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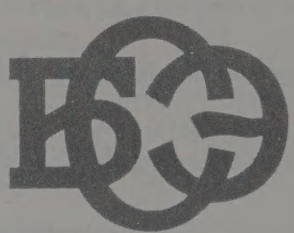

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Explanatory Notes

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All bibliographies that appear in the Russian-language edition of the Encyclopedia are fully listed in the English edition. Bibliographic entries follow the same order and are listed in the same language in which they appear in the Russian work. Those works that are written in languages using the Latin alphabet are rendered as they are. Languages in other alphabets are given in the Library of Congress transliteration system for that language or, if there is no Library of Congress system, in the transliteration system used throughout the Encyclopedia.

Names of authors whose works are translated into Russian appear in the original language, not in Russian transliteration.

This method of presentation is such that all entries in the bibliographies can be checked through the National Union Catalog. Therefore, the spelling of an author's name may occasionally differ from text to bibliography; this is because in text the Russian-language edition spells the names of all peoples of the Soviet Union in Russian but in bibliographies sometimes lists their works in the original languages. Insofar as possible, the English edition transliterates names in the bibliographies from the original language into the Library of Congress system (or the system used throughout) and gives this variant transliteration in brackets.

The bibliographies are selective and serve as sources for the authority of the article and for additional information. They contain suggestions for further reading, sources for historical and current data, and sometimes further bibliographies.

Usually the structure of the bibliographies reflects the structure and content of the article. That is, general works are listed first, followed by more specialized references. In long bibliographies for articles dealing with Soviet views on broad subjects, a system is generally followed whereby the classic reference works of Marxism-Leninism are given first, followed by works in Russian or other languages of the Soviet Union, then foreign language publications, and, finally, reading lists. The entries may be arranged alphabetically by author or chronologically; they may also be listed under clearly defined subject fields. On Western subjects, foreign authors are sometimes listed first.

Bibliographies of articles on people are divided into two parts: WORKS—that is, works written by the subject; and REFERENCES—that is, works about the subject. Under REFERENCES, the publications in Russian are listed first, then foreign works in Russian translation, and then foreign works in all other languages. If a publication appeared in several editions, either the first or most valuable edition (from a scholarly point of view) is presented.

ARTICLE NUMBER CODE

To assist those readers who wish to refer to the Russian edition, each article has been coded with a number for easy reference to the *Bol'shaia Sovetskaia Entsiklopediia.* For example, the article "Alexander Nevsky" has the number [1-1199-2]. This means that in the Russian edition the article may be found in Volume 1, column 1199, second article in the column.

ABBREVIATIONS

Following is a list of frequently used special abbreviations

ACP(B)—All-Union Communist Party (Bolshevik)
ASSR—Autonomous Soviet Socialist Republic
CPSU—Communist Party of the Soviet Union
RCP(B)—Russian Communist Party (Bolshevik)
RSDLP—Russian Social Democratic Labor Party
RSDLP(B)—Russian Social Democratic Labor Party (Bolshevik)
RSFSR—Russian Soviet Federated Socialist Republic
SSR—Soviet Socialist Republic
Izbr. proizv. or *soch.*—selected works
Izbr. voen. proizv.—selected military writings
Poln. sobr. soch.—complete collected works
Sobr. soch.—collected works
Soch.—works

TRANSLITERATION

For the languages of the USSR we are using the Library of Congress transliteration system when available and modified to eliminate diacritical marks. Languages for which there is no Library of Congress system, for example, Tadzhik, are transliterated according to the system developed by Professor Edward Allworth in *Nationalities of the Soviet East* (Columbia University Press, 1971). The only exceptions are for proper names so familiar in English that to transliterate them otherwise would mislead the user. For works cited in text we have translated the titles so that the full sense of the article will be preserved. The transliteration table used throughout the work for Russian Cyrillic is given below.

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А	а	*А*	*а*	a	Р	р	*Р*	*р*	r
Б	б	*Б*	*б*	b	С	с	*С*	*с*	s
В	в	*В*	*в*	v	Т	т	*Т*	*т*	t
Г	г	*Г*	*г*	g	У	у	*У*	*у*	u
Д	д	*Д*	*д*	d	Ф	ф	*Ф*	*ф*	f
Е	е	*Е*	*е*	e	Х	х	*Х*	*х*	kh
Ж	ж	*Ж*	*ж*	zh	Ц	ц	*Ц*	*ц*	ts
З	з	*З*	*з*	z	Ч	ч	*Ч*	*ч*	ch
И	и	*И*	*и*	i	Ш	ш	*Ш*	*ш*	sh
Й	й	*Й*	*й*	i	Щ	щ	*Щ*	*щ*	shch
К	к	*К*	*к*	k	Ъ	ъ	*Ъ*	*ъ*	”
Л	л	*Л*	*л*	l	Ы	ы	*Ы*	*ы*	y
М	м	*М*	*м*	m	Ь	ь	*Ь*	*ь*	’
Н	н	*Н*	*н*	n	Э	э	*Э*	*э*	e
О	о	*О*	*о*	o	Ю	ю	*Ю*	*ю*	iu
П	п	*П*	*п*	p	Я	я	*Я*	*я*	ia

Articles—Volume 29

The articles in the Russian-language Bol'shaia Sovetskaia Entsiklopediia *are alphabetized according to the Cyrillic alphabet; in our edition, they are translated and alphabetized within each volume according to the English alphabet. Thus, the articles in Volume 29 of the Russian edition are listed below; they run from A through Z in English because of the title changes that occur when they are translated. In this complete list of articles for Volume 29, the asterisks indicate those titles that appear in the Russian edition only; these constitute less than 1 percent of the total wordage of the volume.*

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Chernitsyn, Nikolai Nikolaevich
Chernobai
Chernobyl'
Chernogolovka
Chernogora
Chernogorsk
Chernoistochinsk
Chernomorka
Chernomorskii
Chernomorskoe
Chernososhnye Krest'iane
Chernov, Aleksandr Aleksandrovich
Chernov, Dmitrii Konstantinovich
Chernov, Sergei Nikolaevich
Chernov, Viktor Mikhailovich
Chernov-Lüders Lines
Chernovtsy
Chernovtsy, University of
Chernovtsy Oblast
Chernovtsy Ukrainian Musical and Dramatic Theater
Chernozem
Chernukhi
Chernukhino
Chernushka
Chernye Brat'ia
Chernye Liudi
Chernye Mountains
Chernye Zemli (geographical region)
Chernye Zemli (landholdings)
Chernyi, Gorimir Gorimirovich
Chernyi, Sasha
Chernyi Les Culture
Chernyi Ostrov
Chernyi Peredel
Chernyi Porog
Chernyi Shliakh
Chernyshev, Aleksandr Alekseevich
Chernyshev, Aleksandr Ivanovich
Chernyshev, Andrei Borisovich
Chernyshev, Arkadii Ivanovich
Chernyshev, Feodosii Nikolaevich
Chernyshev, Grigorii Petrovich
Chernyshev, Pavel Feoktistovich
Chernyshev, Sergei Egorovich
Chernyshev, Vasilii Efimovich
Chernyshev, Vasilii Il'ich
Chernyshev, Zakhar Grigor'evich
Chernyshev
Chernysheva, Lidiia Dem'ianovna
Chernyshevich, Arkadii Dmitrievich
Chernyshev Ridge
Chernyshevsk
Chernyshevskii, Nikolai Gavrilovich
Chernyshevskii
Chernyshkovskii
Cherokee
Cherokov, Viktor Sergeevich
Cherskii, Nikolai Vasil'evich
Cherskii
Cherskii Range (mountain system, Yakut SSR and Magadan Oblast, RSFSR)
Cherskii Range (mountain range, Chita Oblast, RSFSR)
Chertkov, Vladimir Grigor'evich
Chertkovo
Chertok, Boris Evseevich
Chertomlyk
Cherusti
Cherven' (city, Byelorussian SSR)
Cherven (ancient Russian city)
Cherven Cities
Cherviakov, Aleksandr Grigor'evich
Cherviakov, Evgenii Veniaminovich
Chervonenko, Stepan Vasil'evich
Chervonets
Chervoniuk, Evgenii Ivanovich
Chervonoarmeisk (city)
Chervonoarmeisk (urban-type settlement)
Chervonoe (urban-type settlement, Zhitomir Oblast, Ukrainian SSR)
Chervonoe (urban-type settlement, Sumy Oblast, Ukrainian SSR)
Chervonoe Lake
Chervonograd
Chervonogrigorovka
Chervonogvardeiskoe
Chervonopartizansk
Chervonozavodskoe
Chervonyi Arkhiv
Chervonyi Donets
Chesapeake Bay
Chesha Bay
Cheshire
Cheskii, Ivan Vasil'evich
Chesnokov, Iurii Borisovich
Chesnokov, Pavel Grigor'evich
Chesnokovka
Chess
Chess Clock
Chess Composition
Chester (city, England)
Chester (city, Pennsylvania)
Chesterfield, Fourth Earl of
*Chesterfield
Chesterton, Gilbert Keith
Chestnokov, Vladimir Ivanovich
Chet'
Chetaev, Nikolai Gur'evich
Cheti
Chetlasskii Kamen'
Chetniks
Chetverik (architecture)
Chetverik (measurement)
Chetverikov, Sergei Sergeevich
Chetvert'
Chetvertakov, Ermolai Vasil'evich
Chetvert' Landholding
Chevage
Chevakinskii, Savva Ivanovich
Chevalier, Maurice
Chevalier, Pierre
*Chevalier
Chevau-Légers
Cheverev, Aleksandr Mikhailovich
Cheviot (sheep)
Cheviot (textile)
Cheviot Hills
Chevkinite
Chevreul, Michel Éugène
Chevron
Cheyenne (people)
Cheyenne (city)
Chiang Mai (medieval Laotian kingdom)
Chiang Mai (city)
Ch'iangt'ang

Chiantar
Chianuri
Chiapas
Chiatura
Chiaureli, Mikhail Edisherovich
Chibagalakh
Chibchan Languages
Chibisov, Konstantin Vladimirovich
Chibisov, Nikandr Evlampievich
Chibizhek
Chiboni
Chicago
Chicago, Art Institute of
Chicago, University of
Chicago Financial Group
Chicago School
Chicago Tribune
Chichagov, Pavel Vasil'evich
Chichagov, Vasilii Iakovlevich
Chichén Itzá
Chicherin, Boris Nikolaevich
Chicherin, Georgii Vasil'evich
Chicherov, Vladimir Ivanovich
Chichibabin, Aleksei Evgen'evich
Chichibabin Reaction
Chichikleia
Chichinadze, Konstantin Archilovich
Chichkaiul
Chiclayo
Chicopee
Chicoutimi and Jonquière
Chiganak
Chigirin
Chigirin Campaigns of 1677–78
Chigirin Conspiracy of 1877
Chigorin, Mikhail Ivanovich
Chigrinov, Ivan Gavrilovich
*Chigwell
Chihli Clique
Chihuahua (state)
Chihuahua (city)
Chihuahua (dog)
Chiili
Chii-san
Chik
Chika
Chikhachev, Petr Aleksandrovich
Chikhachev Bay
Chikhachev Range
Chikobava, Arnol'd Stepanovich
Chikoi (urban-type settlement)
Chikoi (river)
Chikoidze, Mikhail Nikolaevich
Chikolev, Vladimir Nikolaevich
Chikovani, Grigol Samsonovich
Chikovani, Mikhail Iasonovich
Chikovani, Simon Ivanovich
Chikurachki
Chiladze, Tamaz Ivanovich
Chilaia, Sergei Evstaf'evich
Child, Charles Manning
Childe, Vere Gordon
Chile
Chile, University of
Chilean Archipelago
Chileans
Chile Basin
Chilik
Chililabombwe
Chil'khudzhra
Chillán
Chillon
Chiloé
Chiltern Hills
Chimbai
Chimborazo
Chimbote
Chimion
Chimishliia
Chimkent
Chimkent Oblast
Chimpanzee
Chin
Chinadievo
Chinakal, Nikolai Andreevich
Chinantec
Chinaz
Chinchilla
Chinchillidae
*Chinde
Chindwin
Chingiztau
Chingola
Chingunjav
Chinhae
Chinilin, Anatolii Ivanovich
Chiniot
Chinju
Chink
Chinkov
Chinook
Chinovnichestvo
Chippendale, Thomas
Chiprovets Uprising of 1688
Chiquinquirá
Chir
Chirchik (city)
Chirchik (river)
Chirchik-Bozsu Hydroelectric System
Chiri-Iurt
Chirikof Island
Chirikov, Aleksei Il'ich
Chirikov, Evgenii Nikolaevich
Chirik-Rabat
Chirin, Prokopii Ivanovich
Chirka-Kem'
Chirkei Hydroelectric Power Plant
Chirkov, Boris Petrovich
Chirvinskii, Nikolai Petrovich
Chirvinskii, Petr Nikolaevich
Chisana
Chishmy
*Chislehurst and Sidcup
Chislo
Chistalev, Veniamin Timofeevich
Chistiakov, Ivan Dorofeevich
Chistiakov, Ivan Mikhailovich
Chistiakov, Mikhail Nikolaevich
Chistiakov, Pavel Petrovich
Chistiakovo
Chistoe
Chistoozernoe
Chistop
Chistopol'
Chistovich, Nikolai Iakovlevich
Chita
Chitaia, Georgii Spiridonovich
Chita Oblast
Chita Operations of 1920
Chita Republic
Chittagong
Chittaranjan
Chivilikhin, Vladimir Alekseevich
Chizhapka
Chizhevskii, Aleksandr Leonidovich
Chizhevskii, Leonid Vasil'evich
Chizhevskii, Nikolai Prokop'evich
Chizhikov, David Mikhailovich
Chizhov, Matvei Afanas'evich
Chkalov, Valerii Pavlovich
Chkalovsk (city, RSFSR)
Chkalovsk (city, Tadzhik SSR)
Chkhartishvili, Archil Evstaf'evich
Chkheidze, Nikolai Semenovich
Chkheidze, Nodar Georgievich
Chkheidze, Revaz Davidovich
Chkheidze, Ushangi Viktorovich
Chkhenkeli, Akakii Ivanovich
Chkhenkeli, Ivan Noevich
Chkhikvadze, Noe
Chkhikvadze, Viktor Mikhailovich
Chkhorotsku
Chkoniia, Lamara Grigor'evna
Chlia
Chmi
Chmshkian, Georg Arutiunovich
Chmutov, Konstantin Vasil'evich
Chobanian, Arshak
Chobanu, Ion Konstantinovich
Choban-Zade, Bekir Vagap Ogly
Chocano, José Santos
Chocó
Chocolate
Chocolate-molding Equipment
Chodrishvili, Mikhail Iosifovich
Choe Chi-won
Ch'oe Ik-hyon
Choe Nam-son
Ch'oerh Ho
Choe Suh-hae
Chogori
Choguk Kwangbokhoe
Choibalsan, Khorlogiin
Choibalsan
Choibalsan Ula
Choimbol, Sonomyn
Choiseul, Étienne François de
Choiseul
Chokha
Chokhatauri
Chokhov, Andrei
Cho Ki-chon
Chokrak Lake
Chola
Cholpon-ata
Choluteca
Cho Myong-hi
Chon
Chona
Chonan
Chon Buri
Chondon
Chong Chol

Chong In-ji
Chongjin
Chongju
Chong Pong-jun
Chonguri
Chong Yak-yong
Chonju
Chonkadze, Daniel Georgievich
Chonos, Archipiélago de los
Chop
Chopin, Frédéric-François
Chopin, Jean
Chopovichi
Chornyi, Kuz'ma
Chortkov
Chorukh-Dairon
Chosenia
Choson (first Korean state)
Choson (alternate name for Korea)
Chota Nagpur
Chou
Chouans
Chou En-lai
Chou Hsin-fang
Chouk'outien
Chou Li-po
Choushan
Chou Tun-i
Chow Chow
Chrevo
Chteniia v Istoricheskom Obshchestve Nestora-Letopistsa
Chteniia v Obshchestve Istorii i Drevnostei Rossiiskikh
Chu (city)
Chu (river)
Chuang
Chuang-tzu
Chubar', Vlas Iakovlevich
Chubarov, Sergei Fedorovich
Chubinskii, Pavel Platonovich
Chubut (province, Argentina)
Chubut (river, Argentina)
Chu Chiang
Chu Chiang K'ou
Chuchin, Fedor Grigor'evich
Chuchkovo
Chuchou
Chud'
Chudakov, Aleksandr Evgen'evich
Chudakov, Evgenii Alekseevich
Chudic Mines
Chudina, Aleksandra Georgievna
Chudnov
Chudnovskii, Grigorii Isaakovich
Chudnovskii, Solomon Lazarevich
Chudov, Mikhail Semenovich
Chudov Monastery
Chudovo
Chudskoe-Pskov, Lake
Chudz'iavr
Chufa
Chufarov, Grigorii Ivanovich
Chufarovo
Chufut-kale
Chugach Mountains
Chugaev, Lev Aleksandrovich
Chugaev Method
Chugal'
Chuguchak
Chuguev
Chugurin, Ivan Dmitrievich
Chugush
Chu Hsi
Chuia (tributary of the Katun')
Chuia (tributary of the Lena)
Chuia Road
Chuia Steppe
Chuika
Chuikov, Semen Afanas'evich
Chuikov, Vasilii Ivanovich
Chu-Ili Mountains
Chuiskie Belki
Chukarin, Viktor Ivanovich
Chukchagir Lake
Chukchi (language)
Chukchi (people)
Chukchi Autonomous Okrug
Chukchi Highlands
Chukchi Ivory Carving
Chukchi-Kamchatka Languages
Chukchi Peninsula
Chukchi Sea
Chukhadzhian, Tigran Gevorgovich
Chukhanov, Zinovii Fedorovich
Chukhloma
Chukhno, Andrei Vasil'evich
Chukhnovskii, Boris Grigor'evich
Chukhrai, Grigorii Naumovich
Chukhrov, Fedor Vasil'evich
Chukoch'e
Chu-ko Liang
Chukovskii, Kornei Ivanovich
Chukovskii, Nikolai Korneevich
Chukury
Chulaki, Mikhail Ivanovich
Chulkov, Mikhail Dmitrievich
Chul'man
Chulpan
Chulutyn-Gol
Chulym (city)
Chulym (river, Novosibirsk Oblast)
Chulym (river, Tomsk Oblast)
Chulym-Enisei Basin
Chulymtsy
Chulyshman
Chulyshman Plateau
Chum
Chumachestvo
Chumakov, Mikhail Petrovich
Chumiza
Chumysh
Chuna
Chunatundra
Ch'un Ch'iu
Chunchon
Chungju
Chungking
Chunhyang-Jon
Chuni
Chunia
Chuniri
Chunizhekov, Chalchik Anchinovich
Chunskii
Chupa
Chupakhovka
Chuprov, Aleksandr Aleksandrovich
Chuprov, Aleksandr Ivanovich
Chuquet, Nicolas
Chuquicamata (city)
Chuquicamata (copper deposit)
Chur
Church, Alonzo
Churchill, Lord Randolph
Churchill, Winston Leonard Spencer
Churchill (city, Canada)
Churchill (river, Labrador)
Churchill (river, Saskatchewan)
Churchill Falls
Churikovtsy
Churinga
Churkin, Nikolai Nikolaevich
Churriguera
Chursin, Serafim Evgen'evich
Chu Shih-chieh
Chu Si-gyong
Chusovaia
Chusovoi
Chusovoi Metallurgical Works
Chust
Chust Settlement
Chu Teh
Chutkikh, Aleksandr Stepanovich
Chutovo
Chutskaev, Sergei Egorovich
Chuval
Chu Valley
Chuvans
Chuvash (people)
Chuvash (language)
Chuvash Autonomous Soviet Socialist Republic
Chuvash University
Chuviaki
Chu Yüan-chang
Chuzhak, Nikolai Fedorovich
Chuzik
Ciamician, Giacomo
Ciano, Count Galeazzo
Ciceruacchio
Çiftlik
Çildir
Cilli, Alessandro
Cima, Giovanni Battista
Cimabue, Giovanni
Cimarosa, Domenico
Cimpoi
Cinquecento
Ciompi
Ćipiko, Ivo
Cipriani, Amilcare
Cirebon
Ciucurencu, Alexandru
Ciulei, Liviu
Čiurlionis, Mikalojus Konstantinas
Civitavecchia
Class Ranks
*Cliché (definition)
Cliché (literature)
Clinometer
Clock, Astronomical
Clock and Watch Industry
Clock Drive
Clocks and Watches

Clothing Industry
Code
Coining
Coining Press
Coleophoridae
Commission for National Education
Comstock Mealybug
*Cone
Cone Dryer-Shaker
Connecting Rod
*Consumption
Continental Shelf
Continuous Compression Molding of Plastics
Contract of Affreightment
Control Panel
Converter Tube
Ćopić, Branko
Čopić, Vladimir
Coppers
*Copy
Çorbaci
Corded Ware Culture
*Corkscrew
Corresponding Member
Çoruh
Çorum
Corymb
Ćosić, Branimir
Cosmic Noise
Cotter Pin
Coupling Loop
Cranial Index
Cranial Nerves
Crater
*Crew
Crnojević
Crocus
*Crude Metal
Csokonai Vitéz, Mihály
Csongrád (county)
Csongrád (city)
Ćubrilović, Vaso
Cukurova
Čulinović, Ferdo
Cutting
Cuttings, Propagation by
Cynoglossum
Czardas
Czartoryski
Czech
Czechoslovak Academy of Sciences
Czechoslovak Corps Mutiny of 1918
Czechoslovakia
Czechoslovak News Agency
Czechoslovak People's Party
Czechoslovak Radio
Czechoslovak Social Democratic Labor Party
Czechoslovak Socialist Party
Czechoslovak Television
Czechoslovak Theater
Czechowicz, Józef
Czech Progressive Party
Czechs
Czech Socialist Republic
Czech Uprising of 1547
Czech Uprising of 1618–20
Czech Uprising of 1775
Czekanowski, Jan
Czeladź
Czernin, Ottokar
Czerny, Karl
Czerski, Jan
Czerwony Sztandar
Częstochowa
Częstochowa Województwo
Czeszko, Bohdan
Czynsz
Dandy Roll
Demolition Block
Dermoptera
*Detritus
Devil
Diaspididae
Djazirah Doberai
Dowel
Dowel-making Machine
Drafting and Designing Equipment
Drill Hole
Dross
Dryopteris
Duff
*Dugout
Dunlin
*E
Ea
Eakins, Thomas
Eannatum
Ebbinghaus, Hermann
Ebeko
Ebenaceae
Ebers, Georg
Eberswalde
Ebert, Friedrich (chancellor)
Ebert, Friedrich (lord mayor)
Ebert, Max
Ebi Nor
Ebner-Eschenbach, Marie von
Ebolowa
Ebonite
*Ebony (trees)
Ebony (wood)
Ebro
Ebullioscopy
Eccarius, Johann Georg
Eccles, John Carew
Ecclesia
Ecdysone
Eçevit, Bülent
Eckermann, Johann Peter
Eckersberg, Cristoffer Vilhelm
Eck's Fistula
Eclampsia
Eclecticism (architecture, art)
Eclecticism (philosophy)
Ecliptic
Ecloga
Eclogite
Eclogite Facies
Eclogue
Ecnomus
Ecobiomorph
Ecogenesis
Ecological Amplitude
Ecological Niche
Ecology
Econometrics
Economically Active Population
Economic and Social Commission for Asia and the Pacific
Economic and Social Council
Economic Cartography
Economic Category
Economic Commission for Africa
Economic Commission for Europe
Economic Commission for Latin America
Economic Commission for Western Asia
Economic Comparisons, International
Economic Competition Between the Two World Systems
Economic Compulsion to Work
Economic Cooperation Between the USSR and Nonsocialist Countries
Economic Cooperation of the Socialist Countries
Economic Crisis
Economic Efficiency
Economic Efficiency of Capital Investments
Economic Efficiency of New Technology
Economic Efficiency of Socialist Production
Economic Geography
Economic Growth, Theories of
Economic Incentive
Economic Information
Economic Laws
Economic Management
Economic Maps
Economic Materialism
Economic Model, Mathematical
Economic Pattern
Economic Policy
Economic Potential
Economic Reform in the USSR
Economic Region
Economic Regionalization
Economics
Economics, Construction
Economics, Encyclopedias and Dictionaries of
Economics, Industrial
Economics, Institute of
Economics, Journals of
Economics and Politics in the Era of the Dictatorship of the Proletariat
Economics Education
Economics Institute of the State Planning Committee of the USSR
Economics Institutes
Economics Institutes, Research
Economics of Communications
Economics of the World Socialist System, Institute of
Economics of Trade
Economic Statistics
Economic Table
Economism
Economist, The
Economizer
Economo, Constantin Alexander von

Economy
Economy of Time, Law of
Écossaise
Ecosystem
Ecosystem, Closed
Ecotype
Eczema
Edaphon
Eddington, Arthur Stanley
Ede (city, Nigeria)
Ede (city, Netherlands)
Édea
Edelfelt, Albert
Edelman, Gerald Maurice
Edel'shtein, Vitalii Ivanovich
Edén, Nils
*Eden
Eder, Boris Afanas'evich
Edfu
Edge Island
Edger
Edgeworth, Francis Ysidro
Edgeworth, Maria
Edict
Edificator
Edil'baev Sheep
Edinburgh
Edinburgh, University of
Edirne
Edison, Thomas Alva
Editorial Technique
Edjeleh
Edmonton
Edom
Edrioasteroidea
Edward (kings of England)
Edward (the Black Prince)
Edward (lake)
Edward VII Peninsula
Edwards, Jonathan
Edwards Plateau
Edward the Confessor
Eeden, Frederik van
Eekhoud, Georges
Eemian Interglacial
Egadi Islands
Egalitarianism
Egba Uprising
Egbert
Egede-Nissen, Adam Hjalmar
Eger
Eggert, John Emil Max
Egin-Gol
Egk, Werner
Egmont, Count of
Egocentrism
Egoism
*Egotism
Egressy, Gábor
Eğridir
Egrisi
Eguchi Kiyoshi
Egvekinot
Eichendorff, Joseph von
Eichhorn, Emil
Eichhorn, Karl Friedrich
Eichler, August Wilhelm
Eichman, Adolf
Eideman, Robert Petrovich
Eidetic Memory
Eidinov, Grigorii Borisovich
Eidlin, Lev Zalmanovich
Eidos
Eidsvoll Constitution of 1814
Eidukevičius, Pranas
Eifel
Eifelian Stage
Eiffel, Alexandre Gustave
Eigen, Manfred
Eights Coast
Eijkman, Christiaan
Eike von Repgau
Eikhe, Genrikh Khristoforovich
Eikhe, Robert Indrikovich
Eikhenbaum, Boris Mikhailovich
Eikhenval'd, Aleksandr Aleksandrovich
Eikhfel'd, Iogan Gansovich
Eikhval'd, Eduard Ivanovich
Eikonal
Eilenburg
Eimer, Theodor Gustav Heinrich
*Eimeria
Einaudi, Luigi
Eindhoven
Einhard
Einmann, Eduard
Einsiedel, Johann August von
Einstein, Albert
Einstein, Alfred
Einstein
Einstein Coefficients
Einstein–de Haas Effect
Einsteinium
Einstein Law of Photochemical Equivalence
Einthoven, Willem
Eiren
Eirene
Eisele, Donn Fulton
Eisenach
Eisenacher
Eisenerz
Eisenhower, Dwight David
Eisenhower Doctrine
Eisenhüttenstadt
Eisenstein, Sergei Mikhailovich
Eišiškės
Eisleben
Eisler, Hanns
Eisner, Ján
Eisner, Kurt
Eisriesenwelt
Eizen, Artur Arturovich
Ejective
Ejector
Ék, Sándor
Eka-Elements
Ekhof, Konrad
Ekibastuz
Ekibastuz Coal Basin
Ekibastuz State Regional Power Plant
Ekimchan
Ekinchi
Ekk, Nikolai Vladimirovich
Ekman, Vagn Walfrid
Ekmolin
Ekonomicheskaia Gazeta
Ekonomicheskie Krest'iane
Ekonomika
Ekonomika i Matematicheskie Metody
Ekonomika Sel'skogo Khoziaistva
Ekonomika Stroitel'stva
Ekskuzovich, Ivan Vasil'evich
Ekwensi, Cyprian
Ekzekutor
Elat
Elateridae
Elektrokhimprom Chirchik Production Association
*Embosser
Emergency, State of
Emergency Budget
Emergency Legislation
Emergency Tax
*Enciphering
End-measuring Instrument
Enrichment System
Entrenching Tools
Environmental Physiology
Épée
Eqbal, Abbas
Equant
Equational Division
*Equator
*Equator, Celestial
*Equator, Geomagnetic
*Equator, Magnetic
Equatorial
Equatorial Air
Equatorial Belt
Equatorial Channel
Equatorial Climate
Equatorial Forest Zone
Equatorial Guinea
Equatorial (Negro-Australoid) Race
*Equatorial Parallax
Equatorial Plate
Equatorial Undercurrent of the Indian Ocean
Equidensitometry
Equidistant Curve
Equiplain
*Equipment
Equipotential Surface
Equivalence, Principle of (economics)
Equivalence, Principle of (physics)
Equivalence Relation
*Equivalent (definition)
Equivalent (chemical)
*Equivalent (electrochemical)
Equivalent Power
Equivalents, Law of
*Equivoque
Eric the Red
Esocidae
Esocoidei
Esophagitis
Esophagoscopy
Esophagotomy
Espalier
Espionage
Eucalyptus
Eucalyptus Forests
Eucalyptus Oil

Eucken, Rudolf
Eucken, Walter
Euclase
Eucommia
Eudaemonism
Eudes, Émile François Desiré
Eudialyte
Eugenol
Eugeosyncline
Euglena
Euglenophyta
Euler, Leonhard
Euler, Ulf Svante von
Euler Angles
Euler Characteristic
Euler-Chelpin, Hans Karl August Simon von
Euler-Fourier Formulas
Euler-MacLaurin Summation Formula
Euler Number
Euler Numbers
Euler Phi-function
Euler's Constant
Euler's Equation
Euler's Equations
Euler's Formula
Euler's Integral
Euler Substitutions
Euphausiacea
Euphemism
Euphony
Euphoria
Euphuism
*Eureka
Euripos
European Blackbird
*Eury-
Eurybathic Animal
Eurybiont
*Eurydice
Euryhaline Animal
Euryphagy
Eurypteroidea
Eurystomus
Eurytherm
Eurytopic Organism
Eustacy
Eutectic
Eutectoid
Eutrophic Plants
Euwe, Max
Evacuation
Evacuation, Medical
Evangelista, Crisanto
Evans, Arthur John
Evans, Edith
Evans, Ronald Ellwin
Evanston
Evansville
Evaporography
Evarnitskii, Dmitrii Ivanovich
Evection
Even
Even and Odd Functions
Evenki (people)
Evenki (language)
Evenki Autonomous Okrug
Even Literature
*Even Number
Evens
Evensk
Evensmo, Sigurd
Everett
Everglades National Park
Evernia
Evers, Iogann Filipp Gustav
Eversmann, Eduard Aleksandrovich
Evert, Aleksei Ermolaevich
Évian Agreements
Evliya Çelebi
Evolute and Involute
Evolution
Evolution, Biological
Evolution, Doctrine of
Evolutionary Morphology and Animal Ecology, Institute of
Evolutionary Physiology
Evolutionary Physiology and Biochemistry, Institute of
Evolutionist School
*Évora
Evoron
Evorsion
*Evreux
Evvoia
Ewald, Johannes
Ewe (people)
Ewe (language)
*Ex-
Exa-
Exacum
Exaltados
Exaltation
Examination
Exanthema, Vesicular
Exaration
Exarchate
Excavation
Excavator
Exciton
Excitron
*Excoriation
*Excrement
Excursion
*Excursus
Executive Committee Range
*Exedra
*Exegesis
*Exegetics
Exekias
Exequatur
Exercice
*Exercises
Exergy
Exeter
Exhauster
*Exhibitionism
Exhumation
Exine
Existentialism
Exkuseia
*Exo-
Exobiology
Exocrine Gland
*Exodermis
Exogamy
Exogastrulation
Exogenous (botany)
*Exogenous (medicine)
Exogenous Nutrition
Exogenous Process
Exopeptidase
Exophthalmos
Exosomatic Organ
Exosphere
Exostosis
Exothermic Reaction
*Exotica
Extended-day Schools and Groups
Extraordinary All-Russian Congress of Soviets of Peasants' Deputies
Extraordinary and Increased Security
Extraordinary Budget
Extraordinary Eighth Congress of Soviets of the USSR
Extraordinary Fourth All-Russian Congress of Soviets of Workers', Peasants', Soldiers', and Cossacks' Deputies
Extraordinary Seventeenth All-Russian Congress of Soviets
Extraordinary Sixth All-Russian Congress of Soviets of Workers', Peasants', Cossacks', and Red Army Deputies
Eyadéma, Gnassingbe
Eyre, Edward John
Eyre (lake)
Eyre (peninsula)
Eyskens, Gaston
Ezana
Ežerėlis
Ezero
Ezop
Ezra
Family Member
Feeler
Feeling
Ferrous Metallurgy
Ferrous Metallurgy, Institute of
*Ferrous Metals
Ficaria
Filler
Fine
Fireclay
Fireclay Refractory
Focal-plane Shutter
Ford Ranges
Foremen's Schools and Classes
Four Arts
Four-bar Linkage
Four-color Problem
Four-cycle Engine
Four Families of China
Four-horned Antelope
Fourhorn Sculpin
Fourteen Points
Fourteenth All-Russian Congress of Soviets of Workers', Peasants', and Red Army Deputies
Fourteenth Conference of the Russian Communist Party (Bolshevik)
Fourteenth Congress of the All-Union Communist Party (Bolshevik)
Four-terminal Network

Fourth Conference of the Russian Social Democratic Labor Party
Fourth Congress of Soviets of the USSR
Fourth Republic
Fourth (Unity) Congress of the Russian Social Democratic Labor Party (RSDLP)
Four-year Sejm
Frame Frequency
Frazil Ice
Frequency
Frequency, Electrical
Frequency-contrast Response Curve
Frequency Dictionary
Frequency-independent Antenna
Frequency Meter
Frequency Modulation
Frequency-response Method
Frequency-shift Telegraphy
Frequency Standard, Primary
Frequency Standard, Secondary
Gable
Gage
Gallery
Gallnut
Garlic
Gate
Gear Pump
Genghis Khan
Globular Cluster
Gnathostomata
Goldfinch
*Grapevine Cutting
Grinding
Grinding Head
Grinding Machine
Ground Joint
*Half Title
Halimodendron
*Hard Sign
Hatched Ware Culture
Hats
Haymarket Square Riot of 1886
Hébert, Jacques-René
Hébertists
Helmet
Helmet, Communications
Herbert, Edward
Hereditary Feudal Lease
Herringbone Gear
Heuristic
Hexabiblos of Harmenopulus
Hexactinellida
*Hide
Hinge Line
*Hit
Hobby
Hodgson's Hawk Cuckoo
Hohenstaufen
Honor and Dignity, Legal Protection of
Horologium
Hosiery
Hosiery Machine
*Hour
Hulling Mill
Human Factors
Human Relations Theory
Hymenomycetes
Ice Chute, Frazil
Idehan Marzuq
Idehan Ubari
Ijmuiden
Ijssel
Iltutmish, Shams al-Din
Imbricate Structure
Ink Sac
Interlaced Scanning
Involute Gearing
Involute-profile-measuring Instrument
Iron and Steel Monopolies
Jackal
Japanese Angelica Tree
Jaw
Jónsson, Einar
Jurchen
Jurchens
Kalgan
*Key
Key Joint
Keyway-milling Machine
Kid Leather
Kingbolts and Kingpins
Kjellén, Rudolf
Kjellgren, Josef
Labor Economics
Ladle Car
Landing Gear
Land Valuation
Laparotomy
Lapwing
Lard
Laridae
Lathyrus
Latitude
Latitude, Geomagnetic
Latitude, Magnetic
Latitude Station
*Lead
Leaf Cast
*Leapfrog
Lens
Lenticel
Leontopodium
Level Width
Light-beam Oscillograph
Linchpin
Linkage
Linkwork
Lisp
Lithuanian Black and White Cattle
Location Theories
Lock
Locking of Rivers
Lockstitch
Man
Mandibular Arch
Mange
Marasmius Scorodonius
Marrubium
*Masterpiece
Matrix Balance Sheet
Matte
May Fourth Movement
Melitaea and Euphydryas
Meropidae
Mine, Underground
Mine Area
Mine Hoist
Mine Probe
Mine Telephone
*Miracle
Montenegrins
Montenegro
Mooring Equipment
Morus
Moving Coil
Moving-target Indication
Mugwort
Mukden
Mukden Incident of 1931
Museum of Science and Industry
Mute Swan
Mutilation
National Liberation Front
Neck
Nemirovich-Danchenko School Studio
Net Output
Net Profit
Net Social Income
Niello
Nigella
Noise
Noise, Atmospheric
Noise, Receiver
Noise, Terrestrial
Noise Control
Noise Figure
Noise Temperature
Notostraca
Number (linguistics)
Number (mathematics)
Numbers, Theory of
Numeral
Numerical Methods
Numerical Solution of Equations
Nux Vomica
Occupation Number
Oedipus
Oedogoniales
Oil Cake
Oil Mining, Subsurface
One Step Forward, Two Steps Back
Optical Square
Oscillation, Frequency of
Oscinella
Ösel, Battle of (1719)
Ösel Episcopate
Osmunda
Øverland, Arnulf
Oxalic Acid
Padus
Pale of Settlement
Palpus
Panel-assembling Machine
Parallel Rule
Parity
Parity of a State
Part and Whole
Partial Discharge
Particle
Particular Solution
Parts of Speech
Passive Sonar
Pattern

Pediment
*Pedometer
Pelobatidae
Pelta
Penalty Function Method
*Pendant
Pentatomoidea
Pholiurus
Pig
Pillow Lava
Pilot Balloon
*Pin (definition)
Pin (machinery)
Pinching
Pine Grosbeak
*Pinion
Pintail
Piston Rod
Pit
*Pitch, Gear-tooth
Pitch, Screw-thread
Plague
Plague-like Diseases of Animals
Plague Revolt
*Plaid
Plaster and Stucco
Plastering and Stuccoing
Plug-and-socket Connection
Poetic Edda
*Point
Portland Blast-furnace Slag Cement
Postage Meter
*Prayer Beads
Print and Lettering
Private Accusation
Private Labor
Private Law
Private-Public Accusation
Prose Edda
Prune
Prunella
Psithyrus
Puck
Pulley
*Punctiliousness
Purebreeding
Pure Culture
Pure Line
Pure Metal
Pure State
Purgatory
Purge of the Party
Pygopodidae
Quadripartite Agreement on West Berlin
Quarter-tone System
Quarter-wave Stub
Quaternary Geology
*Ramrod
Rank (position)
Rank (line)
Raw Silk
Reader
Recovery of Sold Property
Recurvirostra
Red Gold
Regions of the World
Repoussage
Resolution Sensitivity
*Reserve Shore Formation
Rete Mirabile
Rhizoctonia Rot of Citrus
Roller-bit Drilling
Roofing Tile
Rumex
Sa
Šabac
Saber Carp
Šafařík, Pavel Josef
Ságvári, Endre
Saisunaga
Sajo
Šakiai
Sakya
Šalčininkai
Salgótarján
Sallai, Imre
Salvia
Sanding
Sanding Machine
Sankara
Šantić, Aleksa
Sarcoptidae
Šar Planina
Sastri, K. A. Nilakanta
Saxicola
Scabies
Scale (definitions)
Scale (measurement)
Scale (zoology)
Scale Insect
*Scale of a Physical Quantity
Schacht, Joseph
Schädel, Gottfried Johann
Schadow
Schaffhausen
Schäffle, Albert Eberhard Friedrich
Schairer, John Frank
Schallück, Paul
Schally, Andrew Victor
Schapper, Karl
Schärf, Adolf
Scharf, Erwin
Scharnhorst, Gerhard Johann David von
Scharoun, Hans Bernhard
Schaudinn, Fritz Richard
Schaum, Matthäus
Scheel, Heinrich
Scheel, Walter
Scheele, Karl Wilhelm
Scheelite
Scheer, Reinhard Karl Friedrich von
Schefferville
Scheidemann, Philipp
Scheiner, Christoph
Scheiner, Julius
Scheldt
Scheler, Max
Schelling, Friedrich Wilhelm Joseph von
Scherer, Wilhelm
Scherfig, Hans
Scheuchzer, Johann Jakob
Scheuchzeria
Schick Test
Schiff, Hugo
Schiff Base
Schiller, Ferdinand Canning Scott
Schiller, Johann Christoph Friedrich von
Schiller, Leon
Schilling
Schiltberger, Johann
Schimmelpenninck, Rutger Jan
Schimper, Andreas Franz Wilhelm
Schimper, Wilhelm Philipp
Schinkel, Karl Friedrich
Schirmacher Ponds
Schirra, Walter Marty, Jr.
Schistosomiasis
Schizognathism
Schizogony
Schizoid
Schizophrenia
Schlaf, Johannes
Schlagintweit Brothers
Schlegel, August Wilhelm von
Schlegel, Friedrich von
Schleicher, August
Schleicher, Kurt von
Schleiden, Matthias Jakób
Schleiermacher, Friedrich
Schleissing, Georg Adam
Schlesinger, Arthur Meier, Jr.
Schlesinger, Frank
Schlesinger, Max
Schleswig
Schleswig-Holstein
Schlich
Schlichting, Albert
Schlick, Moritz
Schlieffen, Alfred von
Schlieffen Plan
Schliemann, Heinrich
Schliere
Schlieren Method
Schlippenbach, Volmar Anton von
Schlosser, Friedrich Christoph
Schlözer, August Ludwig
Schlüter, Andreas
Schlüter, Hermann
Schmalenback, Eugen
Schmalkalden
Schmalkaldic League
Schmalkaldic War (1546–48)
Schmidt, Adolf
Schmidt, Helmut
Schmidt, Isaac Jakob
Schmidt, Johannes
Schmidt, Wilhelm
Schmidt, Wilhelm Matthäus
Schmidt Correction Plate
Schmidt Number 1
Schmidt Telescope
Schmitt, Harrison Hagan
Schmoller, Gustav von
Schneeberg
Schneider
Schneiderhöhn, Hans
Schnitscher, Johann Christian
Schnitzler, Arthur
Schöffen
Schomburgk, Robert Hermann
Schönbein, Christian Friedrich
Schönberg, Arnold
Schönbrunn, Treaty of (1805)
Schönbrunn, Treaty of (1809)

Schönebeck
Schongauer, Martin
Schöngrabern, Battle of (1805)
Schönherr, Karl
Schönherz, Zoltán
*School (definitions)
School (art)
School (education)
School Administration
School of Mathematical and Navigational Sciences
Schools, Industrial Training
Schools, Literacy
Schools for Adults
Schools for Apprenticeship in Industry
Schools for Kolkhoz Youth
Schools for Peasant Youth
Schools for Rural Youth
Schools for Working Youth
Schools for Young Workers
School Theater
Schooner
Schopenhauer, Arthur
Schorl
Schorlemmer, Karl
Schörner, Ferdinand
Schott, Friedrich Otto
Schott, Paul Gerhard
Schottky Barrier
Schottky Barrier Diode
Schottky Effect
Schrader, Otto
Schramm, Konrad
Schreiner, Albert
Schreiner, Olive
Schreker, Franz
Schrieffer, John Robert
Schröder, Ernst
Schröder, Friedrich Ludwig
Schröder-Devrient, Wilhelmine
Schrödinger, Erwin
Schrödinger Equation
Schubart, Christian Friedrich Daniel
Schubert, Franz Peter
Schuchardt, Hugo
Schuchert, Charles
Schuchhardt, Karl
Schulhoff, Julius
Schultze, Max Johann Sigismund
Schulz, Max Walter
Schulze, Franz Eilhard
Schulze-Boysen–Harnack Organization
Schulze-Delitzsch, Franz Hermann
Schulze-Gäevernitz, Gerhart von
Schumacher, Kurt
Schuman, Robert
Schumann, Georg
Schumann, Robert Alexander
Schuman Plan
Schumpeter, Joseph
Schungite
Schuppe, Wilhelm
Schürtz, Heinrich
Schuschnigg, Kurt von
Schütz, Heinrich
Schutzbund
Schwalbe, Gustav
Schwank
Schwann, Theodor
Schwann's Cell
Schwarz, Hermann Amandus
Schwarzenberg, Felix von
Schwarzkopf, Elisabeth
Schwarzschild, Karl
Schwassmann-Wachmann I Comet
Schwedt
Schweickart, Russell
Schweinfurt
Schweinfurth, Georg August
Schweitzer, Albert
Schweitzer, Johann Baptist
Schweizerische Kreditanstalt
Schweizerischer Bankverein
Schwerin (district)
Schwerin (city)
Schwind, Moritz von
Schwinger, Julian
Schwyz
Sciacca, Michele Federico
Scotland
Scots
Scottish School
Scow
Scraper
Scraping
Screen Adaptation
Screened Deposit
Screw Conveyor
Screw Tie-down
*Scupper
Scutage
*Scutella
Scutellaria
Scutellum
Scutum
Seam
Seam Welding
Sechium
Section
Šeduva
Seedless Spike
Şehdi Osman
Şemsettin Sami
Şenchus Mor
Šenoa, August
Sense Organs
Sensibility
Sensing Element
Sensitivity (automatic control system)
Sensitivity (measuring instrument)
Sensitivity, Receiver
Sensory Nerve Fiber
Sentence Parts
Sentry
Sere
Sericulture
Serratia Marcescens
Service Balloon
Šešupė
Setaria
Sewing Machine
Seyhi, Sinan
*Sh
Shaamirian, Shaamir Sultanum
Shaartuz
Shaba
Shabad, Leon Manusovich
Shabaka
Shabalin, Aleksandr Osipovich
Shabbi, Abu al-Qasim al-
Shabdar, Osyp
Shabel'kovka
Shabende
Shabestari, Mahmud
Shabliovskii, Evgenii Stepanovich
Shablykino
Shabrovskii
Shabulin, Mikhail Nikolaevich
Shackleton, Ernest Henry
Shackleton Coast
Shackleton Ice Shelf
Shad
Shadaev, Apollon Innokent'evich
Shaddadid
Shaded-pole Motor
Shadr, Ivan Dmitrievich
Shadrinsk
Shadrinsk Goose
Shafarevich, Igor' Rostislavovich
Shaffer, Gordon
Shafi Ahmad al-Sheik, al-
Shafirov, Petr Pavlovich
Shafonskii, Afanasii Filimonovich
Shafran, Daniil Borisovich
Shafranovo
Shafranovskii, Ilarion Ilarionovich
Shaftesbury, Third Earl of
Shaft Furnace (industry)
Shaft Furnace (domestic heating)
Shagan
Shaginian, Grant Amazaspovich
Shaginian, Marietta Sergeevna
Shaglyteniz
Shagonar
Shagov, Nikolai Romanovich
Shagzhin, Tsyren
Shah
Shahbandar, Abdul Rahman
Shah-Fazyl
Shahi
*Shahinshah
Shahin Taniyus
Shah-i-Zinda
Shah Jahan
Shahjahanpur
Shahn, Ben
Shah-nameh
Sha Ho
Shahr-ashub
Shahrastani, Muhammad Ibn Abd al-Karim al-
Shahreza
Shahr-i Sokhta
Shahristan
Shahrud
Shah Rukh
Shaigino
Shaik, Abdulla Mustafa Ogly
Shaikh al-Islam
Shaikhet, Arkadii Samoilovich
Shain, Grigorii Abramovich
Shain's Comet
Sha'ir
Shairi

*Shaitan
Shaka
Shake
Shakespeare, William
Shakhan
Shakhaziz, Smbat Simonovich
Shakhberdyeva, Maiia
Shakhbuz
Shakhdag (mountain peak)
Shakhdag (mountain range)
Shakhdara (river)
Shakhdara (mountain range)
Shakhimardan
Shakhlicha
Shakhlin, Boris Anfiianovich
Shakhmatov, Aleksei Aleksandrovich
Shakhmurzaev, Said Osmanovich
Shakhov, Feliks Nikolaevich
Shakhovskaia
Shakhovskoi, Aleksandr Aleksandrovich
Shakhovskoi, Dmitrii Ivanovich
Shakhovskoi, Fedor Petrovich
Shakhovskoi, Grigorii Petrovich
Shakhovskoi, Iakov Petrovich
Shakhrikhan
Shakhrisabz
Shakhristan
Shakhsenem
Shakhseveny
Shakhta
Shakhtersk (city, Ukrainian SSR)
Shakhtersk (city, RSFSR)
Shakhterskii (urban-type settlement, Magadan Oblast, RSFSR)
Shakhterskii (urban-type settlement, Tula Oblast, RSFSR)
Shakhtinsk
Shakhtnoe
Shakhtnoe Stroitel'stvo
Shakhtnyi
Shakhty
Shakhty Trial of 1928
Shakhun'ia
Shakhurin, Aleksei Ivanovich
Shaklovityi, Fedor Leont'evich
Shaksha
Shakva
Shalakusha
Shalaurov, Nikita Pavlovich
Shalia
Shalikov, Petr Ivanovich
Shalkar
Shalkarteniz
Shal'nikov, Aleksandr Iosifovich
Shalom Aleichem
Shal'skii
Shalygino
Shamaldy-sai
Shaman
Shamanism
Shamanova, Mariia Gavrilovna
Shamary
Shamash
Shamash-shum-ukin
Shambala
Shamiakin, Ivan Petrovich
Shamil
Shamkhal (urban-type settlement)
Shamkhal (title)
Shamkhor
Shamkhorchai
Shamlug
Shamota, Nikolai Zakharovich
Shámov, Afzal Shigabutdinovich
Shamov, Vladimir Nikolaevich
Shams al-Din Ildiguz
Shamshurenkov, Leontii Luk'ianovich
Shamuratova, Aimkhan
Shamurin, Evgenii Ivanovich
Shan (people)
Shan (state)
Shanfara
Shanghai
Shanghai Uprisings of 1926–27
Shang Yang
Shanhaikuan
Shanhaikuan Corridor
Shaniavskii University
Shanidar
Shanidze, Akakii Gavrilovich
Shannon, Claude Elwood
Shannon
Shannon's Coding Theorem
Shanshiashvili, Sandro Il'ich
Shansi
Shant, Levon
Shantar Islands
Shantingtung
Shantser, Virgilii Leonovich
Shantsy
Shantung (province)
Shantung (peninsula)
Shantung Mountains
Shan Upland
Shaohsing
Shaokuan
Shaoyang
Shapiro, Fedor L'vovich
Shapkin, Timofei Timofeevich
Shapkina
Shapley, Harlow
Shaporin, Iurii Aleksandrovich
Shaposhnikov, Boris Mikhailovich
Shaposhnikov, Vladimir Georgievich
Shaposhnikov, Vladimir Nikolaevich
Shapovalov, Aleksandr Sidorovich
Shapshal
Shapsug
Shapur
Sharaf Khan
Sharakan
Sharaliev, Borislav
Sharanga
Sharav, Balduugiin
Shargorod
Shargun'
Shar'ia (city)
Sharia (Islamic law)
Sharif, Aziz Alievich
Sharif
Sharifzade, Abbas Mirza
Sharjah
Sharkey, Lawrence Louis
Shark Iulduzi
Shark Kapysy
Sharkovshchina
Sharma, Ram Sharan
Sharokhin, Mikhail Nikolaevich
Sharonov, Vsevolod Vasil'evich
Sharpey's Fiber
Sharqawi, Abd al-Rahman al-
Sharua
Sharukan'
Sharvin, Iurii Vasil'evich
Sharzhenga
Shasenem and Garib
Shashih
Shashka
Shashkevich, Markian Semenovich
Shashkov, Serafim Serafimovich
Shashmakom
Shasta, Mount
Shastri, Lal Bahadur
Shatalin, Stanislav Sergeevich
Shatalov, Vladimir Aleksandrovich
Shatberti
Shatelen, Mikhail Andreevich
Shater
Shaternikov, Mikhail Nikolaevich
Shatilov Forest
Sha T'ing
Shatirian, Mikhail Aleksandrovich
Shatki
Shatlyk Gas-condensate Deposit
Shatov, Vladimir Sergeevich
Shatrova, Elena Mitrofanovna
Shatsk (city)
Shatsk (urban-type settlement)
Shatskii, Nikolai Sergeevich
Shatskii, Stanislav Teofilovich
Shatskin, Lazar' Abramovich
Shatt al-Arab
Shatunovskii, Samuil Osipovich
Shatura
Shatura Electric Power Plant
Shaturtorf
Shaumian, Lev Stepanovich
Shaumian, Stepan Georgievich
Shaumiani
Shaumianovsk
Shauqi, Ahmad
Shaver
Shaverdian, Danush
Shavgulidze, Georgii Vladimirovich
Shaving
Shavishvili, Mikhail Kalistovich
Shavly, Stikhvan
Shavrov, Ivan Egorovich
Shavsheti Range
Shavteli, Ioane
Shavyrin, Boris Ivanovich
Shaw, George Bernard
Shaw, Irwin
Shaw, William Napier
Shawi, Niqula
Shawinigan
Shawnee
Shayda
Shaykhi
Shaykh 'Uthman
Shays, Daniel
Shays' Rebellion
Shazhere
*Shch

Shchadenko, Efim Afanas'evich
Shchapov, Afanasii Prokof'evich
Shchara
Shchebetovka
Shchedrin, Feodosii Fedorovich
Shchedrin, Nikolai Pavlovich
Shchedrin, Rodion Konstantinovich
Shchedrin, Semen Fedorovich
Shchedrin, Sil'vestr Feodosievich
Shchedrovskii, Ignatii Stepanovich
Shchegliaev, Andrei Vladimirovich
Shcheglov, Afanasii Fedorovich
Shcheglov, Aleksandr Sergeevich
Shcheglov, Mark Aleksandrovich
Shcheglovitov, Ivan Grigor'evich
Shcheglovsk
Shchegolenok, Vasilii Petrovich
Shchegolev, Pavel Eliseevich
Shchegolev, Viacheslav Ivanovich
Shchekatikhina-Pototskaia, Aleksandra Vasil'evna
Shchekino
Shchekotov, Nikolai Mikhailovich
Shchel'iaiur
Shchelkalov, Andrei and Vasilii Iakovlevich
Shchelkin, Kirill Ivanovich
Shchelkovo
Shchelokov, Nikolai Anisimovich
Shchelokov, Nikolai Kononovich
Shchepillo, Mikhail Alekseevich
Shchepin-Rostovskii, Dmitrii Aleksandrovich
Shchepkin, Evgenii Nikolaevich
Shchepkin, Mikhail Semenovich
Shchepkin, Viacheslav Nikolaevich
Shchepkina-Kupernik, Tat'iana L'vovna
Shcherba, Lev Vladimirovich
Shcherbachev, Dmitrii Grigor'evich
Shcherbachev, Vladimir Vladimirovich
Shcherbak, Aleksandr Efimovich
Shcherbakov, Aleksandr Sergeevich
Shcherbakov, Dmitrii Ivanovich
Shcherbakov, Petr Petrovich
Shcherbakty
Shcherbatov, Mikhail Mikhailovich
Shcherbatskoi, Fedor Ippolitovich
Shcherbina, Boris Evdokimovich
Shcherbina, Fedor Andreevich
Shcherbina, Nikolai Fedorovich
Shcherbina, Vladimir Rodionovich
Shcherbinka
Shcherbitskii, Vladimir Vasil'evich
Shchetinkin, Petr Efimovich
Shchetovo
Shchigry
Shchipachev, Stepan Petrovich
Shchirets
Shchirskii, Ivan
Shcholgolev, Iakov Ivanovich
Shchors, Nikolai Aleksandrovich
Shchors
Shchorsk
Shchuch'e
Shchuch'e Ozero
Shchuch'ia
Shchuchin
Shchuchinsk
Shchugor
Shchukarev, Aleksandr Nikolaevich
Shchukin, Aleksandr Nikolaevich
Shchukin, Boris Vasil'evich
Shchukin, Ivan Semenovich
Shchukin, Nikolai Leonidovich
Shchukin, Stepan Semenovich
Shchuko, Vladimir Alekseevich
Shchurovskii, Grigorii Efimovich
Shchusev, Aleksei Viktorovich
She
Shebalin, Mikhail Petrovich
Shebalin, Vissarion Iakovlevich
Shebeke
Shebekino
Sheberghan
Sheboldaev, Boris Petrovich
*Sheboygan
Shebuev, Vasilii Koz'mich
Shebunino
Shed
Sheehy Affair
Sheepskin Sheep Raising
Sheep Sorrel
Sheerness
Sheet-metal Forming and Forging
Sheet Piling
Sheffield
Shefner, Vadim Sergeevich
Shefstvo
Shegarka
Shehu, Mehmet
Sheibanids
Sheibanid State
Sheidai
Sheikh
Sheikhzade, Maksud
Shein, Aleksei Semenovich
Shein, Mikhail Borisovich
Shein, Pavel Vasil'evich
Sheindlin, Aleksandr Efimovich
Sheinkman, Iakov Semenovich
Sheinmann, Iurii Mikhailovich
Sheinovo
Shekhtel', Fedor Osipovich
Shekhurdin, Aleksei Pavlovich
Sheki (historical region)
Sheki (city)
Sheki Khanate
Shekshema
Sheksna (urban-type settlement)
Sheksna (river)
Shelagskii, Cape
Shelaputy
Shelebi, Nikolai Ivanovich
Shelekhov
Shelenkov, Aleksandr Vladimirovich
Shelford, Victor Ernest
Shelgunov, Nikolai Vasil'evich
Shelgunov, Vasilii Andreevich
Shelgunov Demonstration
Shelikhov, Grigorii Ivanovich
Shelikof Strait
Shelikov, Gulf of
Shellac
Sheller, Aleksandr Konstantinovich
Shelley, Mary Wollstonecraft
Shelley, Percy Bysshe
Shell Oil Company
Shel'movanie
Shelon'
Shelon', Battle of the (1471)
Shelter-deck Ship
Sheludiak, Fedor
Shemakha
Shemakha Astrophysical Observatory
Shemiakin, Evgenii Ivanovich
Shemiakin, Mikhail Mikhailovich
Shemiakin Sud
Shem'i-zade, Eshref Abduramanovich
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Shmidt, Aleksandr Aleksandrovich (Soviet biochemist)
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Shmidt, Evgenii Vladimirovich
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ACANTHIS (redpolls), a genus of birds of the family Fringillidae of the order Passeriformes. The birds are 12 to 14 cm long. The plumage is gray with speckles; males of the species *A. flammea* and *A. hornemanni* have a red or pink cap and breast. The genus comprises three species, distributed in Europe, Asia, and North America. All three occur in the USSR. The common redpoll (*A. flammea*) inhabits coniferous forests and forest tundra, Hornemann's redpoll (*A. hornemannis*) inhabits the forest tundra, and the twite (*A. flavirostris*) is found on the Kola Peninsula, in the stony steppes of Kazakhstan, and in the mountains of the southern part of the USSR (from the Caucasus to the Altai). In winter the birds migrate in flocks. They build their nests in shrubs. A clutch contains four to six eggs, which are incubated 13 or 14 days. The diet consists of seeds. [29–522–4]

ACHNATHERUM, a genus of perennial herbaceous plants of the family Gramineae. The inflorescence is a panicle that is sometimes almost spicate. The spikelet bears a single bisexual flower. There are 15 to 20 species, found in the temperate and subtropical belts of Eurasia, northern Africa, and North America. The USSR has six species. The most common is *A. splendens* (formerly *Lasiagrostis splendens*), which usually grows in steppes and semideserts on more or less saline soil. The plant also occurs on rocky and debris-strewn slopes. It often forms large clumps. *A. splendens* grows in the southern Urals, along the lower Volga, in southern Siberia, and in Middle Asia (except the Karakum and Kopetdag). A grazing plant, it is eaten by animals before spike formation. The plant can also be used as hay. [29–553–2]

ADIT, a horizontal or inclined excavation that has an outlet to the surface and is designed to facilitate mining operations. Adits can be exploratory or used for working deposits. Transport, ventilation, and water-removal adits are distinguished, depending on their purpose. [29–1484–3]

ADRIAN, EDGAR DOUGLAS. Born Nov. 30, 1889, in London; died there Aug. 4, 1977. English physiologist. Fellow of the Royal Society of London (from 1923; president, 1950–55). Student of K. Lucas.

Adrian graduated from Cambridge University in 1915 and then lectured on physiology at Trinity College, where he became a professor in 1937; beginning in 1951 he was master of Trinity College. Adrian's research was primarily devoted to the electrophysiology of the sense organs and nerve conductors. Adrian, a brilliant experimenter, was a pioneer in the use of electronics in physiological research. He was the first to perform experiments on individual nerve fibers and nerve endings. His research led to the wide use of the all-or-none law. Beginning in 1934, Adrian worked on the electrophysiology and functional disturbances of the brain. He received a Nobel Prize in 1932, with C. Sherrington.

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L. G. MAGAZANIK [29–1689–1]

AEDICULA (aedicule, edicule), in classical architecture, a niche framed by columns or pilasters resting on a pedestal and with a pediment above. It contained statues of the gods and was featured in temples, public buildings, and residences. The term is also used in reference to small Greek and ancient Roman shrines. [29–1684–1]

AEDILES, ancient Roman officials. The *aediles plebeii*, established in 494 B.C., were two assistants to the people's tribunes. The two *aediles curules*, introduced in 367 (or 366) B.C., were elected by the *comitia tributa* for one year.

The aediles conducted the distribution of bread to the citizens; supervised the water supply, the operation of the markets, the cleanliness of the city, and the building and maintenance of the temples; and organized games at their own expense. The two *aediles ceriales* were introduced by Julius Caesar in 44 B.C. to distribute bread; they were also responsible for conducting public games in the circus.

By the fourth century A.D., the office of aedile had ceased to exist. [29–1684–2]

AEDUI, an ancient Celtic tribe inhabiting the area between the Saône and Loire rivers in Gaul; their central city was Bibracte. As a result of Caesar's Gallic campaigns (58–51 B.C.), the area settled by the Aedui was conquered by the Romans and incorporated into the Gallic provinces of Rome. From 16 B.C., it was part of Gallia Lugdunensis. [29–1692–3]

AEGEAN CIVILIZATION, the general name of the Bronze Age civilization (third and second millennia B.C.) on the Aegean Islands, Crete, and the Greek mainland and in Asia Minor (Anatolia).

The first centers of the Aegean civilization were discovered by H. Schliemann in Mycenae (in 1876) and A. Evans on Crete (from 1899). (*See* MYCENAE.) Several hundred monuments and cultural remains have been studied since the 19th century, includ-

ing burial grounds, settlements, and large cities, such as Poliochni on the island of Lemnos, with a 5-m high stone wall, and Phylakopi on the island of Melos, as well as a number of royal residences—in Troy and on Crete (Cnossus, Mallia, and Phaestos)—and the acropolis in Mycenae (*see* TROY; CNOSSUS; MALLIA; and PHAESTOS). The development of the Aegean civilization proceeded unevenly, and its centers underwent periods of decline and prosperity. Cities with public buildings and temples and fortified by walls with towers and bastions appeared in western Anatolia in the third millennium B.C., and fortified settlements appeared on mainland Greece in the late third millennium. Fortresses were unknown on Crete as late as the second millennium B.C.

Several local archaeological cultures or civilizations are distinguished within the Aegean civilization—Thessalian, Macedonian, Western Anatolian, Helladic, Cycladic, and Minoan (*see* CYCLADIC CULTURE and MINOAN CULTURE). Chronologically, it is conventional to divide these cultures into three main periods—early, middle, and late—and each period into three subperiods—I, II, and III—for example, Early Minoan I or Middle Thessalian III.

The formation of the Aegean civilization was complex and lengthy. The cultures of western Anatolia and central Greece evolved from local Neolithic cultures. Trojan culture dominated the islands of the eastern Aegean Sea, while the western Anatolian influence was strong on other islands.

Circa 2300 B.C., the Peloponnesus and northwestern Anatolia were invaded, judging from the evidence of fires and destruction in the settlements. By the early second millennium B.C., under the influence of invaders who were probably of Indo-European origin, the material culture of mainland Greece, Troy, and several islands had changed. On Crete, which escaped invasion, the Minoan culture continued to develop; hieroglyphic scripts appeared in the early second millennium B.C., and the Linear Script A in 1600 B.C. The Middle Bronze Age (first half of the second millennium B.C.) was the period of the greatest consolidation of the Aegean civilization, which is attested to by the absolute unity of the material culture, including the pottery and metalware. Circa 1600 B.C., the invasion of mainland Greece by new tribes, probably the Achaeans, who used battle chariots, prepared the way for the development of a number of small states of what is now referred to as the Mycenaean period around other cities—Mycenae, Tiryns, and Orchomenos (*see* TIRYNS and ORCHOMENOS). Circa 1470 B.C., several centers of the Aegean civilization, especially Crete, were destroyed by an eruption of the Santorin volcano. An Achaean (Mycenaean) population appeared on Crete, bringing a new culture and the Linear Script B. Beginning in the late 13th century B.C., the Aegean civilization underwent a profound internal crisis, accompanied by an invasion of the Dorians and the Peoples of the Sea, which led to its downfall. V. S. TITOV

Art. Throughout the history of the development of Aegean art, the leading center of artistic culture often shifted from one part of the Aegean world to another. Aegean art is characterized by the development of regional styles and shows influences of ancient Egyptian, Syrian, and Phoenician art. In comparison with the art of the ancient East, it is more secular. Among the remains from the third millennium B.C., of particular interest are the funerary sculptures of the Cyclades—the Cycladic idols—marble statuettes or heads (fragments of statues) of geometricized, austere, monumental form with clearly expressed architectonics ("violin-shaped" figures, nude female statuettes).

Circa the 23rd century B.C., Crete became the leading center of artistic culture, reaching its zenith in the first half of the second millennium B.C. The influence of Cretan art spread to the Cyclades and mainland Greece. The highest achievements of the Cretan architects are the palaces in Cnossus, Phaestos, Mallia, and Kato Zakro, in which the combination of wide horizontal spaces (courts), blocks of two- and three-story chambers, light wells, ramps, and stairways creates the effect of picturesque boundless space and an emotionally rich artistic image permeated with endlessly changing impressions. A unique type of column, one that widens toward the top, was created on Crete. In Cretan fine and decorative applied arts, the ornamental-decorative style of the 20th to 18th centuries B.C., which attained perfection in the painted Kamares ware, was replaced in the 17th and 16th centuries B.C. by a more detailed and straightforward depiction of plants, animals, and people (the frescoes in the palace at Cnossus, vases with representations of sea creatures, and small figurines, toreutic works, and glyptic art). By the late 15th century B.C., probably in connection with the Achaean conquest, conventionality and stylization became more pronounced (the throne room frescoes and the painted stucco relief of a priest-king in the Cnossus Palace and the "palace-style" vase painting).

The art of Achaean Greece reached its zenith in the 17th to 13th centuries B.C. Fortress cities, such as Mycenae and Tiryns, were contructed on hills, with thick walls built in the Cyclopean style from blocks of stone weighing up to 12 tons; such cities had two levels—a lower city, sheltering the surrounding population, and an acropolis, where the ruler's palace stood. In Achaean residential architecture, palaces and dwellings were built on stone socles of mud brick with wooden trusses, as on Crete; a type of porticoed rectangular building was developed—the megaron—the prototype of the ancient Greek temples in antis. The palace in Pylos (*see* PYLOS) was excavated more thoroughly than other sites. Of particular interest are the round domed tholos tombs, with a false arch and dromos, including the Treasury of Atreus near Mycenae (14th or 13th century B.C.).

The fine and decorative applied arts of Achaean Greece were strongly influenced by the art of Crete, especially in the 17th and 16th centuries B.C., judging from the gold and silver articles found in the shaft graves in Mycenae. The regional style is characterized by generalized and austere forms (the reliefs on the superjacent stelae of the shaft graves, the funerary masks, and several vessels found in the graves, including Nestor's Cup). Achaean art of the 15th to 13th centuries B.C., like Cretan art, devoted considerable attention to man and nature (the frescoes in the palaces in Thebes, Tiryns, Mycenae, and Pylos; vase painting and sculpture), but gravitated toward stable symmetrical forms and generalization (the heraldic composition with the figures of two lions on the relief on the Lion Gate in Mycenae). N. M. LOSEVA

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AEGEAN SEA, a semi-enclosed body of water in the basin of the Mediterranean Sea, bounded by the Balkan Peninsula, Asia Minor, and the island of Crete. The Aegean is linked with the Sea of Marmara and ultimately with the Black Sea by the Dardanelles in the northeast and with the Mediterranean by several straits between islands in the south. The sea has an area of approximately 179 sq km. It formed as a result of the submersion in the late Pliocene and Pleistocene of the land block known as Aegeides. The numerous islands are remnants of this land, and for this reason the Aegean was formerly called the Greek Archipelago.

The prevalent depths are 200–1,000 m, reaching a maximum of 2,529 m in the south. Currents in the western parts of the sea flow south, while those in the eastern part flow north. The velocity of the currents reaches 0.5–1 km/hr. The water temperature at the surface is 11°–15°C in winter and 22°–25°C in summer. At depths of more than 350 m the water temperature is 12°–13°C and remains constant throughout the year. The salinity of the sea is 37.0–39.0‰. Tides are semidiurnal and have ranges of 30–60 cm. The sea yields fish and sponges. The principal ports are Piraeus and Thessaloniki in Greece and Izmir in Turkey. [29–1673–1]

AEGILOPS, a genus of annual herbs of the family Graminae. The inflorescence is narrowly cylindrical. The lanceolate or oval spikes fall as a whole or in parts upon maturation. The spikelets are two- to five-flowered; the flowers are borne singly on the axis of the spike. There are 20 to 25 species, distributed from the Mediterranean to Afghanistan and Central Asia. The USSR has ten species, in the southern European section, in the Caucasus, and in Middle Asia. The plants grow on rocky and dry slopes, on sand, and near roads; more frequently they occur as weeds in various cultivated crops. *Aegilops cylindrica*, which is eaten by grazing livestock and sometimes used as hay, is commonly found in steppes and semideserts. [29–1674–4]

AEGIRITE (from Aegir, the Scandinavian god of the sea), also aegirine, a rock-forming mineral, a silicate of the group of monoclinic pyroxenes, with the chemical composition $NaFe[Si_2O_6]$. It contains admixtures of Mn, Zn, Ti, Nb, Zr, and V. As a result of the isomorphism $Na^+ \rightleftarrows Ca^{2+}$ accompanied by the replacement of Fe^{3+} by $(Mg, Fe)^{2+}$ or Si^{4+} by Al^{3+}, transitions are observed to aegirite-diopside, aegirite-hedenbergite, and aegirite-augite.

Aegirite occurs in the form of elongated tabular, columnar, or acicular crystals, radiated and fibrous ("mermaid hair") concretions, and sometimes spherulites. The color ranges from green to greenish black; sometimes the mineral is almost colorless. Aegirite has a vitreous luster, a hardness of 5.5–6 on Mohs' scale, and a density of 3,400–3,600 kg/m^3.

Aegirite is a typical mineral in alkali rocks and associated pegmatites; it is also characteristic of zones of alkaline metasomatism that develop after various intrusive and sedimentary-metamorphic rocks (gneisses, schists, and ferruginous quartzites). In agpaitic nepheline syenites it is found together with nepheline, orthoclase, eudialite, and apatite. In alkali granites it occurs with albite, riebeckite-arfvedsonite, and zircon. In zones of alkaline metasomatism it is found together with albite, hematite, and pyrochlore. Aegirite alters to chlorite, hematite, and limonite.

A. I. GINZBURG [29–1675–2]

AEGITHOGNATHISM, a type of palate structure characteristic of sparrows and martins. Aegithognathism is a variation on neognathism. In aegithognathism the palatal processes of the maxillary bones do not fuse to each other or to the vomer. [29–1675–3]

AEQUI, an ancient Italian tribe, evidently of Oscan descent. In the middle of the first millennium B.C. the Aequi settled in the Aniene Valley. From the early fifth century B.C., along with the Sabines, Volscians, and Hernicians, they waged a bitter struggle with the Romans, who finally subjugated the Aequi in 304 B.C. [29–1750–1]

AESOP, Greek author of fables in the sixth century B.C. According to legend, Aesop was a Phrygian freedman who was employed at the court of the Lydian king Croesus and died a violent death in Delphi. Biographical information on Aesop is drawn from legend.

Aesop has been credited with supplying the themes of most of the fables known in antiquity. Short written versions of these fables were collected in the fourth and third centuries B.C.; more than 300 fables with short "morals" appear in many later manuscripts ranging in time from the tenth to the 15th century. Ideologically, Aesop's fables are skeptical and pessimistic; their protagonists—mainly animals—are avowedly conventional figures, the narrative is concise and straightforward, and the language is simple and close to the colloquial. Aesop's fables are the basic source of themes for the European literary fable from Phaedrus and Babrius to La Fontaine and I. A. Krylov.

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M. L. GASPAROV [29–1694–7]

AESOPIAN LANGUAGE (from the name of the ancient Greek fabulist Aesop), a special type of cryptographic or allegorical writing used in literature, criticism, and journalism in order to circumvent censorship when such literary activity is denied freedom of expression.

An example of Aesopian language was the technique worked out in the Russian press between the late 18th and the early 20th century—that is, the system of "deceptive means," or of encoding (and decoding) freely conceived ideas—as a reaction against the ban that forbade mention of certain ideas, subjects, events, and persons. Specific examples of such techniques were the use of images derived from fables and of allegorical "fairy-tale descriptions," particularly in the work of M. E. Saltykov-Shchedrin, who in fact popularized the term "Aesopian language"; semitransparent circumlocutions and pseudonyms, such as those used by A. V. Amfiteatrov in *The Obmanovs* (Deceivers), his feuilleton about the tsar's family (the Romanovs); more or less covert allusions; and irony—which, when "clothed in tactfulness," was invulnerable to censorship. "Foreign" subject matter was used to disguise condemnations of actual conditions in Russia, and common phrases became gibes, as in the case of the expression "At your service, Sir," which was a reference to A. S. Suvorin's newspaper *Novoe vremia*. Readers knew that "the big job" stood for "revolution," that "the realist" was K. Marx, and that "those missing from the anthologies" meant V. G. Belinskii or N. G. Chernyshevskii. When so used, Aesopian language was accessible to the general reader and served as a tool not only of political struggle but also of realistic literary craftsmanship. In France, H. Rochefort was master of the Aesopian language.

In time, the typical techniques used in Aesopian language became part of the satiric style, and today's writers resort to such techniques independently of censorship pressures. Whether used separately or combined with other means of creative linguistic expression, these techniques have become attributes of specific writers' styles, as exemplified by A. France's *Penguin Island*, the works of M. A. Bulgakov, K. Čapek's *The War With the Newts*, and various literary genres of science fiction and humor.

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V. P. GRIGOR'EV [29–1695–3]

AESOPUS, CLAUDIUS. Flourished first century B.C. Ancient Roman tragic actor. Friend of Cicero.

Aesopus was famous for his majestic bearing and his carefully thought out gestures; he was a master at evoking powerful emotional and psychological responses from his audience. He acted with great success in the tragedies of Euripides. Aesopus last performed in 55 B.C. at the dedication of a theater built by Pompey.

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AGARICUS (meadow mushroom and related species), a genus of mushrooms of the family Agaricaceae. The cap is 3–25 cm in diameter, smooth or scaly, fleshy, and compact. There are about 60 cosmopolitan species. The mushrooms grow mainly on forest or meadow humus, on well-manured soils, on the barks of dead trees, and in anthills. They can be found on roadsides, in flower gardens, in vegetable gardens, in parks, on livestock farms, and in hotbeds.

The most common species are *A. campester* (common field mushroom), *A. arvensis*, and *A. bernardii* (which also occurs in deserts and semideserts). Two species—*A. meleagris* and *A. xanthoderma*—are poisonous. The species *A. bisporus* is raised commercially in many countries, including the USSR, the USA, Great Britain, France, Holland, Denmark, and the German Democratic Republic. The mushroom contains 46.5 percent pro-

tein and yields a harvest of up to 15 kg/m^2. In the USSR mushrooms of the genus *Agaricus* are cultivated commercially in the suburbs of many large industrial centers, including Moscow, Leningrad, and Gorky.

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AGRICULTURAL ECONOMICS, in the USSR, socialist agricultural economics, or the science of agriculture as an integrated branch of the economy producing agricultural products. Agricultural economics dates back to the socialist transformation of small peasant farms into the socialist type of large-scale collective production in accordance with V. I. Lenin's cooperative plan.

Agricultural economics is the study of the particular features that distinguish agricultural production, reproduction, and accumulation, the intensification of agriculture, and the socialist agricultural system as a whole. The subject matter of agricultural economics is the land—the principal means of production in agriculture—and its rational utilization, including (1) the land resources of the USSR and their classification and composition, (2) the material and technological basis and technological advances of agriculture, agricultural fixed capital stock, and agricultural working capital, (3) labor and labor productivity in agriculture, (4) the location and specialization of production in agriculture, and (5) prime costs, prices, and pricing in agriculture, sales of agricultural output, the role of commodity-money relations, and profit-and-loss accounting.

Crop production and animal husbandry, including fodder production, are separate branches of agricultural economics. The industrialization of agriculture is a specialized field. The organization of agricultural enterprises (such as kolkhozes and sovkhozes, interkolkhoz production enterprises, and agroindustrial complexes) is a subdivision of agricultural economics.

The science of agricultural economics is closely related to agronomy—that is, to cropping methods, soil science, land reclamation and chemicalization, agrobiology, genetics, and zootechny. Studies in agricultural economics deal with questions of land appraisal, differential pricing of agricultural products, and equalization of the operating conditions of agricultural enterprises located in different economic and natural zones.

The basic provisions of agricultural economics are worked out in the zonal agricultural economics research institutes and in the departments of agricultural economics that are part of all the agricultural higher education institutes and academies. The All-Union Scientific Research Institute of Agricultural Economics was established in 1955 as part of the V. I. Lenin All-Union Academy of Agricultural Sciences, with affiliates in the RSFSR (North Caucasus, Volga Region, and Central Chernozem Zone); institutes have also been set up under the ministries of agriculture of all the Union republics. In addition, research work in this field is carried out in the agronomy divisions and sectors of the institutes of economics of the Academy of Sciences of the USSR and of the Union republics. Publications on agricultural economics include the newspaper *Sel'skaia zhizn'* and the journal *Ekonomika sel'skogo khoziaistva*, both published in Moscow.

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A. M. EMEL'IANOV [29–1804–1]

AGRICULTURAL ECONOMICS, INSTITUTE OF (full name, All-Union Scientific Research Institute of Agricultural Economics of the V. I. Lenin All-Union Academy of Agricultural Sciences). The institute was founded in Moscow in 1955. It has, as of 1978, 12 scientific divisions. One division specializes in problems of increased reproduction in agriculture, while another studies economic problems of cooperation among farms, agroindustrial integration, ties among economic sectors, labor, stimulation of agricultural production, and management and planning. Other divisions deal with socioeconomic problems of rural life; optimization and location of agricultural facilities; efficiency of intensifying agriculture; and the study of the economics of agriculture in foreign countries. The scientific-organizational division has 36 sections.

The institute has branches in the Central Chernozem Zone, the North Caucasus, and the Volga Region. It has a large network of centers for the scientific organization of labor. The institute has research bases and economics groups at farms in different zones of the USSR. It works on theoretical and practical problems of the development of agriculture by zone and region, coordinates research in agricultural economics by other institutions, and publicizes results of advanced studies.

The institute offers graduate study in residence and by correspondence and is certified to confer the degree of doctor and candidate. It publishes collections of scientific articles, methodological works, and writings on recommended procedure. [29–1810–2]

AIKEN, a city in the southeastern USA, in the state of South Carolina; a suburb of Augusta, Georgia. The Savannah River Atomic Energy Plant is located near Aiken. [29–1706–2]

ÄIKIÄ, ÄRMAS (peudonym of Vilje Wiio). Born Mar. 14, 1904, in Konnitsa; died Nov. 20, 1965, in Helsinki. Finnish poet, journalist, and public figure. Member of the Communist Party of Finland from 1924.

Äikiä was imprisoned on several occasions between 1923 and 1930 for political activity. He was the author of the narrative poem *The Song of the Eagle* (1935–40), which deals with the life of the Finnish revolutionary T. Antikainen, and of the poetry collection *The Lyre Behind Bars* (1945). In the poetry collections *The Fiery Kantele* (1947) and *The Exile* (1948) he exposed German fascism and Finnish reactionary circles. In 1962 he published *The Singer at the Foot of the Volcano*, about the life and work of K. Kaatra. Äikiä also translated poems of A. S. Pushkin and M. Iu. Lermontov, as well as works by V. V. Mayakovsky and other Soviet poets.

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[29–1707–1]

AIR-CUSHION VEHICLE, RAM-WING (ram-wing ACV; also called ram-wing ground-effect machine [GEM]), an aircraft designed to fly close to the earth's surface, usually at heights of one-tenth to one-fifth the width of the wing. A ram-wing ACV differs from an airplane in that the former uses the ground effect to produce the aerodynamic forces and differs from a marine GEM in that it uses the approaching airflow—that is, a velocity head—rather than the pressure of the air forced under a marine GEM by a special fan.

The main design features of a ram-wing ACV are as follows. The wing is mounted low to enhance the ground effect and has a low aspect ratio (seldom exceeding 1.5–2) to ensure safety in flight. End plates or floats are carried on the underside of the wing at the wing tips to reduce the flow of air from beneath the wing—that is, from the high-pressure area—over the wing tips. The tail unit, which is horizontal and extends above both the influence of the ground effect and the airflow swept past the wing, is set high to provide longitudinal stability. Takeoff devices—for example, flaps, spoilers, ailerons, water skis, and forcing engines—are used to reduce aerohydrodynamic drag when the vehicle accelerates over water or to reduce the frictional resistance of the ground when it moves over land.

The main advantage of a ram-wing ACV is its high lift-drag ratio, which may be as high as 20–25. The lift-drag ratio of a ram-wing ACV is 25–50 percent higher than that of modern transport airplanes. Such a high lift-drag ratio makes it possible to increase

the payload or to reduce the thrust of the engine and, consequently, the fuel consumption.

Virtually all the ram-wing ACV's that have been built are designed for takeoffs from water and landings on water. Ram-wing ACV's that are intended for use only over land and do not have the required buoyancy for use over water have also been built. Some ram-wing ACV's that have been developed can fly above the influence of the ground effect, that is, above a height ranging from eight-tenths the width of the wing to the width of the wing.

The first ram-wing ACV was built in 1935 by the Finnish engineer T. Kario. As of 1978, about 30 small experimental vehicles had been built in Finland, Sweden, the USA, Japan, the Federal Republic of Germany (FRG), Great Britain, and the USSR. As a rule, the performance characteristics of the experimental vehicles are modest. The vehicles weigh 0.3–4.3 tons, are powered by one or two engines that develop a total of 16–520 hp, have cruising speeds of 22–250 km/hr, and can seat one to six persons. Four of the experimental vehicles—the ESKA-1 (USSR), the X-112 (USA), and the X-113 and X-114 (FRG)—can fly above the influence of the ground effect. For example, the X-113 can reach an altitude of 800 m.

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N. I. BELAVIN [29–1889–1]

AIRY FUNCTION, either of the functions Ai(z) and Bi(z), which are solutions of the second-order differential equation

$$W'' - zW = 0$$

where z is the independent variable.

The Airy functions of the argument $(-z)$ may be expressed in terms of Bessel functions of order $\nu = \pm 1/3$:

$$\mathrm{Ai}(-z) = \frac{z^{1/2}}{3}\left[J_{-1/3}\left(\frac{2}{3}z^{3/2}\right) + J_{1/3}\left(\frac{2}{3}z^{3/2}\right)\right]$$

$$\mathrm{Bi}(-z) = \left(\frac{z}{3}\right)^{1/2}\left[J_{-1/3}\left(\frac{2}{3}z^{3/2}\right) - J_{1/3}\left(\frac{2}{3}z^{3/2}\right)\right]$$

$$|\arg z| < 2\pi/3$$

The asymptotic representations for large $|z|$ are

$$\mathrm{Ai}(z) = \frac{\pi^{-1/2}}{2} z^{-1/4} e^{(-2/3)z^{3/2}}[1 + O(|z|^{-3/2})]$$

$$|\arg z| \leq 2\pi/3 - \delta$$

$$\mathrm{Bi}(z) = \pi^{-1/2} z^{-1/4} e^{(2/3)z^{3/2}}[1 + O(|z|^{-3/2})]$$

$$|\arg z| \leq \pi/3 - \delta$$

Airy functions play an important role in the theory of asymptotic representations of various special functions; they have diverse applications in mathematical physics—for example, in the theory of the diffraction of radio waves at the earth's surface. Airy functions were studied by J. R. Airy in 1911.

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AIX-EN-PROVENCE (also Aix), a city in southeastern France, in Bouches-du-Rhône Department. The ancient capital of Provence. Population, 111,000 (1975). Aix-en-Provence is a transportation junction. It has enterprises for the production of wine-making equipment, electrical machinery, matches, hats, carpets, and food products. Part of the University of Aix-Marseille is located there. The city is a balneological health resort.

Aix-en-Provence was founded in the second century B.C. In ancient times it was called Aquae Sextiae. Architectural monuments include the ruins of Roman buildings, the Romanesque Cathedral of St. Sauveur (constructed mainly in the 12th and 13th centuries), the Gothic church of St. Jean de Malte (c. 1285), and numerous palaces and fountains of the 17th and 18th centuries, mostly in the Italian baroque style. The museums of the city include the Granet Museum, which primarily houses works of the old French school, and the Museum of Tapestries and Old Furniture. P. Cézanne's studio is open as a museum in the city.

[29–1890–4]

AIX-LES-BAINS, a city in eastern France, in the Savoy Alps, on the Lake of Le Bourget, in Savoie Department. Population, 21,000 (1968). The city has electronics industry. Aix les-Bains is a balneoclimatic health resort. The climate is warm and dry; the average temperature in the summer is 21°C. Curative measures include climatotherapy, sulfide thermal springs (with temperatures of 43.5° to 47°C), and bicarbonate-calcium-chalybeate springs (with temperatures of 15° and 8°C). The spring water is used for bathing, inhaling, and irrigating. Disorders of the organs of movement and support, the nervous system, the female reproductive system, and the skin are treated. Facilities include bathhouses, balneological clinics, hotels, and boarding hotels. Aix-les-Bains is a popular winter-sports resort. [29–1905–2]

ALCEA (also *Althaea*), a genus of biennial or perennial herbs of the family Malvaceae. The alternate leaves are entire or serrate-lobed. The flowers are solitary or in groups in the leaf axils. About 60 species occur in the Eastern Mediterranean region. They are raised as ornamentals and for their nectar. The hollyhock (*A. rosea*) reaches 250 cm in height and has large, often double, flowers. The coloration of the flowers may be black-red, violet, pink, or white. Cultivated forms are used in floriculture. The plants thrive under most conditions, and they have a long flowering period. The black-red petals are used for coloring wines, liqueurs, and fabrics. The dried flowers are used medicinally in the form of teas as an emolient and for poultices. The stems yield a coarse fiber used to manufacture ropes, twines, and sackcloth. [29–1483–3]

ALCIDAE, a family of birds of the order Charadriiformes. There are 13 genera, comprising 20 or 22 extant species. The most common genera are *Uria, Alca, Aethia, Alle, Brachyramphus, Lunda, Fratercula*, and *Cepphus*. One species, the great auk (*Pinguinnus impennis*), became extinct in the mid-19th century. Alcids are typical seabirds, going ashore only to mate and lay eggs. The birds are common along the seas of the moderate and cold latitudes of the northern hemisphere. They are excellent swimmers and divers; they propel themselves underwater with their wings. Alcids feed only on marine organisms—small fish and various invertebrates, including crustaceans and mollusks. The birds usually nest in colonies along seashores; many species, along with gulls, constitute the main residents of bird rookeries. The eggs are usually laid in crevices of cliffs or among rocks. Murres (*Uria*) breed on open rocky ledges, and Atlantic puffins (*Fratercula*) and tufted puffins (*Lunda*) burrow in loose soil. A clutch contains one or two large eggs, weighing more than 10 percent of the female's weight. Both parents incubate the eggs (24 to 35 days) and feed the young. The young are born sighted and covered with dense down. In some parts of the world alcids are commercially valued for their down, feathers, meat, and eggs.

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N. N. KARTASHEV [29–640–2]

ALISMA (water plantain), a genus of perennial herbs of the family Alismataceae. The long-petioled entire leaves are in a radical rosette. The white bisexual flowers have a double perianth and are in whorled panicled branches. The fruit is a compound nutlet of dry monospermous fruitlets. There are nine or ten species (according to another classification, one or two species with subspecies), distributed in the temperate zone of the northern hemi-

sphere and in Australia. The USSR has six species. *A. plantago-aquatica* grows along bodies of water, grassy marshes, swampy meadows, and ditches. Its rootstock is rich in edible starch. The plant contains a substance that irritates the skin; in fresh form it is poisonous to cattle. Water plantain is sometimes cultivated as an ornamental. [29–92–3]

ALKALI, a base in aqueous solution. Aqueous alkaline solutions have high concentrations of OH^- (hydroxyl) ions. Alkalies include the hydroxides of the alkali metals, the alkaline-earth metals, and ammonium.

Most alkalies are highly hygroscopic white solid compounds. Their dissolution in water is accompanied by the liberation of large amounts of heat. Alkaline solutions change the color of acid-base indicators. The strongest, that is, caustic, alkalies are the hydroxides of the alkali metals, such as NaOH and KOH, while the weakest alkalies are ammonium hydroxide and the hydroxides of the alkaline-earth metals, such as $Ca(OH)_2$ and $Ba(OH)_2$. Also sometimes considered as alkalies are the salts of strong bases and weak acids (*see* ACIDS AND BASES), whose aqueous solutions exhibit alkaline reactions, for example, the hydrosulfides NaSH and KSH, the carbonates Na_2CO_3 and K_2CO_3, the hydrocarbonate $NaHCO_3$ and the borax $Na_2B_4O_7$. Alkalies are commonly used in laboratory work and in industry (*see* SODIUM HYDROXIDE; POTASSIUM HYDROXIDE; and CALCIUM HYDROXIDE). [29–1587–1]

ALKALI METAL, any one of several chemical elements of the major subgroup of Group I of Mendeleev's periodic system of the elements: lithium, sodium, potassium, rubidium, cesium, and francium. The subgroup's name is derived from the hydroxides of the alkali metals, called caustic alkalies. The atoms of alkali metals have one *s* electron in their outer shell and, with the exception of lithium, two *s* electrons and six *p* electrons in the next to the last shell. The alkali metals always exhibit an oxidation number of +1 in their compounds. They are very reactive chemically. They are oxidized rapidly by atmospheric oxygen and react vigorously with water to form alkalies, MeOH (where Me is a metal). Their reactivity increases from lithium to francium. (*See also* LITHIUM; SODIUM; POTASSIUM; RUBIDIUM; CESIUM; and FRANCIUM.) [29–1589–1]

ALKALINE-EARTH METAL, any one of the chemical elements of the main subgroup of Group II of Mendeleev's periodic system, comprising the calcium family: calcium, strontium, barium, and radium (beryllium and magnesium are also sometimes considered to be alkaline-earth metals). The origin of the name is related to the fact that the oxides of the alkaline-earth metals ("eerths" in alchemical terminology) were found to be alkaline in water. The outer electron shell of alkaline-earth metal atoms contains two *s* electrons; the preceding shell contains two *s* and six *p* electrons. The alkaline-earth metals exhibit an oxidation number of +2 in their compounds. They are chemically reactive, and their reactivity increases from calcium to radium. (*See also* CALCIUM; STRONTIUM; BARIUM; and RADIUM.) [29–1588–1]

ALKALINE STORAGE BATTERY, an electrical accumulator in which the active mass of the negative electrode is a plate made of porous iron or cadmium; the positive electrode is a nickel body filled with nickel(III) oxide, and the electrolyte is a 20-percent solution of potassium hydroxide. The transformation of electrical energy into chemical energy (charging) and the reverse process (discharging) occur as a result of a reaction such as

$$Fe + Ni_2O_3 + 3H_2O \underset{\text{discharge}}{\overset{\text{charge}}{\rightleftharpoons}} Fe(OH)_2 + 2Ni(OH)_2$$

The emf of an alkaline storage battery is 1.3 V. The specific capacity of such a battery is less than in a lead-acid storage battery, but it sustains overloads well and is insensitive to surplus charge and to strong discharge. Alkaline storage batteries are preferable for use under difficult conditions, for example, in power trucks and in the start-up of large diesel engines. [29–1588–2]

ALKALI-RESISTANT MATERIALS, materials capable of resisting the action of alkalies. The behavior of a material in alkalies depends on the material's chemical composition, structure, and particle size, on the concentration and temperature of the alkali, and on the duration of the action of the alkali. Alkali-resistant materials are subdivided into metallic and nonmetallic (inorganic and organic) materials.

Metallic materials. Strong alkaline solutions do not affect metals of the copper subgroup (copper, silver, and gold) and the iron subgroup (iron, cobalt, and nickel) and cadmium, magnesium, the rare-earth metals, thallium, thorium, and the platinum metals. Molybdenum, tungsten, vanadium, and tantalum are stable in alkaline solutions at room temperature. Most metals react with molten alkalies. Zirconium and hafnium are quite resistant to alkaline solutions and melts. Copper-base, nickel-base, and zirconium-base alloys are also stable in aqueous alkaline solutions.

Nonmetallic inorganic materials. Many inorganic materials whose composition includes the basic oxides (portland cement, dolomite, and magnesite) are alkali resistant. Many oxides, including Cr_2O_3, ZrO_2, HfO_2, ThO_2, CeO_2, Al_2O_3, and CdO, are stable in aqueous alkaline media at room temperature and upon heating; they react with molten alkalies. Aluminum oxide and zirconium oxide are the most stable to the action of molten sodium hydroxide at 540°C.

Quartz glasses and multicomponent silicate glasses, which contain ZrO_2, are the most resistant glasses to alkaline solutions. Many pigments, such as cadmium yellow, cinnabar, ocher, and iron minium (Berlin brown), are resistant to alkaline solutions.

Hot concentrated alkaline solutions do not affect graphite and crystalline boron. The carbides of boron, chromium, titanium, zirconium, and tungsten are highly resistant to dilute and concentrated alkaline solutions, as are metalloceramic alloys based on chromium carbide with nickel. Also resistant to alkaline solutions are the nitrides of chromium, niobium, zirconium, silicon, and boron, nickel boride, iron boride, the hexaborides of the rare-earth metals, and the silicides, sulfides, and fluorides of some elements.

Organic materials. Many polymer materials have high resistance to alkaline solutions and are used to produce anticorrosion coatings and dyes. Polyisobutylene, polypropylene, polyethylene, and fluoroplastics are stable in hot and cold alkaline solutions. Vinyl asbestos, Pentaplast, polyamides, polyvinyl chloride, and polystyrene exhibit satisfactory resistance in hot alkaline solutions and high resistance in cold solutions.

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N. I. TIMOFEEVA [29–1586–3]

ALKALI ROCK, a magmatic rock that is relatively rich in the alkali metals sodium and potassium. The mineral composition of alkali rocks is typified by nepheline and other feldspathoids (sodalite, cancrinite, and leucite), as well as by alkali pyroxenes and by amphiboles, such as aegerine and arfvedsonite.

Alkali rocks are divided into three groups according to silicon content: ultrabasic rocks—ijolites, melteigites, and urtites (40–45 percent SiO_2); gabbroid rocks—theralites and essexites (45–50 percent); and syenitic rocks—alkali syenites and nepheline syenites (more than 50 percent SiO_2).

In the earth's crust, alkali rocks are found chiefly in small (to 50–100 sq km) intrusive bodies of nepheline syenites and alkali syenites or their effusive varieties (nephelinites, phonolites, leucitites, and tephrites) within volcanic alkali-basaltic associations on the continents and oceanic islands. Ijolites and melteigites are typical of complex alkali-ultrabasic massifs, where pyroxenites and olivinites predominate. Major carbonatite deposits have been identified in these massifs. The nepheline syenites are divided into miascite, in which potassium and sodium together are less than aluminum, and the rarer agpaite, in which potassium and sodium together are more than aluminum. Various minerals

rich in Zr, Ti, Nb, and Sr are typical of agpaitic rocks. The apatite and nepheline ores in the USSR (the Khibiny on the Kola Peninsula) and in Greenland, Canada, Brazil, and South Africa are also associated with alkali rocks.

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L. S. BORODIN [29–1588–4]

ALLIARIA, a genus of biennial plants of the family Cruciferae. The leaves are entire; the radical leaves are reniform and long-petioled. The flowers are white and gathered in racemes. The fruit is a capsule. The plants emit a strong garlic odor. There are about five species, distributed in the temperate zone of Eurasia. The USSR has two species. *A. petiolata* (formerly *A. officinalis*) grows in shady forests, shrubbery-thickets, and in ravines; it also is a weed in parks, orchards, and gardens. The plant is used as a seasoning in place of garlic. The leaves contain vitamin C, and the seeds contain a fatty oil. The seeds can be used as a substitute for mustard. The milk of cows that have eaten *A. petiolata* acquires a reddish yellow color and a caustic aftertaste. [29–341–3]

ALLIED POWERS (also Allies; Russian, *chetvernoe soglasie*), in World War I, a coalition that, together with other states, opposed the Central Powers. In Russian usage the term is somewhat more restricted than in the West and refers to Great Britain, France, Russia, and Italy. The coalition was formed when Italy, which had been part of the Triple Alliance of 1882, joined the Triple Entente. [29–347–1]

ALTERNATION OF GENERATIONS, a regular succession of generations differing in mode of reproduction.

Animals may have primary or secondary alternation of generations. A primary alternation of generations, which characterizes many protozoans, is the alternation of a sexual generation with a generation reproducing by asexual cells (agametes). In foraminifers, for example, the alternating generations consist of sexual and asexual individuals—gamonts and agamonts (schizonts), respectively. By repeated division of the nucleus, the gamonts form gametes, which copulate in pairs to form a zygote, which in turn develops into an agamont. The agamont divides into agametes—future gamonts—as a result of schizogony. Since reduction division, or meiosis, occurs before agametes form, the sexual generation, like the gametes, is haploid, whereas the zygote and agamonts are diploid. In sporozoans and flagellates only the zygote is diploid, because meiosis is effected during the first division. In heliozoans, some flagellates, and infusorians meiosis is associated with the formation of gametes, the only haploid stage in the life cycle. This pattern typifies all multicellular animals.

A secondary alternation of generations occurs in two forms in animals. The alternation of different forms of sexual reproduction, for example, the normal sexual process with parthogenesis, is called heterogony. The alternation of sexual and asexual reproduction by means of multicellular vegetative bodies or by transverse division is called metagenesis. Heterogony is characteristic of trematodes, some roundworms, rotifers, and some arthropods (including water fleas, aphids, gallflies, and some gall midges). Metagenesis is very characteristic of tunicates (salpae, Doliolidae, ascidians, and pyrosomes) and coelenterates (hydrozoans and scyphozoans) in which the sexual generation consists of single free-swimming medusae and the asexual generation consist of sessile polyps, which often form colonies. Metagenesis in the broad sense should also include polyembryony, since embryos that reproduce vegetatively more or less constitute an underdeveloped asexual generation.

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A. V. IVANOV

The alternation of generations in plants usually refers to the alternation of diploid and haploid phases in the developmental cycles. It is characteristic of plants in which both the diploid phase (diplont) and the haploid phase (haplont) are multicellular. The diplont forms sporangia, in which spores result from meiosis (hence a diplont is also called a sporophyte); the haplont forms gametangia, whose gametes are formed without reduction division (a haplont is also called a gametophyte). A sporophyte develops from a zygote, and a gametophyte from a spore. In some plants, for example, the algae *Ulva* and *Dictiota*, the sporophyte and gametophyte develop equally. In others, however, there is dominance of either the gametophyte (some brown algae [for example, *Cutleria*] and all bryophytes) or the sporophyte (some brown algae [for example, *Laminaria*] and all ferns and seed plants). In many green and, possibly, in some red algae only the zygotes that divide by meiosis are diploid, whereas in Siphonales, diatoms, and some brown algae only the gametes are haploid, as in the great majority of animals. These plants do not actually have an alternation of generations, although there is a succession of nuclear phases.

The sporophytes, or sporogonia, of bryophytes develop on the gametophytes. The gametophytes of ferns exist independently, whereas those of seed plants develop on the sporophytes. The gametophytes of isosporous plants are monoecious; those of heterosporous plants are dioecious and more reduced (especially males) than those of isoporous plants. In angiosperms the male gametophyte is the pollen grain, and the female gametophyte the embryo sac.

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A. N. SLADKOV [29–188–1]

AMERY ICE SHELF, an ice shelf in eastern Antarctica, between the Lars Christensen and Ingrid Christensen coasts. The Amery Ice Shelf measures more than 200 km in length and ranges in thickness from 400 m to 800 m. It extends 250 km into the continent and merges in the south with the Lambert Glacier, its main source. The shelf has an area of approximately 40,000 sq km. In 1964 a huge iceberg covering an area of approximately 11,000 sq km broke off from the shelf.

The shelf was discovered in 1931 by an expedition sponsored by Great Britain, Australia, and New Zealand and was named for W. B. Amery, a representative of the British government in Australia. Amery Base, a temporary Australian station, was used to conduct research on the shelf in 1968. Soviet antarctic expeditions carried out detailed geological and geographical research from 1971 to 1974 at the temporary Sodruzhestvo Station. [29–1719–3]

ANABLEPS (four-eyed fishes), a genus of viviparous fishes of the family Anablepidae of the order Cyprinodontiformes. The body length is 15–20 cm (rarely to 30 cm). The cornea and retina of the eyes are divided by an epithelial septum into upper and lower divisions. The upper part is adapted for vision above the water. Hence, the fishes, which usually swim near the surface, are able to see over and under the water simultaneously. There are two known species of four-eyed fishes, inhabiting lagoons in Central America and northern South America. The fishes feed on small invertebrates, mainly flying insects, found in the water or above the water's surface. Fertilization is internal; one to five fry, measuring 4–6 cm long, are born.

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ANCISTRODON (also *Agkistrodon*), a genus of poisonous reptiles of the family Crotalidae (rattlesnakes). The top of the head is covered with large symmetrical plates, and the body scales have a rugged surface; there is no rattle on the tail. The snakes measure as much as 1 m in length and have mottled markings. The genus embraces 13 species, of which ten are found in Asia (one of these also in southeastern Europe) and three in North and Central America.

Representatives of the genus are mainly crepuscular and nocturnal. They live chiefly in dry places, but some have strong aquatic habits, for example, the water moccasin (*A. piscivorus*), a North American species. The snakes are ovoviviparous. They feed on frogs, rodents, and lizards, as well as invertebrates. The USSR has two species: *A. blomhoffi*, which inhabits southeastern parts of the Far East, and *A. halys*, found from the southern Trans-Volga Region and southeastern Azerbaijan to the southeastern borders of the USSR. The bite of the snakes is painful to humans, but recovery is usually complete in five to seven days. [29–1613–2]

ANTHROPOMORPHIDAE, a group of higher primates that, together with the family Hominidae, make up the superfamily Hominoidea. According to the most commonly used taxonomic system, the Anthropomorphidae include two families: Hylobatidae (gibbons) and Pongidae (orangutans, chimpanzees, and gorillas).

Gibbons are about 1 m tall when erect and weigh 4–12.5 kg. Orangutans and chimpanzees attain a height of 1.5 m, and gorillas 1.75 m and greater. Chimpanzees weigh 50–70 kg, and orangutans and gorillas up to 100–150 kg. Some male gorillas in captivity attain a weight of 180 kg or greater. Female orangutans, chimpanzees, and gorillas are smaller than their male counterparts.

Cheek pouches and a tail are absent, and ischial callosities are present only in gibbons. The arms are considerably longer than the legs. The brain is relatively large, with developed sulci and convolutions; it weighs 100–150 g in hylobatids and 350–600 g in pongids (sometimes to 750 g in gorillas). Male orangutans and gorillas have well-developed cranial crests. Orangutans have 12 pairs of ribs; all other species have 13 pairs. The animals have an appendix, which reaches a length of 20–25 m. Laryngeal sacs are well developed.

Chimpanzees and gorillas inhabit the tropical rain and mountain forests of Africa. Gibbons occur in Southeast Asia, including Malacca and Sumatra. Orangutans are found on Kalimantan and Sumatra. The animals live in small herds or family groups. Pongids build nests for the night, but gibbons sleep amid dense foliage midway up trees. The animals often swing through the trees using only their arms. They feed mostly on plant substances, occasionally eating birds' eggs and young birds. Chimpanzees sometimes feed on ants and termites.

Reproduction is year-round. The gestation period is seven months for gibbons, 225 days for chimpanzees, 275 days for orangutans, and 250 to 290 days for gorillas. Usually there is a single offspring. Sexual maturity is reached by the age of seven to ten years. The life-span may reach 30 to 60 years.

In many anatomical and physiological respects, chimpanzees and gorillas are the animals most closely related to humans. Biochemical research has revealed a nearly 100-percent similarity of polypeptides in humans and chimpanzees. For this reason, the chimpanzee is widely used in medical and biological experiments.

Fossil Anthropomorphidae were widespread in the Miocene and Pliocene periods of the Old World. *Dryopithecus*, the parent form of all extant pongids and the predecessor of humans, descended from the Miocene *Pliopithecus*, ancestors of the gibbons.

Owing to their decreasing numbers, orangutans, dwarf chimpanzees, the mountain gorilla, and two gibbon species are protected and registered in the Red Data Book of the International Union for the Conservation of Nature and Natural Resources.

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T. D. GLADKOVA [29–149–3]

APPENDIX, a process of the cecum in lemurs, apes, humans, many rodents, and some Carnivora. The base of the human appendix is situated at the bottom of the cecum, 2–3 cm below the start of the ileum. The average length of the appendix in adults is 8–10 cm, and the cavity averages 4–5 mm in diameter. The appendix is not fixed and is sometimes found behind the peritoneum. It has its own mesentery with fatty tissue, blood vessels, nerves, and lymph nodes. Its wall consists of a mucous membrane and serous, muscular, and submucosal layers. The function and role of the appendix have been little-studied. Disorders of the appendix include appendicitis, diverticulosis, tumors, and, sometimes in humans, infestation by parasitic worms, protozoans, and fungi. [29–179–3]

ARAB STATES BROADCASTING UNION (ASBU), an intergovernmental radio broadcasting organization founded in 1969 within the Arab League in order to strengthen cooperation in radio broadcasting among the member countries and acquaint people throughout the world with life in the Arab countries. Radio and television organizations of Spain, Pakistan, France, and Yugoslavia are associate members. The working languages are Arabic, English, and French.

ASBU publishes the Arabic-language monthly *Arab Broadcasts*, the English-language quarterly *ASBU Review*, and the serial publications *Broadcasting Reports* and *Broadcasting Studies and Researches*. [29–1736–3]

ARTHROPODA, the highest and largest phylum of invertebrates, including approximately 1.5 million terrestrial, aquatic, and parasitic species. Arthropods evolved from forms with a single metamerism but eventually acquired heteronomous segmentation manifested both as specialization of individual body segments and their appendages and as the formation of body regions consisting of relatively similar segments. The primitive marine annelid worms are believed to be the ancestors of arthropods, but whether arthropods are monophyletic, that is, derived from a single group of ancestors, remains a contentious issue.

Arthropods have a bilaterally symmetrical body, usually consisting of a head, thorax, and abdomen. Thoracic segments are often attached to the head, thus forming a cephalothorax. The limbs are articulated, in the form of multijointed levers; they were probably biramous initially. (The ancient trait of biramosity is, for example, characteristic of Paleozoic trilobites and is preserved to this day in many crustaceans.) The body is covered with a chitinous cuticle, forming a protective skeletal shell to which the internal muscles are attached. Growth is intermittent in arthropods, occurring after the old cuticle is shed and before the new cuticle has hardened.

The nervous system consists of three pairs of united supraesophageal ganglia (brain) and an abdominal nerve net in which the segmental ganglia often come together and fuse. The advanced differentiation of the brain is related to the complexity of movement and behavior and to the high level of development of the sense organs, among which compound eyes are especially typical. The alimentary canal consists of an ectodermal pharynx and hind-gut that are lined with chitin and an endodermal midgut into which open ducts from a digestive (hepaticopancreatic) gland, which is also referred to as the liver. The respiratory organs are gills, book lungs, or tracheae.

During the embryonic period, paired coelom sacs form. The sacs subsequently break down, and the individual cavities merge together and with the remains of the original body cavity. The result is the formation of a mixed body cavity, which contains the internal organs and is filled with hemolymph. Arthropods have an open circulatory system; only the large arteries and aorta are present. The metameric heart, which is located above the alimentary canal and which is homologous with the dorsal circulatory vessel of annelid worms, is always arterial.

The excretory organs are in the form of coelomoducts (coxal, green, and maxillary glands), or, in terrestrial forms, Malpighian tubules. The sexes are separate. Reproduction is sexual or, sometimes, parthenogenetic. Embryonic development often involves metamorphosis.

The various systems of classification of arthropods differ greatly from one another. According to the most widely accepted classification, the phylum is divided into four subphyla: (1) Trilo-

bitomorpha (containing the extinct class Trilobita), (2) Chelicerata (containing the classes Merostomata and Arachnida), (3) Branchiata (containing the single class Crustacea), and (4) Tracheata, or Atelocerata (containing the classes Myriopoda and Insecta).

The behavior of arthropods is extremely diverse. Relatively complex instincts are characteristic of the higher arthropods. For example, many insects form associations in which there is distribution of labor among polymorphic individuals. Many arthropods are beneficial to man. Some are edible (crayfish, lobsters) or manufacture important products, for example, honey, wax, or silk (the honeybee and the silkworm). Some beneficial arthropods are raised by man. A significant number of arthropod species are crop pests (Colorado potato beetle, locusts), human and animal parasites (itch mite, fleas, lice), and disease vectors (malarial mosquito, ixodid ticks).

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A. V. IVANOV [29–669–2]

ARTICULATA, a term introduced in 1812 by the French zoologist G. Cuvier to designate one of four animal phyla, the other three being Vertebrata, Mollusca, and Radiata. Some modern zoologists use the term to designate the higher segmented protostomatic animals, which include Annelida and Arthropoda, as well as the closely related Onychophora, Tardigrada, and Pentastomata. [29–670–1]

ASHLAR, a term applied to items made of natural stone, especially in the form of rectangular blocks, used in their natural form in construction and measured during quarrying by the piece or in cubic meters.

Most ashlar is produced for use in walling; it is made from porous rocks, such as limestones, volcanic tuffs, and coquina, which have good heat-insulation properties and which are relatively light and suitable for processing by cutting, hewing, and hammering. It is quarried by opencut or, less often, underground mining methods with stonecutting and coal-cutting machines and cable saws.

Three types of ashlar are produced for walling. Machine-cut wall ashlar with a sawed surface finish is produced in the USSR with the following standard dimensions: 19 × 19 × 39 cm and 19 × 24 × 49 cm (for limestone products), and 29 × 19 × 39 cm (for tuff products). The weight of the blocks does not exceed 40 kg, and the density ranges from 1,200 to 2,200 kg/m^3; the ultimate compressive strength ranges from 0.4 to 40 megapascals per m^2 (4–400 kg-force per cm^2). Rough-hewn wall ashlar is quarried from tuffs by coal-cutting machines; it is hewn on the face side on milling machines or by hand to dimensions of 30 × 20 × (30–55) cm. Large-block wall ashlar is produced in various sizes, up to blocks as high as the height of a building floor. The face side of porous ashlar has a sawed, hewn, or, rarely, polished texture. More than 10 million cu m of limestone ashlar and 2 million cu m of tuff ashlar are produced annually in the USSR.

Blocks of dense rock, such as granites, basalts, and marbles, are produced for subsequent finishing into facing sheets (made from decorative stone) and stone for walling (for socles and retaining walls). They are quarried only by opencut methods with explosives. Further working is accomplished manually or with pneumatic or steam-jet tools (for granite) or milling machines (for basalt). The dimensions of granite ashlar blocks are (45 or 60) × 17 × (50 or more) cm, and those of basalt blocks are 30 × 20 × (30–60) cm. The face side of dense ashlar has a steam-jet, point, grooved, riffled, hewn, or polished texture.

In the USSR ashlar is produced in the Ukraine (limestone and granite), Azerbaijan and Moldavia (limestone), Armenia (tuff and basalt), the Kabardinian-Balkar ASSR (tuff), and Georgia (teschenite). Ashlar is also produced in France, Italy, Great Britain, the USA, Czechoslovakia, and Yugoslavia.

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Z. A. ATSAGORTSIAN [29–1507–3]

ASHURAH (in Russian, *Shakhsei-vakhsei*), a day of mourning observed by Shiite Muslims in memory of the death of the "great martyr" Imam Husein, a son of Caliph Ali. Husein perished in a battle at Karbala on the tenth day of the month of Muharram in A.D. 680, the 61st year of the Hegira; he had been ambushed by soldiers of the Umayyad caliph Yazid I (ruled 680–683).

The religious ceremonies associated with Ashurah are accompanied by fasting and songs of prayer. Self-flagellation is encouraged, and the participants in the processions whip themselves, crying, "Shah Husein, ah, Husein!" (Russians in Persia heard the phrase as "Shakhsei-vakhsei!") In addition, they inflict saber and dagger wounds on themselves in accordance with the traditional belief that Husein was stabbed 33 times and slashed 34 times. A passion play (*taziyat*) is also performed; the play depicts scenes from the lives of Husein and Caliph Ali, with emphasis on the murder of Husein.

The Shiites have officially observed the day in memory of Husein since the 16th century. [29–906–2]

ATACAMA TRENCH, a narrow deep-sea depression in the Pacific Ocean that stretches along the foot of the Andes. The trench has a length of 2,200 km, widths ranging from 30 km to 90 km, and a maximum depth of 8,069 m. It forms a typical seam: on the eastern edge is a continental margin; on the western edge, a typical oceanic crust; and in the axial zone, the trench forms a wedge. [29–593–3]

AUGER BORING, rotary drilling with a rotary-blade drill bit, in which the broken rock is removed from the cutting face by means of a screw conveyor. The rock is broken up by steel or hard-alloy cutting tools (sometimes replaceable types), which rotate at 100–240 rpm and are pressed against the face with a force of 300–2,000 kg by a drilling strut composed of the augers. Auger drilling is used to drill shot holes in fairly weak rock (less frequently, to sink holes with the aid of a drill) and to sink shallow hydrogeological and engineering-geological wells. Drilling productivity ranges from a few meters to hundreds of meters per shift. Pneumatic auger drilling is currently being tested. The technique uses compressed air, which is fed into the spiral of the auger and which partially suspends the particles of broken rock moving through the auger, thus facilitating removal of the rock from the well. [29–1327–3]

AVEBURY, a complex of megalithic sanctuaries and tombs dating from the Neolithic period and early Bronze Age (2100–1650 B.C.), near the village of the same name in Wiltshire, Great Britain. It includes a large cromlech about 350 m in diameter, consisting of about 100 stone pillars weighing up to 50 tons each and surrounded by an earthen bank and ditch. Within this cromlech are two smaller ones, each about 108 m in diameter. An avenue of mehhirs, 2.3 km long, leads from the south of this complex to the cromlech of Overton Hill, which consists of two concentric circles. A number of long barrows and megalithic tombs are located near Avebury. [29–1697–5]

AVELING, EDWARD. Born Nov. 29, 1851, in Stoke Newington; died Aug. 2, 1898, in London. British socialist.

Aveling studied the natural sciences and became known as a popularizer of C. Darwin's theories and of atheism. In the early 1880's he became acquainted with Marxism, and in 1883–84 he edited the socialist journal *Progress*. Together with his wife Eleanor Marx, K. Marx's daughter, Aveling played a prominent role in the British and international labor movement and in the propagation of Marxist doctrine. He was active in the Democratic Federation (renamed the Social Democratic Federation in August 1884); he condemned the opportunistic tendencies of the federation's leader, H. Hyndman, and together with a group of left-wingers he left its ranks.

Aveling was one of the founders of the Socialist League (December 1884). With the support of F. Engels, he sought to convert the league into the nucleus of the mass political party of the proletariat. The anarchists' predominance in the league in the late 1880's caused Aveling and his followers to break with it. Having joined the new trade union movement, Aveling helped organize and was active in the Second International. He was a co-translator into English of the first volume of Marx' *Das Kapital* and Engels' *Development of Socialism From Utopia to Science* [published in English as *Socialism, Utopian and Scientific*].

Aveling was also known as a playwright and literary scholar. The last years of his life were clouded by ill health.

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L. I. GOL'MAN [29–1639–4]

BALANCING, a genre of circus art centered on the performer's ability to maintain his equilibrium in any unstable position of the body while on a tightrope, large ball, or trapeze. It is often combined with acrobatics and juggling. [29–1749–5]

BALLAST-CLEANING MACHINE, a track machine for cleaning ballast of contaminants, such as fine debris and dust, that lower the resiliency of the ballast layer and prevent the drainage of moisture. Ballast becomes contaminated because the gravel is abraded and crushed by the dynamic loads of passing trains and compacted under railroad ties during track maintenance operations; in addition, particles of ore, coal, and the like are spilled on the ballast from passing trains. As a result of the impaired filtering capability of the gravel layer, moisture is retained by the contaminants, the ballast foundation becomes thin in places, the gravel is scattered, and frost heaves are formed in winter.

The most commonly used ballast-cleaning device in the USSR is the model ShchOM-D, which was designed by the Soviet engineer A. M. Dragavtsev; it is mounted on an electric ballasting machine. The device consists of an endless reticulated belt that moves crosswise to the direction of the railroad track around the rails and ties, which are elevated by the electric ballasting machine. The belt slides underneath along a blade (at a speed of 12 m/sec) that cuts under the gravel layer as the machine is moved. Fine particles of contaminants are ejected onto the shoulder of the roadbed through holes in the belt as the belt moves over the curved portion of its trajectory; large pieces fall into a bin and are then poured back onto the track and leveled off. The ShchOM-D can process up to 2,000 cu m of ballast per hour at an operating speed of 1 to 3 km per hour. Ballast-cleaning machines that operate without elevating the rails and ties have scraping mechanisms to separate the gravel and feed it into a cleaning device. They are used mainly to clean the ballast under railroad switch layouts and station tracks.

Ballast is cleaned on an average of once every 8–10 years; cleaning is done more often on track sections where contamination, such as by coal dust, is more severe. The use of ballast having special fillers, for example, asbestos, can extend the servicing period to as much as 15–20 years. [29–1573–4]

BALL VALVE, a valve in which the seal is effected by a ball. The spherical surface of the ball is pressed against a conical seat that forms the transmission path of a pipe, thus providing a hermetic seal in the channel. Globular check valves—a type of ball valve—are very common. The ball in such valves is pressed against the seat by the action of a spring or by the ball's own weight (in the latter case, the seat axis is vertical); the mechanism allows a gas or liquid to flow only in one direction when the pressure of the flow overcomes the force created by the spring or weight of the ball. Globular check valves with solid metal balls are used for inside diameters up to 15 mm; similar valves with hollow, rubber-coated balls are used for inside diameters up to 100 mm. Valves with balls that have a through hole are used as shut-off and regulating devices for inside diameters up to 1,000 mm. Such valves are opened and closed by rotation of the ball through 90°. [29–866–5]

BARBASTELLA, a genus of bats of the suborder Microchiroptera. The body is 4–6 cm long and weighs 6–10 g. The very broad ears are concresced at the forehead. There are two species—the European barbastel (*B. barbastellus*) and the Asiatic barbastel (*B. leucomelas*)—which are distributed in temperate and subtropical latitudes of Eurasia and in North Africa. In the USSR the European barbastel inhabits the Caucasus and western and southern regions of the European portion; the Asiatic barbastel inhabits the Caucasus, Transcaucasia, and Middle Asia. During the day the bats hide in caves, rock crevices, tree hollows, and buildings. They feed on insects. The females bear one or two young. [29–1230–4]

BARBELL, the basic apparatus used in weight lifting. It consists of a steel bar with freely revolving sleeves on the ends, removable metal disks attached to the bar ends to vary the weight, and locks to fasten the disks. The bar has a length of 2,200 mm and a diameter of 28 mm; the sleeves have a length of 400 mm and a diameter of 55–60 mm; and the disks have diameters up to 450 mm, with weights varying from 0.1 to 50.0 kg (international standard). [29–1451–1]

BARREL ORGAN, a mechanical wind instrument. The barrel organ, a type of portative organ, resembles a small box and consists of bellows, organ pipes in one or more ranks, and cylinders equipped with metal pins. As the cylinder is turned by a hand crank, the pins engage a special mechanism that opens a passage permitting air to reach the pipes; at the same time, air is pumped by means of the bellows. Some barrel organs have replaceable cylinders and can thus perform several musical pieces. The instrument, which first appeared in Western Europe in the 18th century and in Russia in the first quarter of the 19th century, was popular among itinerant musicians. The barrel organ is called a *katerynka* in the Ukraine and a *katarynka* in Poland.

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A. M. MIREK [29–862–2]

BARRIER, a lifting or sliding beam, usually installed at a railroad crossing to stop automobile, cart, and pedestrian traffic prior to the passing of a train. Barriers may be operated manually, mechanically, or automatically. Automatic barriers are operated by signals from the railroad's automation and remote control systems; signal lights and acoustic devices may be used. The normal position for automatic barriers is the open position; for nonautomatic barriers it is the closed position. [29–1271–4]

BAYONET, a cold-steel thrusting weapon, affixed to the barrel of a firearm (since the 1800's, a rifle, carbine, or automatic weapon) for hand-to-hand fighting. The bayonet appeared in the mid-1600's in France (where it received its name). Originally it was a shortened spear that was driven into the bore of a gun barrel; by the late 1600's bayonets were made entirely of metal with a sleeve that fitted tightly over the gun barrel, which permitted loading and firing with the bayonet in place. The bayonet was adopted by Russia in the early 1700's. Various armies have used bayonets with three or four faces as well as blades, both detachable and nondetachable.

After World War II, Soviet troops were equipped with a bayonet-knife having a flat blade with teeth on one side, a hand grip by which the weapon could be attached to a gun, and a sheath; the bayonet-knife could also be used as a saw. [29–1508–2]

BIDENS (beggar-ticks, bur marigold, or sticktight), a genus of annual or perennial herbs of the family Compositae. The opposite leaves vary from entire to pinnatisect. The disk flowers are bisexual; sometimes there are infertile ray flowers. The flowers are in heads generally borne singly on the apices of the stem and the branches. The fruit is an achene, with two to four retrosely barbed bristles on the apex.

There are more than 200 species, which are distributed worldwide but mainly in the Americas. The USSR has eight species. *B. tripartita* grows along bodies of water marshes, ditches, moist wastelands, gardens, and fields. The plant sometimes forms a dense cover. It contains essential oil; mucilaginous, bitter, and tannic substances; carotene; and vitamin C. In folk medicine the leaves and stem apices are used in baths to heal various diatheses with rashes; the herb is also used in an antiscrofulous mixture.

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BIG TOP, a collapsible structure designed for traveling circus shows. A big top is usually a dome-shaped canvas tent stretched over tall center poles and side poles by means of various fastenings; inside the tent are stands for spectators, room for equipment, and a backstage area. Big tops originated in the 1830's at the Cirque d'Eté on the Champs Elysées in Paris. They became widely popular in the USA and later in other countries. The first one in Russia was constructed in Moscow, in Neskuchnyi Sad in 1830.

The big top was the main circus structure in prerevolutionary provincial Russia, and traveling circuses with big tops of various types are practically the only form of circus in all the capitalist countries. In the USSR, a vast network of tent circuses is operated simultaneously with numerous permanent circuses.

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Kuznetsov, E. *Tsirk* [2nd ed.]. Moscow-Leningrad, 1971. [29–848–1]

BLACK AFRICA, a term used in scholarly works, political writings, and literature to denote African countries populated by negroid races. The French term *Afrique noire* first appeared in the second half of the 19th century, when France's colonial empire was taking shape in West and Equatorial Africa. The German term *Schwarzafrika* has not gained wide use. In English, the term "Negro Africa" has largely been replaced by "Black Africa," "Subsaharan Africa," and "Africa south of the Sahara," the last of which is also coming into use in French. The last term is accepted in Soviet writings. [29–232–1]

BLACK AND WHITE CATTLE, a breed of dairy cattle confirmed in 1959. Differences in the local parent stock, natural conditions, and the level of pedigree work have led to the development of features unique to the particular region where the cattle are raised.

In the central regions of the RSFSR the breed was developed in the late 19th century by crossing local Great Russian cattle and their crossbreeds with Ostfriesian, Swedish Black and White, and Holstein-Friesian breeds. The resulting cattle are larger than the parent stock. The bulls weigh as much as 1,000 kg, and cows 550–650 kg. The highest milk yields average about 4,000 kg (record yields to 12,000 kg). The fat content of the milk is 3.5–3.6 percent.

The Urals Black and White breed was developed in 1936–37 by crossing the Tagil breed with Ostfriesian and Baltic Black and White cattle. The bulls weigh 900–950 kg, the cows 500–600 kg. The average milk yield is 3,700–3,800 kg, with a record yield of 17,517 kg. The fat content of the milk is 3.7–3.8 percent. The Siberian Black and White cattle was developed in 1929–30 by crossing local Siberian cattle with Ostfriesian and Holstein-Friesian breeds. The bulls weigh 850–900 kg, and the cows 450–500 kg. The average milk yield is about 3,500 kg; the fat content is 3.7–3.8 percent.

The meat of Black and White cattle is of satisfactory quality. With intensive fattening, the young weigh 500–550 kg by 18 months of age. The Black and White breed is one of the most common cattle breeds in the USSR. It is raised in the central and northwestern regions of the RSFSR, in the Urals, and in Western Siberia, as well as in certain regions in Eastern Siberia, the Ukrainian SSR, the Byelorussian SSR, and the Uzbek SSR.

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Cherno-pestryi skot i metody ego uluchsheniia. Edited by M. M. Lebedev. Leningrad, 1971. [29–300–3]

BLACK BOX (in Russian, *chernyi iashchik*), an object of study whose internal structure either is unknown or is too complex for any conclusions about the behavior of the object to be drawn on the basis of the properties of the object's elements or on the basis of the structure of the connections between the elements. In Russian, the term *chernyi iashchik* is also used to refer to the method of studying such objects.

The black-box method is used in cases where an outside observer knows only the input to an object and the object's response; in such cases, the processes occurring within the object are unknown. The study of a multiterminal network whose internal circuitry is unknown provides a very simple example of the use of the black-box method. By observing the behavior of such an object for a sufficiently long time and, if necessary, by carrying out active experiments on the object (that is, by changing the input in some specific manner), a level of knowledge about the properties of the object may be achieved such that changes in the object's behavior in response to any given input may be predicted. However, no matter how thoroughly the behavior of a black box is studied, an unambiguous conclusion about the internal structure of the object cannot be reached, since the same behavior may be characteristic of different objects.

The black-box method is widely used to solve problems in the modeling of controlled systems—for example, in the study of integrated systems—especially in cases where the behavior rather than the structure of a system is of interest. [29–308–6]

BLACK-BROWN RABBIT, a breed of rabbit raised for meat and fur. The Black-Brown Rabbit was first bred at the Biriulia Breeding Sovkhoz in the Tatar ASSR by crossing the Viennese Blue, Flanders, and White Giant breeds. The breed was officially recognized in 1948. The Black-Brown has a thick, dark brown pelt with glistening black tips on the awnlet hairs, which form a thick, black veil; its coloring resembles that of the silver fox. The rabbits are large; the length of the body is about 60 cm, and the average liveweight is about 5 kg, sometimes 7 kg. The females bear seven to eight young per litter. The breed, which acclimatizes well in various zones, is raised in the Tatar ASSR.

REFERENCE
Krolikovodstvo. Moscow, 1975. [29–252–2]

BLACK CARP (*Mylopharyngodon piceus*), a species of fish of the family Cyprinidae. The black carp reaches a length of 120 cm and a weight of 30 kg or greater. The body and fins are almost black, but the abdomen is lighter in coloration. The black carp is distributed from the Amur River southward to South China; it is sparse in the Amur basin. The fish feeds mainly on gastropod mollusks. Spawning occurs in June and July, with each female producing about 1 million floating roe. Sexual maturity is attained in seven to nine years. The black carp is a valuable commercial fish; it is being acclimatized in waters of the southern USSR. The fish is raised at pond fisheries. [29–306–2]

BLACK CHOKEBERRY (*Aronia melanocarpa*), a shrub of the family Rosaceae measuring 1.5–3 m tall. The leaves are elliptical and serrate. The shiny black fruits are globose and measure

0.7–1.5 cm in diameter. The dark red pulp is tart and astringent; the juice is ruby-colored.

The black chokeberry occurs in eastern regions of North America. Introduced into cultivation in the USSR by I. V. Michurin, it is widespread in commercial and farm orchards of the European USSR (the Baltic region and the northern, northwestern, and central regions of the RSFSR), Siberia, and the Altai. It thrives in various soils and climates, although it does require much moisture. The fruits, which contain sugars, vitamins P and C, and provitamin A, are used in fresh or dried form. They are used to make juice, jam, and various medicinal substances. The yield is 3–8.5 kg per shrub (50–70 quintals per hectare). The plants are set out in sunny areas in spring or autumn, with a distance of 4 m between rows and 1.5–3 m between plants in a row. The shrubs form many shoots, which thicken the plantings and require systematic pruning. Black chokeberries are ornamental, especially in the spring, when the plants are covered with large white inflorescences, and in the autumn, when they are covered with scarlet leaves. The shrubs are often used in landscaping. The plants are nectar bearers.

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Burmistrov, A. D. *Iagodny kul'tury*. Leningrad, 1972.

E. V. KOLESNIKOV [29–301–1]

BLACK CODES, bills introduced in the legislatures of several Southern states after the US Civil War (1861–65). The codes forced Negroes to work for meager wages for their former owners and deprived them of their freedom of movement and their right to own or rent land; they also permitted the use of forced Negro child labor and forbade Negroes to hold meetings of any kind, carry weapons, or marry whites. Provision was made for the formation of special courts to deal with crimes committed by Negroes. The Black Codes were formally abolished in a number of states in the 1870's, but similar statutes were included in state constitutions and criminal legislation.

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Ivanov, R. F. *Bor'ba negrov za zemliu i svobodu na Iuge SShA, 1865–1877*. Moscow, 1958. [29–305–1]

BLACK DEATH, the name given by contemporaries to the plague that spread throughout Europe between 1347 and 1353. During that period approximately 25 million people—that is, almost half the population of Europe—died of the Black Death. The pandemic recurred on a smaller scale in 1361 and 1369.

The Black Death resulted in a decline in the number of workers and, consequently, in a rise in the cost of labor. To provide the feudal aristocracy and urban patriciate with cheap labor, the governments of some countries enacted laws fixing wages at preplague levels. These measures intensified the class struggle, which found expression in uprisings, the rejection of feudal obligations, and the flight of peasants from their feudal lords.

[29–240–2]

BLACKENING, a type of oxide coating for iron and steel products, used for corrosion protection and for decorative purposes. The most common method of blackening is to immerse the products in a concentrated alkaline solution containing sodium nitrate or sodium nitrite as an oxidizer. As the concentration of the alkali is increased (other conditions being equal), the thickness of the oxide film also increases. A thin coating (20 to 40 angstroms) does not alter the external appearance of the surface nor does it provide practical protection for the metal against corrosion. Thick coatings (2.5 micrometers), which are black or grayish black, have poor mechanical strength. The best thickness is 0.6 to 0.8 micrometer. Blackening is a special case of blueing.

[29–240–5]

BLACK FOREST (in German, Schwarzwald), a mountain massif in the southwestern part of the Federal Republic of Germany. The Black Forest extends 160 km along the right bank of the Rhine. It measures 35–60 km in width and rises to an elevation of 1,493 m at Mt. Feldberg. It is composed primarily of gneisses, granites, and sandstones. The massif falls sharply toward the Upper Rhine Lowland. The peaks are flat and dome-shaped, with rivers cutting deeply into the slopes. Oak and beech forests are found at elevations to 800 m, and spruce-fir forests grow at higher elevations. The upper zone of the Black Forest is timberless. There are mineral springs and resorts at Baden-Baden and Badenweiler. [29–930–2]

BLACK FRIDAY (Apr. 15, 1921), in Great Britain, the day that opportunist leaders of the "triple alliance" of miners, railwaymen, and transport workers thwarted a sympathy strike planned by railwaymen and transport workers in support of miners locked out by the coal industry. A few hours before the strike was to take place, the union leaders canceled it against the wishes of the rank and file. Forced to strike alone, the miners were defeated. After Black Friday the bourgeoisie launched a broad frontal attack on the working people and nullified many of the victories that had been won during the upsurge in the class struggle between 1918 and 1921.

REFERENCE
Gurovich, P. V. *Pod"em rabochego dvizheniia v Anglii v 1918–1921 gg*. Moscow, 1956. [29–239–2]

BLACK HEADS (also Schwarzhäupter). **(1)** A society in Livonia from the 14th to 16th centuries, membership in which was dependent on a person's class and religion. The members included servants and low-ranking officials of the Livonian Order. The name of the society is derived from the group's coat of arms, on which an image of the head of St. Mauritius was emblazoned.

(2) From the 14th to early 20th centuries, societies of foreign merchants in the Baltic region who did not have their homes and families in the area. Named for the symbol of St. Mauritius, who was considered their protector, the Black Heads defended the interests of foreign merchants and arranged social activities for them. In Riga, Tallin, and Vilnius, the societies owned houses that fulfilled the combined functions of clubs and dormitories. A number of the buildings constructed for the Black Heads have been preserved and are outstanding monuments of medieval architecture in the Baltic region.

(3) In Riga until 1939, a society of Riga German merchants who were bachelors. [29–263–2]

BLACK HOLE, a celestial object that is formed as a result of the relativistic gravitational collapse of a massive body. In particular, the evolution of a star whose mass at the moment of collapse exceeds some critical value may terminate in catastrophic gravitational collapse. The value of the critical mass is not precisely determined and, depending on the equation of state of matter used, ranges from 1.5 to 3 solar masses ($M_\odot$).

For any equation of state of matter, the general theory of relativity predicts that no stable equilibrium exists for cold stars of several solar masses. If, after a star becomes unstable, not enough energy is released to halt the collapse or to cause a partial explosion after which the remaining mass would be less than the critical mass, the central portions of the star collapse and, in a short time, reach the gravitational radius r_g. No forces whatsoever can prevent the further collapse of a star if the radius of the star shrinks down to r_g, which is also known as the Schwarzschild radius and is the radius of a sphere whose surface is called the event horizon. A fundamental property of the event horizon is that no signals emitted from the surface of the star and reaching the event horizon can escape from the region inside that horizon. Thus, as a result of the gravitational collapse of a massive star, a region in space-time is formed from which no information whatsoever about physical processes occurring within the region can emerge.

A black hole has a gravitational field whose properties are determined by the hole's mass, angular momentum, and—if the collapsing star was electrically charged—electric charge. At large distances, the gravitational field of a black hole is virtually indistinguishable from the gravitational field of a normal star. In addition, the motion of other objects that interact with a black hole at

large distances is governed by the laws of Newtonian mechanics. Calculations show that a region known as the ergosphere, which is bounded by a surface called the static, or stationary, limit, should exist outside the event horizon of a rotating black hole. The attractive force that a black hole exerts on a stationary object situated in the ergosphere tends to infinity. However, the attractive force is finite if the object has an angular momentum whose direction coincides with that of the black hole's angular momentum. Therefore, any particles that happen to be in the ergosphere will revolve around the black hole.

The presence of an ergosphere may lead to energy losses by a rotating black hole. In particular, energy losses are possible in the case where some object that has entered the ergosphere breaks up (for example, as a result of an explosion) into two fragments near the event horizon of the black hole. In this case, one of the fragments continues to fall into the black hole, but the other fragment escapes from the ergosphere. The parameters of the explosion may be such that the energy of the fragment that escapes from the ergosphere is higher than the energy of the original object. The additional energy in this case is drawn from the rotational energy of the black hole.

As the angular momentum of a rotating black hole decreases, the static limit comes closer to the event horizon; when the angular momentum is zero, the static limit and the event horizon coincide and the ergosphere disappears. Owing to the effects of the centrifugal force of rotation, the rapid rotation of a collapsing object prevents the formation of a black hole. Therefore, a black hole cannot have an angular momentum that is greater than some extreme value.

Quantum-mechanical calculations show that particles—such as photons, neutrinos, gravitons, and electron-positron pairs—may be produced in the strong gravitational field of a black hole. As a result, a black hole radiates like a blackbody with an effective temperature of $T = 10^{-6}(M_{\odot}/M)$ °K, where M is the mass of the black hole, even in cases where no matter whatsoever falls into the hole. The energy of the radiation is drawn from the energy of the black hole's gravitational field; as a result, the mass of the black hole decreases with time. However, owing to their low efficiency, the quantum radiation processes are unimportant for massive black holes, which are formed as a result of stellar collapse.

In the early stages of the evolution of the universe, which were hot and ultradense, black holes with masses ranging from 10^{-5} g to a solar mass or higher may have been formed as a result of an inhomogeneous distribution of matter. In contrast to the black holes that are formed by collapsed stars, these objects are called primordial black holes. Since quantum radiation processes reduce the mass of a black hole, all primordial black holes with a mass of less than 10^{15} g should have evaporated by the present time. The intensity and effective temperature of black-hole radiation increase as the mass of a black hole decreases. Therefore, in the final stage, the evaporation of a black hole with a mass of the order of 3×10^9 g would be an explosion accompanied by an energy release of 10^{30} erg in 0.1 sec. Primordial black holes with a mass of greater than 10^{15} g have remained virtually unchanged. The detection of primordial black holes on the basis of their radiation would make it possible to draw important conclusions about the physical processes that occurred in the early stages of the evolution of the universe.

The search for black holes in the universe is a task of current interest in modern astronomy. Searches are carried out on the assumption that black holes may be the invisible components of certain binary star systems. However, this inference is not definite, since the normal star in a binary system may be invisible against the higher luminosity of the second component. Another method of identifying black holes in binary systems is based on the radiation emitted by matter flowing from the companion, which is a normal star, to the black hole. In this case, a disk consisting of matter flowing to the black hole is formed near the hole; the layers of the disk move around the hole with various velocities (see Figure 1). Owing to friction between adjacent layers, the matter in the disk is heated to tens of millions of degrees. The inner regions of the disk emit energy in the X-ray region of the electromagnetic spectrum. The same type of radiation is produced in the case where a binary system contains a neutron star rather than a black hole. However, a neutron star cannot have a mass higher than some limiting value.

As a result of space studies, a large number of X-ray sources in binary systems have been discovered. The X-ray source Cygnus X-1 is the most likely candidate for a black hole. In this binary system, the mass of the X-ray source, which may be estimated from the observed orbital velocity of the optical star and from Kepler's laws, exceeds 5 $M_{\odot}$, that is, is higher than the limiting mass for a neutron star.

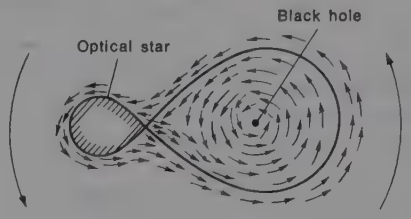

Figure 1. A black hole in a binary star system

The hypothesis has also been advanced that supermassive black holes—that is, black holes with a mass $M \simeq 10^6$–10^8 $M_{\odot}$—may be located in the nuclei of active galaxies and in quasars. In this case, the activity of the active galactic nuclei and quasars is attributed to the infall of ambient gas onto the black hole.

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BLACK HOODS (Russian, *Chernye Klobuki*), members of a Turkic alliance that was formed circa the mid-12th century in the forest-steppe regions of Rus' (primarily along the Ros' River) from surviving groups of such peoples as the Pechenegs, Torks, and Berendei, who had settled there in the second half of the 11th century. As vassals of Rus', the Black Hoods were required to guard the southern borders of the state and to take part in the campaigns of the Kievan princes. As they gradually turned from nomadic stock raising to land cultivation, feudal relations developed among them. In the 13th century, after the Mongol-Tatar invasion, some of the Black Hoods intermingled with the Russian population, and some left to roam the steppe.

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BLACK HUNDREDS, members of certain reactionary public organizations in Russia at the beginning of the 20th century.

The Black Hundreds, who believed that the autocracy should remain intact and continue to pursue a policy of great-power chauvinism, assisted the tsarist regime in its efforts to repress the revolutionary movement. Precursors of the Black Hundreds were the Sviashchennaia Druzhina (Holy Host) and the Russian Assembly in St. Petersburg; beginning in 1900 these organizations united reactionary members of the intelligentsia, the bureaucracy, the clergy, and the landowning class.

During the Revolution of 1905–07 numerous right-wing organizations were formed in response to the intensifying class struggle; these included the League of the Russian People, located in St. Petersburg; the Union of Russian Men, the Russian Monarchist Party, and the Society for Active Resistance to the Revolution, all located in Moscow; and the White Two-headed Eagle, located

in Odessa. The organizations drew support from diverse social elements: landowners, clergy, members of the big and petite urban bourgeoisie, merchants, *meshchane* (members of the lower urban strata), artisans, politically unaware workers, and *déclassé* elements. The activities of the Black Hundreds organizations were directed by the Council of the United Nobility and were given financial and moral support by the autocracy and the camarilla of the tsarist court.

Although their programs differed somewhat, all the Black Hundreds groups were united in their opposition to the revolutionary movement. Members of the groups spoke on behalf of their cause at churches, assemblies, political meetings, and lectures; they held religious services and demonstrations, and sent delegations to the tsar. This agitation, by arousing anti-Semitism and monarchist fervor, led to a wave of pogroms and acts of terrorism against revolutionaries and progressive public figures.

Newspapers published by the Black Hundreds groups included *Russkoe znamia, Pochaevskii listok, Zemshchina, Kolokol, Groza*, and *Veche*. Such right-wing newspapers as *Moskovskie vedomosti, Grazhdanin*, and *Kievlianin* also printed articles by the Black Hundreds. Leading figures of the Black Hundreds included A. I. Dubrovin, V. M. Purishkevich, N. E. Markov, the lawyer P. F. Bulatsel', the priest I. I. Vostorgov, the engineer A. I. Trishchatyi, the monk Iliodor, and Prince M. K. Shakhovskoi.

In an effort to form a united front, the Black Hundreds held four national congresses, and in October 1906 a central board was elected for the United Russian People, an organization representing all the Black Hundreds organizations. After the Revolution of 1905–07 the national organization collapsed, the Black Hundreds movement lost momentum, and the number of organizations sharply declined. During the February Revolution of 1917 the remaining groups were officially banned. After the October Revolution the leaders and many rank-and-file members of the groups opposed Soviet power. The term *chernosotenets* (member of the Black Hundreds) came to be applied to, for example, extreme reactionaries and militant opponents of socialism.

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BLACK LEG, a disease of agricultural plants in which the root collar and the base of the stem turn black and rot. Causative agents are parasitic fungi and bacteria.

Black leg of cabbage, caused by parasitic fungi, mostly infects cabbage, cauliflower, kohlrabi, and radish seedlings. Diseased plants lose turgor, turn yellow, and droop. The disease is ubiquitous. Control measures include replacement and disinfection of soil in garden frames, treatment of seeds, and proper care of plants.

Black leg of potato, caused by soil bacteria, results in yellowing, curling, and wilting of leaves and in blackening and rotting of the base of the stem. If infected before flowering, the plants form no tubers. With later infection, the tubers are also affected. Control measures include removal of diseased plants, planting of healthy tubers, and disinfection of seed tubers.

Black leg also affects carrots, forage legumes, and seedlings of fruit trees. [29–239–1]

BLACK PARTITION (Chernyi Peredel; also Party of Socialists and Federalists), a revolutionary populist organization in Russia in the early 1880's. The Black Partition was formed in August and September 1879 after a split in the secret society Land and Liberty. Its name is connected with the rumor, widespread among the peasants, of an imminent partition of the land among the common people (*chern'*).

The members of the Black Partition initially subscribed to the program of Land and Liberty; they denied the need for political struggle and rejected the terrorist and conspiratorial tactics of the People's Will in the belief that only the people could bring about a revolution. They favored large-scale agitation and propaganda among the masses. The organizers of the Central Circle of the Black Partition in St. Petersburg included G. V. Plekhanov, P. B. Aksel'rod, O. V. Aptekman, M. P. Popov, L. G. Deutsch, and V. I. Zasulich. The circle set up a press, which published the journal *Chernyi peredel* and the newspaper *Zerno*, and established ties with students and workers. Affiliated circles were active in such cities as Moscow, Kharkov, Kazan, Perm', Saratov, and Samara.

After such figures as Plekhanov, Deutsch, and Zasulich emigrated in the early 1880's, the leaders of the Black Partition included A. P. Bulanov, M. K. Reshko, K. Ia. Zagorskii, and M. I. Sheftel'. The new leaders set up a press in Minsk and broadened their ties with the workers. The organization's headquarters was moved to Moscow. In the spring of 1880 the Black Partition members E. N. Koval'skaia and N. P. Shchedrin organized in Kiev the Southern Russian Workers' Union, which comprised several hundred workers.

By this time the views of the Black Partition members had undergone a major evolution. The importance of struggle in order to attain political freedom and the need to use terror as a means of revolutionary struggle were recognized in the program of the northern Russian society Land and Liberty. The program was drafted with Aksel'rod's help and was approved by the members of the Black Partition who had emigrated.

Arrests in 1880 and 1881 weakened the Black Partition. Influenced by the successes of the People's Will, many members adopted the views of that organization, notably Ia. V. Stefanovich, Bulanov, and Popov. By the end of 1881 the Black Partition had ceased to exist as an organization, although some of the group's circles remained active until the second half of the 1880's. Such former members as Plekhanov, Deutsch, and Zasulich broke with Populism and in 1883, adopting a Marxist position, established in Geneva the first Russian Marxist organization, the Liberation of Labor group.

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BLACK RUST, a plant disease caused by various fungi, both saprophytes and hemiparasites. It affects fruit and berry crops (including citrus, grape, mulberry), cereal grains, hops, houseplants, hothouse plants, and certain forest trees. It occurs mainly in subtropical and tropical climates. Black and dark brown spots and films (mycelia and spore sacs of fungi) appear on affected plants, decreasing photosynthetic activity and obstructing access of air to the tissues. Black rust is especially damaging to spikes and caryopses of cereal grains, lowering the yield and quality of wheat, rye, and millet grains. Control measures consist mainly in destroying aphids and scale insects, upon whose discharges the causative agents feed.

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BLACK SEA, an inland sea of the Atlantic Ocean, between Europe and Asia Minor.

Physical geographic description. GENERAL INFORMATION. The Black Sea is bounded by the USSR, Rumania, Bulgaria, and Tur-

key. In the northeast it is connected with the Sea of Azov by way of Kerch' Strait, and in the southwest it is connected with the Sea of Marmara by way of the Bosporus and then with the Aegean Sea and the Mediterranean Sea by way of the Dardanelles. The Black Sea's greatest east-west length is 1,150 km, and the greatest north-south length, 580 km. At its narrowest point, the sea is 265 km wide. It has an area of 420,300 sq km and a water volume of 547,000 cu km. Its average depth is 1,300 m. The chief rivers that empty into the Black Sea are the Danube, Dnestr, Iuzhnyi Bug, Dnieper, Rioni, and Kızıl (Kyzyl Irmak).

COASTLINE. The Black Sea coastline, which measures a total of 3,400 km, is relatively smooth, with only one major peninsula—the Crimean Peninsula. Some of its segments have their own name, for example, the Southern Coast (Iuzhnyi Bereg) of the Crimea and the Black Sea Coast (Chernomorskii Bereg) of the Caucasus in the USSR and the Rumelian and Anatolian coasts in Turkey. In the west and northwest the shores are low and, in places, steep; limans are characteristic of the shores in the northwest. The northern coast of the Crimean Peninsula is flat, while the southern coast is mountainous. In the east and south the mountains of the Greater and Lesser Caucasus and the Pontic Mountains extend to the very edge of the sea; there are a few low-lying areas here, formed by river deltas jutting out into the sea near the capes of Pitsunda and Kodor in Georgia and Civa and Bafra in eastern Anatolia. The largest bays and gulfs are Karkinitskii, Kalamitskii, Dnieper-Bug, Dnestr, Varna, and Burgas in the northwest and west and Sinop and Samsun in the south. Islands are few, the most important being Berezan' and Zmeinyi.

TOPOGRAPHY OF THE BOTTOM AND GEOLOGICAL STRUCTURE. Three parts are identified in the topography of the bottom: the shelf, the continental slope, and the deep sea basin. The shelf extends to a depth of 110–160 m and reaches its greatest width, more than 200 km, in the northwest; elsewhere it usually extends to depths less than 110 m and ranges in width from 2.5 km (along the coast of Turkey) to 10–15 km.

The continental slope is strongly dissected by underwater valleys and canyons. Its average inclination is 5°–8°, but in the northwest and near Kerch' Strait, the inclination is 1°–3°. Some parts reach a steepness of 20°–30°. A system of underwater ridges measuring more than 150 km in length stretches almost parallel to the shore between Sinop and Samsun.

The floor of the deep sea basin is a flat aggradation plain, whose depth gradually increases to more than 2,000 m at the center; the maximum depth is 2,211 m. Geologically, the bottom comprises parts of different type and age. Most of the Black Sea is located within the Alpide geosynclinal (folded) region. The earth's crust beneath the deep sea basin consists of two layers: the sedimentary and "basalt" layers. The sedimentary layer is 10–16 km thick, and its upper part, at least 3–4 km thick, lies almost horizontally. In the central parts of the deep sea basin, the crust is 22–25 km thick, reaching 30–35 km along the periphery, where a granite layer appears above the "basalt" layer. In the northwest, the shelf encompasses the southern edge of the East European Platform and the Epipaleozoic Scythian Platform.

The formation of the Black Sea basin is linked with either the processes of "oceanization" of the continental crust or with the relict nature of the Black Sea basin as a remnant of the basin of the ancient ocean Tethys. The outlines of the modern basin had formed during the Oligocene, when uplifts in Asia Minor gradually separated the Black and Caspian seas from the ocean. During the Upper Miocene, the Black Sea was one of a chain of freshwater lake-seas (the Sarmatian Basin). After a short-lived connection with the Mediterranean Sea, during the Meotian stage, the freshwater Lake Pontus formed. In the late Pontian stage, the connection between the Black Sea and the Caspian was closed. During the Middle and Upper Pliocene, the Black Sea was probably a freshwater lake with an outlet. In the Middle Pleistocene, the Black Sea was twice connected with the Mediterranean for short periods and had more saline water. During the last glaciation, the New Euxine lake-sea formed, with relatively fresh water; 6,000–7,000 years ago, it was connected to the Mediterranean Sea by way of straits, giving rise to the modern Black Sea. Tectonic activity is manifested by earthquakes, whose epicenters are located along the margins of the basin and in the adjoining regions.

In the littoral zone, coarse deposits—pebbles, gravel, and sand—predominate. Farther out to sea, they are replaced quite rapidly by fine-grained sand and aleurites. In the northwest, coquinas and latter-day shell mounds inhabited by mytilids, oysters, and other mollusks are widespread. The continental slope and sea floor are characterized by pelitic oozes, whose carbonate content increases toward the open sea, exceeding 50 percent in some places; coccolithophores play a significant role in the carbonate material. At depths to 2,000 m in the southeast, aleuritic and sandy sediments deposited by turbidity currents are found.

The chief useful minerals in the Black Sea are petroleum and gas, found in the northwestern part of the basin, and titanomagnetite sands, found in the coastal waters off Taman' and the Caucasus.

CLIMATE. In the course of the year, the Black Sea is affected primarily by continental polar, marine polar, and marine tropical air masses. Continental polar air predominates. In the winter its intrusion is accompanied by strong northerly and northeasterly winds, a drop in temperature, and frequent precipitation; the winds are especially strong in the vicinity of the city of Novorossiisk, where they are called boras. When marine polar air intrudes from the Atlantic Ocean, considerable cyclonic activity develops, accompanied by squalls and precipitation. The marine tropical air, which is always warm and has higher humidity, is brought in by southwesterly winds from the Mediterranean Sea basin.

Most of the Black Sea has warm, humid winters and hot, dry summers. The average air temperature in January is about 8°C in the central part of the sea, 6°C along the eastern coast, −3°C in the northwest, and 6°–9°C in the southeast and south. The temperatures in the northern part of the Black Sea may drop to as low as −30°C, and in the southern part, to −10°C. Snowfalls occur everywhere during the winter; Sochi and Khost have up to eight days of snow a year.

In the summer, part of the Azores high extends over the Black Sea, bringing consistently clear and warm weather. The average air temperature in July is 22°–24°C; temperatures sometimes reach 30°–35°C. Average annual cloudiness is 60 percent, with a maximum in the winter and a minimum in the summer. Annual precipitation is 300–500 mm in the west and northwest, 750–800 mm in the south, and 1,800–2,500 mm in the east. Waterspouts occur in the fall.

HYDROLOGICAL REGIME. The sea's water balance is governed by atmospheric precipitation (230 cu km per year), continental runoff (310 cu km per year), and the influx of water from the Sea of Azov (30 cu km per year), on the one hand, and evaporation from the surface of the sea (360 cu km per year) and outflow through the Bosporus (210 cu km per year), on the other. The general cyclonic atmospheric circulation over the Black Sea and continental runoff lead to the development of cyclonic circulation of water, moving counterclockwise along the shores at the surface. Internal cyclonic circulations develop deep within this cycle in the west, central part, and east. The surface currents have velocities up to 1 km/hr; in some areas, they increase to 5–6 km/hr as a result of strong winds.

The excess fresh water flowing into the Black Sea causes the water to be steadily discharged through the Bosporus into the Sea of Marmara by the upper (to a depth of 40 m) current, while the lower current carries transformed salt water from the Mediterranean Sea, by way of the Bosporus, to fill the deep layers of the Black Sea. As a result, the vertical exchange of water in the Black Sea is impeded. The surface and deep waters intermix as a result of vertical flows of water in the centers of the circulations and along the continental slope.

Water-level fluctuations as a result of wind-driven currents vary from 40–60 cm in the Crimea to 1.5 m in the northwest. Changes in level caused by tides do not exceed 10 cm, while seiches do not exceed 60 cm. Wind-driven currents can cause the temperature of the coastal surface water in the summer to drop from 25°C to 10° or less in a few hours as a result of the rising of the deep waters to the surface.

During the winter, the water temperature at depths of 60 m drops to 6°–7°C. In the northwest it reaches 0.5°C, and the inlets usually freeze at temperatures below zero. In the southeast the water temperature is higher, reaching 9°–11°C. In the summer, the surface water warms up to 24°–26°C, reaching 29°C along the

shore. The temperature remains at about 7°C year-round at depths below 60–80 m.

The abundant continental runoff, the influx of relatively fresh water from the Sea of Azov, and atmospheric precipitation determine the salinity. The salinity of the surface water is 17–18 ‰ in the open sea and 3–9 ‰ near the mouths of rivers. At depths of 60–80 m it is 19–20 ‰, and at the bottom, 22–22.5 ‰. The water density at the surface is 1.013–1.015 g/cm^3 in the winter and 1.0085–1.0120 g/cm^3 in the summer. Dissolved oxygen is found only in the top layer of water; its content is 8–9 ml/*l* at the surface.

Below depths of 150–200 m, the water is "contaminated" by hydrogen sulfide, which reaches a concentration of 11–14 ml/*l* at the bottom. It is believed that hydrogen sulfide forms in the Black Sea primarily as a result of the vital activity of sulfate-reducing bacteria, the sharply delineated water stratification, and weak vertical exchange.

The color of the water differs in different parts of the sea. It is greenish blue in the central and eastern parts and bluish green in the northwest. The transparency of the water averages 16–22 m; in the western and eastern parts it is 20–27 m, decreasing to 6–8 m in the coastal regions and even to 2–3 m in some areas.

L. M. FOMIN

PLANT AND ANIMAL LIFE. A characteristic feature of the Black Sea is the almost total absence of life at depths greater than 150–200 m, where the hydrogen sulfide zone begins, with the exception of anaerobic bacteria, primarily *Microspira*. Of the plants, 350 species of unicellular phytoplankton algae are known, including about 150 species of diatoms and 150 of peridinians, and about 280 species of benthic macrophytes, including 129 species of red algae, 71 of brown algae, 77 of green algae, and several species of marine grasses, primarily *Zostera*. The brown algae *Cystoseira* and the red algae *Phyllophora* are especially numerous, forming enormous accumulations at depths of 20–50 m in the northwestern part of the sea; they are commercially important, with estimated reserves of more than 5 million tons.

The fauna of the Black Sea is approximately one-third as rich as that of the Mediterranean Sea. Benthic species predominate, numbering about 1,700. The most typical biocenoses are the mytilid oozes and phaseoline (named for the mollusk *Modiola phaseolina*) oozes, the former occurring primarily at depths of 30–70 m, and the latter, at 50–200 m. With respect to origin, immigrant species from the Mediterranean Sea predominate, constituting more than 30 percent of all the species. Of lesser importance are relicts of the Pliocene brackish Pontic Basin and freshwater immigrant species that inhabit the parts with less saline water. Endemic species constitute about 12 percent. More than 2,000 species of animals are known, including about 300 species of protozoans, 650 of various types of worms (including 190 species of marine polychaetes), 640 of crustaceans, more than 200 of mollusks, 160 of fishes, and about 150 of animals of other groups, including four mammalian species—seals—and three species of dolphins. Because of the lowered salinity, many groups of stenohaline marine animals are represented by only a small number of species (for example, there are only 14 species of echinoderms and one species of radiolarian) or are completely absent (there are no cephalopod mollusks or brachiopods). Many fish (about 20 percent of the species) are commercially important, among them the anchovy, horse mackerel, Atlantic mackerel, bonito, sprat, and sturgeon.

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Economic geography. The Black Sea is an important artery, linking the USSR with foreign countries; one-fourth of all USSR imports and one-half of all exports are shipped by way of the sea. The Black Sea merchant fleet accounts for a significant share of USSR marine shipping. Considerable domestic cargo is also shipped on the Black Sea, often by way of the V. I. Lenin Volga–Don Ship Canal, which links the Black Sea with the Volga River and Caspian Sea. The largest port on the Black Sea is Odessa, which, together with the nearby port of Il'ichevsk, accounts for one-third of the total freight turnover on the Black Sea. Virtually all types of raw materials and industrial products pass through Odessa. Petroleum is shipped from Novorossiisk, Tuapse, and Batumi. Cement is shipped from Novorossiisk and manganese ore from Poti. Other large ports are Nikolaev, Kherson, Kerch', Feodosiia, Sevastopol', and Izmail.

The Black Sea is also very important for the economies of Bulgaria, Rumania, and Turkey. The main ports in Bulgaria are Burgas and Varna, and in Rumania, Constanţa. A large part of the cargo from the Balkan countries is transported to the Black Sea along the Danube. The most important Turkish ports are Trabzon, Samsun, and Zonguldak.

The Black Sea is a major commercial source of fish, algae, and mollusks.

The favorable climate of the Black Sea has favored the development of resorts and tourism. In the USSR, the Southern Coast of the Crimea, with its center in Yalta, is a major climatic resort area, as are the cities of Sochi, Pitsunda, Gagra, Sukhumi, Batumi, Anapa, and Gelendzhik on the Caucasian coast. The chief resorts in Bulgaria are Golden Sands and Sunny Coast; the main resort in Rumania is Mamaia.

An important problem is the protection of the Black Sea from pollution. The main pollutants are petroleum, petroleum products, phenols, and detergents. Especially polluted by petroleum are the coastal waters and the western part of the sea, site of shipping lanes from Odessa, to the mouth of the Danube, and then to Istanbul or Varna. Measures have been undertaken to prevent the discharge of untreated industrial and household wastes into the sea; the dumping of petroleum, petroleum products, and other substances that pollute the water has been prohibited.

History of study. Opinions differ regarding the source of the modern name Black Sea. Greek navigators of the sixth and fifth centuries B.C. called the sea Pontus Axeinus, literally "inhospitable sea"; in the early part of the Common Era, it was called Pontus Euxinus, or "hospitable sea." In the ninth and tenth centuries the Arabs called it the Russian Sea. In the 15th century the Turkish named it Karadeniz, literally "black sea" or "bad sea." Another explanation links the word "black" to the color designation used by some peoples for the countries of the world: "black" signified the north. In Slavic, *chermnoe* means "bleak" or "stormy"; the ancient Persian name Achshaena literally means "dark sea," which signifies a harsh sea.

Since ancient times the Black Sea has been an active sea route, well known to the Phoenicians and Greeks. In the third century B.C., the Greeks made the first map of the Black Sea. In the late ninth century A.D., Russians began using the sea to sail from the Baltic to Byzantium, the route "from the Varangians to the Greeks."

The study and scientific development of the Black Sea began in the early 19th century. The first Russian expedition, led by G. P. Manganara, surveyed the coastline, took depth measurements, and studied the soil, and the results obtained were used to draw navigation charts and a map of the Black Sea. Similar studies were later carried out by numerous hydrographic expeditions, which also studied water temperature and currents. The first atlas of depths (down to 180 m), sediments, and currents was published in Russia in 1842. Important studies of the Bosporus were conducted in 1881–82 by S. O. Makarov. He established the two-layer current, the upper current flowing from the Sea of Marmara into the Black Sea and the lower from the Black Sea into the Sea of Marmara. In 1890–91 an expedition led by I. B. Shpindler on the ships *Donets* and *Zaporozhets* made the first deep-water observations and established the "contamination" of the deep sea waters by hydrogen sulfide. After the founding of the Sevastopol' Biological Station in 1871, extensive biological research developed under the direction of A. O. Kovalevskii.

In the 1920's, the Sevastopol' Biological Station and the Marine Observatory embarked on a planned, coordinated study of the Black Sea. The largest expeditions were N. M. Knipovich's scientific-commercial expedition of 1922–27, Iu. M. Shokal'skii's hydrologic and hydrographic expedition of 1923–27, and the Marine Observatory expedition of 1928–38, headed by V. A. Snezhinskii. These expeditions contributed much to the study of the topography of the bottom and to the study of sediments, the vertical structure of the water, and the ichthiofauna of the Black Sea. The material they gathered enabled A. D. Arkhangel'skii and N. M. Strakhov to advance the first generalization of the stratigraphy and geological history of the Black Sea in the Cenozoic.

With the introduction of observations on standard cross sections in the 1930's, the study of the Black Sea became systematic.

The Hydrometeorological Observatory and the Azov–Black Sea Scientific Research Institute of Fishing and Oceanography became involved in studying the sea. In the late 1940's and subsequent years observations on cross sections expanded greatly; hydrologic and hydrochemical observations are now made once a month or every ten days on standard cross sections. Since the late 1950's, a systematic study of the geology and geophysics of the Black Sea, the geomorphology of the bottom, bottom sediments, and other aspects has been conducted. Regular seismic investigations of the structure of the earth's crust beneath the Black Sea was begun in 1957. In 1975 a deep-sea drilling project that went down to a depth of 1 km was carried out by scientists from various countries on the ship *Glomar Challenger*. The State Oceanographic Institute has been systematically monitoring the pollution of the Black Sea since the mid-1960's.

The following institutions are engaged in the study of the Black Sea: the Institute of the Biology of the Southern Seas (the former Sevastopol' Biological Station), the Marine Hydrophysical Institute of the Academy of Sciences of the Ukrainian SSR, the Azov–Black Sea Scientific Research Institute of Fishing and Oceanography, the Sevastopol' division of the State Oceanographic Institute, the Black Sea division of the Institute of Oceanography of the Academy of Sciences of the USSR, the All-Union Scientific Research Institute of Marine Geology, and the Marine Observatory. A. M. MUROMTSEV

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BLACK SEA COSSACK HOST, a military force that was formed in 1787, on the initiative of G. A. Potemkin, in the southern Ukraine from former Zaporozh'e Cossacks. Called the Host of Faithful Cossacks, it was given official status by a ukase of January 1788.

The host, which fought under the atamans S. Belyi and Z. Chepega in the Russo-Turkish War of 1787–91, was renamed the Black Sea Cossack Host and granted lands between the Iuzhnyi Bug and the Dnestr rivers. In 1792 and 1793 the government moved to strengthen the Northern Caucasus by resettling the host in the Kuban'; there it comprised 40 *kureni* (units), with approximately 25,000 men, and maintained a headquarters in Ekaterinodar (now Krasnodar). The host occupied a defensive line along the right bank of the Kuban' River from its mouth to the Laba River.

The Black Sea Cossack Host retained certain external features of the Zaporozh'e Sech', such as formal voting for the members of the host's government and the use of the term *kuren'*, which had been used to designate the Zaporozh'e units. In the first half of the 19th century the host's ranks were swelled by approximately 70,000 settlers—former members of the Zaporozh'e Sech' who had returned from Turkey and cossacks from various Ukrainian hosts that had been abolished, such as the Ust'-Dunai, Azov, Bug, and Ekaterinoslav hosts. By 1860 the host numbered approximately 200,000 men and included 12 cavalry regiments, nine infantry (crawler) battalions, four batteries, and two guard squadrons.

The Black Sea Cossack Host fought in the Caucasian War of 1817–64, and the crawlers took part in the defense of Sevastopol' of 1854–55. In 1860 the host became part of the newly formed Kuban' Cossack Host.

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BLACK SEA FLEET, a higher operational command, a component of the Navy of the USSR in the Black Sea.

The fleet was created in 1783 after the Crimea became part of Russia. Previously there had been naval shipbuilding on the Sea of Azov and at Kherson (from 1778). On May 2, 1783, 11 ships of the Azov Flotilla sailed into the bay at Akhtiar (Sevastopol'); together with the 17 ships of the Dnieper Flotilla that later joined them, they formed the nucleus of the new fleet. In 1785 the first table of organization was established for the Black Sea Fleet, with 12 ships of the line, 20 frigates, five schooners, 23 transport vessels, and a personnel complement of 13,500. The Black Sea Admiralty was created in Kherson for the direction of the fleet.

Throughout its entire history, the Black Sea Fleet has successfully carried out its assigned missions. During the Russo-Turkish War of 1781–91, in spite of the numerical superiority of the enemy's navy, Russian sailors inflicted stunning defeats on the enemy in a battle at Phidonisi (1788), the Kerch' naval battle (1790), a battle off Tendra Island (1790), and at Cape Kaliakra (1791). During the war, brilliant naval leadership was demonstrated by Admiral F. F. Ushakov, who commanded a squadron and, from 1790 to 1798, the Black Sea Fleet.

A shipyard was constructed in Nikolaev in 1789, and the Black Sea Admiralty was moved there from Kherson. In 1804 Sevastopol' became the home port of the fleet. Between 1798 and 1800, during the war with France, a squadron of the Black Sea Fleet under Ushakov's command saw action in the Mediterranean Sea, liberated the Ionian Islands, and captured the island of Kerkira (Corfu) by storm. In 1806 and 1807 a squadron under the command of Vice Admiral D. N. Seniavin, operating in the Aegean Sea, destroyed the Turkish fleet in battles in the Dardanelles (1807) and at Athos (1807).

In 1816, Vice Admiral A. S. Greig was made commander in chief of the Black Sea Fleet and its ports. He bolstered the combat readiness of the fleet by improving ships' armaments, instituting annual maneuvers, and perfecting navigational and hydrographic support; much attention was devoted to the training of officers, and in 1822 the Naval Library was created in Sevastopol'. During the Russo-Turkish War of 1828–29 the fleet supported ground offensives in the Balkan and Caucasus military theaters. The brig *Merkurii* won eternal glory by defeating two Turkish ships of the line.

In 1831 the headquarters of the fleet commander in chief was created. Rear Admiral M. P. Lazarev was appointed chief of staff in 1832 and served as commander in chief of the Black Sea Fleet from 1833 to 1851. Under his leadership ships were renovated, powerful bombardment weapons were introduced as armaments, and an admiralty building and casemate batteries were built in Sevastopol'. By the mid-19th century the Black Sea Fleet had become the finest sailing fleet in the world and included 14 sailing ships of the line, six frigates, four corvettes, 12 brigs, and six steam frigates.

During the Crimean War (1853–56), a squadron under the command of Vice Admiral P. S. Nakhimov destroyed a Turkish squadron in the battle of Sinop (1853). During the defense of Sevastopol' (1854–55), men of the Black Sea Fleet under the leadership of Admirals V. A. Kornilov, Nakhimov, and V. I. Istomin heroically fought on land. Some ships were sunk at the entrance to Sevastopol' Bay to defend the sea approaches, and others provided artillery support to the ground forces.

The Treaty of Paris (1856) deprived Russia of the right of maintaining a fleet in the Black Sea. This limitation of the sovereign rights of Russia in the Black Sea was abolished only in 1871. The reestablishment of the fleet as an ironclad steamship fleet in the late 19th century is associated with the names of G. I. Butakov and S. O. Makarov. A shipbuilding program for the Black Sea Fleet was adopted in 1881. By the early 20th century the fleet included seven squadron ironclads, one cruiser, three mine cruisers, six gunboats, and 22 torpedo boats.

In the early 20th century, with the growth of the revolutionary movement in the country, the sailors of the Black Sea Fleet also

initiated revolutionary activities. A crucial role in the awakening of political consciousness among the sailors of the fleet was played by Lenin's *Iskra* and the first Social Democratic organizations, which were created in the fleet in 1901 and 1902. The Central Naval Committee of Military Organization of the RSDLP ("sailors' central") was formed in Sevastopol' in April 1904; the committee established communications with the Bolshevik committees of Sevastopol', Nikolaev, and Kherson. In June 1905 an uprising broke out on board the battleship *Potemkin*, and the Sevastopol' mutiny of 1905 occurred on the cruiser *Ochakov* in November; both uprisings were brutally suppressed by the tsarist government. The names of the heroes of the uprisings—G. N. Vakulenchuk, P. P. Shmidt, A. I. Gladkov, S. P. Chastnik, and N. G. Antonenko—have been inscribed for eternity in the history of the revolutionary struggle.

By the beginning of World War I, the Black Sea Fleet had six battleships (pre-dreadnoughts), two cruisers, 17 destroyers, 12 torpedo boats, and four submarines. During the war the fleet added three battleships (one was lost in 1916), nine destroyers, ten submarines, and two seaplane transports. The fleet fought in the Black Sea against German and Turkish naval forces, supported the ground forces of the Caucasian Front along coastal axes, and disrupted the enemy's lines of communication.

The sailors of the Black Sea Fleet greeted the victory of the February Revolution of 1917 with great enthusiasm. Despite pressure from the conciliatory parties in the soviets and the sailors' committees, the sailors in the fleet continued to align themselves with the Bolsheviks. The Central Committee of the RSDLP(B) sent to Sevastopol' such experienced party workers as Iu. P. Gaven and N. A. Pozharov. Within the fleet, as in the soviets, a fierce struggle was waged against the Mensheviks, Socialist Revolutionaries, Ukrainian bourgeois nationalists, and anarchists. On Dec. 16, 1917, the conciliatory soviet in Sevastopol' was dissolved, and the newly created military revolutionary committee took power into its own hands. With the help of sailors of the Black Sea Fleet, Soviet power was established in January 1918 in Feodosiia, Kerch', Evpatoriia, Yalta, Odessa, and Rostov.

During the Civil War of 1918–20, sailors of the Black Sea Fleet fought as part of the Dnieper, Azov, and Volga flotillas and in various units of the Red Army. Heroes of the Civil War included sailors A. V. Mokrousov, A. V. Polupanov, and I. A. Nazukin. The occupation of the Ukraine and the Crimea by German and Austrian forces prompted V. I. Lenin to order the transfer of the Black Sea Fleet to Novorossiisk. The revolutionary ships of the Black Sea Fleet carried out Lenin's order in April and May 1918. However, because of the threat of capture by the German interventionists who had appeared at Taman', the Soviet government ordered on June 18 that one battleship, nine destroyers, and several other vessels be scuttled near Novorossiisk and Tuapse. The ships that remained in Sevastopol' were captured by German interventionists and Ukrainian nationalists. Soviet power was reestablished in May 1919, but the Crimea and the Black Sea Fleet were captured soon after by the White Guard forces of General A. I. Denikin. In May 1920 an order of the Revolutionary Military Council of the Republic created the Naval Forces of the Black Sea and the Sea of Azov, units of which fought against the White Guard flotilla. General P. N. Wrangel's troops took with them to Bizerte more than 130 warships and other vessels during their retreat from the Crimea.

The Tenth Congress of the RCP(B) of 1921 adopted a resolution concerning the reestablishment of the Black Sea Fleet. Two destroyers, five gunboats, two submarines, and several minesweepers and minelayers were refitted in 1922. Restoration of the fleet was fundamentally completed by 1928, and the renovation of equipment was begun. During the winter of 1929–30 the battleship *Parizhskaia Kommuna* (later, *Sevastopol'*) and the cruiser *Profintern* (later, *Krasnyi Krym*) were transferred from Kronstadt to Sevastopol'. In 1936 the Naval Forces of the Black Sea and the Sea of Azov became the Black Sea Fleet. After the first and second five-year plans (1929–37), the Black Sea Fleet received more than 500 new warships. In 1938 and 1939 the fleet received new leader-class warships (the *Moskva* and *Khar'kov*) and destroyers of the *Gnevnyi* type, construction was completed on new cruisers (the *Voroshilov*) and other ships, and air forces, coastal defense, and an air defense system were created.

The chiefs of the Naval Forces of the Black Sea and the Sea of Azov (from 1935, commanders of the Black Sea Fleet) were A. V. Dombrovskii (1920), E. S. Pantserzhanskii (1920–21, 1925–26), A. S. Maksimov (1921–22), A. K. Vekman (1922–24), M. V. Viktorov (1924), V. M. Orlov (1926–31), I. K. Kozhanov (1931–37), P. I. Smirnov (1937), I. S. Iumashev (1938–39), and F. S. Oktiabr'skii (from August 1939).

By the beginning of the Great Patriotic War of 1941–45, the Black Sea Fleet was well equipped for the time. It had one battleship, six cruisers, 16 leaders and destroyers, 47 submarines, two brigades of torpedo boats, several divisions of minesweepers and patrol and antisubmarine vessels, fleet air forces (more than 600 airplanes), and a strong coastal defense.

The high level of combat readiness of the Black Sea Fleet frustrated the enemy's attempt to disable the main forces of the fleet during the first days of the war. Fleet aviation delivered strikes on Constanţa, Sulina, and Ploieşti. The Black Sea Fleet fought in the defense of Odessa (1941) and the heroic defense of Sevastopol' (1941–42); the commander in chief of the fleet headed the Sevastopol' Defense Region. Of major importance was the Kerch'-Feodosiia Landing Operation of 1941–42, which was carried out with the active participation of the Black Sea Fleet.

In 1942 and 1943 the Black Sea Fleet fought in the battle for the Caucasus. Submarines from Batumi and Poti traversed 600 miles in order to disrupt the enemy's lines of communication, and surface ships, aviation, and the marine infantry fought for Novorossiisk and in the area of Tuapse. Heroic chapters in the history of the Black Sea Fleet include the landing operations in the area of Iuzhnaia Ozereika and Stanichka (near Myskhako) in February 1943, the defense of the *Malaia Zemlia*, the Novorossiisk-Taman' Operation of 1943, and the Kerch'-El'tigen Landing Operation of 1943. The Azov Flotilla, which was a part of the Black Sea Fleet, participated in the liberation of ports on the Sea of Azov through its support of ground forces. Ships and units of the Black Sea Fleet fought in the liberation of the Crimea, Nikolaev, and Odessa and in the Iaşi-Kishinev Operation of 1944. The Danube Naval Flotilla, which was also part of the Black Sea Fleet, saw action from the lower reaches of the Danube to Vienna.

During the war the title "guards" was awarded to 18 ships and units of various sizes of the Black Sea Fleet; 59 ships and units were awarded orders of the USSR. More than 200 sailors of the fleet received the title of Hero of the Soviet Union. For special merit in combat, the Order of the Red Banner was awarded the fleet by the decree of the Presidium of the Supreme Soviet of the USSR of May 7, 1965.

Commanders of the Black Sea Fleet during the war were F. S. Oktiabr'skii (August 1939–April 1943, March 1944–November 1948) and L. A. Vladimirskii (April 1943–March 1944). Members of the military council were N. M. Kulakov (May 1940–December 1943) and I. I. Azarov (1941–March 1943, February 1944–May 1947). Chiefs of staff were I. D. Eliseev (April 1941–January 1944) and I. F. Golubev-Monatkin (February 1944–December 1945).

In the 1950's and 1960's important changes took place in all the combat arms of the Black Sea Fleet. Reinforcement of the fleet with new ships and the provision of the newest combat matériel, missile weaponry, and electronic equipment have permitted the assignment of entirely new missions to the Black Sea Fleet. The ships of the fleet complete long voyages and cruises into the Mediterranean Sea and various regions of the world, during which they conduct combat training missions and ensure defense of the state interests of the USSR at sea. The Black Sea Fleet demonstrated a high level of combat proficiency during the Okean (1970) and Iug (1971) training exercises and in dozens of cruises to various countries of the Mediterranean and Atlantic. Especially high marks in combat training were gained by the crews of the cruisers *Mikhail Kutuzov* and *Dzerzhinskii*, the antisubmarine cruiser *Leningrad*, the missile cruiser *Groznyi*, the large landing vessel *Voronezhskii Komsomolets*, and the destroyers *Naporistyi*, *Plamennyi*, and *Nakhodchivyi*.

In the postwar period, the Black Sea Fleet has been commanded by Admirals N. E. Basistyi (1948–51), S. G. Gorshkov (1951–55), V. A. Kasatonov (1955–62), S. E. Chursin (1962–67), V. S. Sysoev (1968–74), and N. I. Khovrin (since 1974).

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N. I. KHOVRIN [29–295–2]

BLACK SEA HIGHWAY (Route 19), a trunk road, with a length of 750 km, that connects Novorossiisk and Batumi.

The Black Sea highway was constructed between 1887 and 1910 and was rebuilt and modernized between 1946 and 1950. It crosses Krasnodar Krai, the Abkhazian ASSR, and the Adzhar ASSR. In addition to Sochi, whose health resorts line the highway for approximately 150 km, its principal intermediate points are the health resorts of Gelendzhik, Dzhubga, Tuapse, Gagra, Gudauta, Novyi Afon, Sukhumi, Ochamchira, and Zugdidi. Except for the Ochamchira-Samtredia-Kobuleti section, the highway runs along the seacoast.

The Black Sea highway has spurs that connect it to Myskhako (6 km), Abrau-Diurso (23 km), Krasnaia Poliana (59 km), Mount Akhun (11 km), Salkhino (18 km), Pitsunda (13 km), Ritsa Preserve (56 km), Iuzhnyi Priiut (102 km), Tkvarcheli (27 km), and Zugdidi and Mestia (136 km). It is connected to the highway system of the USSR by the Pavlovskaia-Krasnodar-Novorossiisk highway (Route 18) and the Armavir-Maikop-Tuapse highway. Highways run from Samtredia to Tbilisi, Yerevan, and Baku (routes 15 and 17).

The highway travels through an internationally known tourist area and zone of climatic and balneological health resorts; it is the largest such area in the USSR. Passenger transport predominates, but freight for the resorts and vacationers in the area is carried on the road. Goods shipped from the area include products of the food-processing industry and various fruits, including citrus fruits and grapes. Work is being carried out to increase the traffic capacity of the most heavily traveled sections of the road.
G. I. SHEINIS [29–300–1]

BLACK SEA MUTINY IN THE FRENCH FLEET, an uprising in April 1919 on ships of the French Navy, which had been taking part in the intervention against Soviet Russia; the most important revolutionary uprising among the interventionist forces.

A major role in preparing the mutiny was played by underground Communist organizations, which carried on revolutionary propaganda among the foreign forces; of particular importance was the work of the French group of the Foreign Board (including J. Labourbe) of the Odessa oblast committee of the Bolshevik Party. After several French ground-troop units refused to fight against Soviet power, disturbances broke out on French ships on April 16. On April 19 the sailors of the battleship *France* and the flagship *Jean Barre* mutinied; they were joined by the sailors of the battleship *Justice* and other vessels lying near Sevastopol'. After running up red flags on the ships, the sailors went ashore and organized a demonstration with the workers of Sevastopol'.

The uprising spread to other French ships in the Black Sea. On April 27 a mutiny broke out on the cruiser *Waldeck-Rousseau*, anchored in the outer roads of Odessa's harbor. The sailors and soldiers demanded that they be sent home and that anti-Soviet intervention cease. The French government was forced to announce the evacuation of its armed forces from Soviet Russia. By early May 1919 the French Navy had left the Black Sea.

The French command dealt harshly with the insurgents, many of whom were arrested and imprisoned. The uprising was a clear expression of the solidarity of the international proletariat with Soviet Russia. Amnesty for those who took part in the Black Sea mutiny constituted a demand of the French working-class movement in the 1920's.
G. P. DRAGUNOV [29–299–2]

BLACK SEA PRESERVE, a nature preserve located in Kherson and Nikolaev oblasts, Ukrainian SSR. The Black Sea Preserve covers an area of 64,806 hectares (1976) on the northern coast of Tendra and Iagorlytskii bays of the Black Sea and islands in the bays. It was established in 1927 to protect wintering, migrating, and nesting birds and their habitat. The preserve includes isolated sections of solonchak and sandy steppes; oak, birch, European aspen, and black alder groves; spits; and salt and freshwater lakes, as well as the water area of the bays.

The Black Sea Preserve is the nesting area for numerous seagulls, terns, ducks, and birds of the suborder Limicolae, the family Rallidae, and the order Ciconiiformes. Large numbers of swans (whooper swan and mute swan), ducks, Limicolae, and Rallidae winter in the bays. Many geese (particularly the white-fronted goose), Limicolae, Passeriformes, and other birds stop there during migration. A few bustards and white-tailed eagles nest in the forest-steppe sections, and little bustards are occasionally encountered. The Japanese deer (*Cervus nippon*), which was introduced from Askaniia-Nova in 1957, has adapted well. Fish include mullet, the Black Sea flounder (*Pleuronectes flesus luscus*), and gobies. [29–295–1]

BLACK SEA STRAITS, the general name for the Bosporus, the Dardanelles, and the Sea of Marmara, which lies between the Bosporus and the Dardanelles (*see* BOSPORUS and DARDANELLES). The Black Sea straits constitute the only passage between the Black and Mediterranean seas and consequently occupy a special place in the system of international waterways. So long as Byzantium and, after the Turkish conquest of Constantinople in 1453, the Ottoman Empire ruled the entire Black Sea region, the Black Sea was an internal sea and the use of the Black Sea straits, therefore, was the internal affair of the corresponding state. By the late 17th century, however, the situation was fundamentally different. Peter I embarked on the construction of the Azov Fleet, and in 1696 he took Azov. Russia's border now extended to the Sea of Azov and the Black Sea. Consequently, entry into and departure from the Black Sea became an international issue and thereafter constituted an important part of the Eastern Question (*see* EASTERN QUESTION). The efforts of Russian diplomats to secure access to the Black Sea and Black Sea straits for the Russian fleet long remained unsuccessful. In 1774 the Treaty of Kuchuk Kainarji recognized Russia's right to commercial navigation in the Black Sea and Black Sea straits [*see* KUCHUK KAINARJI, TREATY OF (1774)]. Later, other states, except those at war with Turkey, were granted the same right.

The resolution of the question of the passage of warships proved a much more complex matter for Russian diplomacy. The security of the Black Sea countries necessitated the establishment of a regime of the straits that would guarantee the naval fleets of these countries reliable access to the high seas but at the same time provide protection from the threat of aggression from non–Black Sea powers. This principle was formulated clearly in 1802 by the chancellor A. R. Vorontsov in response to French claims regarding the right of passage of the French fleet through the Black Sea straits. At that time, Turkey held a position similar to Russia's position. While prohibiting the passage of warships of non–Black Sea countries, Turkey granted Russian warships, following the Russo-Turkish treaties of alliance of 1799 and 1805, the right to pass into the Mediterranean Sea (*see* RUSSO-TURKISH TREATIES OF ALLIANCE).

Meanwhile, the non–Black Sea powers, first and foremost Great Britain and France, were seeking to obtain the right of direct access to the Black Sea for both their commercial vessels and their warships, while at the same time denying that right to the Russian fleet. Inasmuch as there could be no straightforward justification for such an unjust demand, they sought "parity" with Russia, that is, either opening up or closing completely the Black Sea straits to warships of all countries.

Under the influence of Napoleon's diplomacy, Turkey in 1806, in violation of the 1805 treaty of alliance with Russia, revoked the right of free passage of Russian ships through the straits. Soon after, during the Russo-Turkish War of 1806–12, Great Britain imposed a treaty on Turkey (1809) that, under the guise of an "ancient rule of the Ottoman Empire," prohibited the passage of the warships of any foreign power through the Black Sea straits. The Treaty of Unkiar Skelessi of 1833, virtually restoring the Russo-Turkish alliance, obligated Turkey to close the Darda-

nelles on Russia's demand to warships of other countries [*see* UNKIAR SKELESSI, TREATY OF (1833)]. However, a few years later, the London Convention of 1840 resurrected the supposedly always extant ancient rule of the Ottoman Empire.

The first multilateral international agreement concerning the Black Sea straits, the London Convention of 1841, confirmed the ancient rule and transformed it into an international obligation. Turkey and Russia thus lost the right of independently regulating the passage of warships into and from the Black Sea through bilateral agreements. The Russian fleet found itself locked within the Black Sea. The prohibition of passage for warships of non–Black Sea countries was of little value to Russia, especially since the 1841 convention stipulated that the ban applied only in peacetime. Turkey, meanwhile, fell ever more under the influence of the Western European powers and often made exceptions to the ancient rule for them. This was one of the leading factors that led tsarist Russia into war with Turkey in 1853 (*see* CRIMEAN WAR OF 1853–56). The Paris Peace Treaty of 1856, which ended the war, prohibited Russia, under the guise of an obligation to maintain the "neutralization" of the Black Sea, from taking effective steps to protect its Black Sea coast [*see* PARIS, TREATY OF (1856)]. In 1870 the Russian government refused to recognize the articles in the Treaty of Paris concerning the "neutralization" of the Black Sea. The London Convention of 1871 sanctioned the abolition of these articles but essentially retained the same status of the Black Sea straits as the 1841 convention. The status was also preserved by the Berlin Treaty of 1878 (*see* BERLIN CONGRESS OF 1878).

Right up to World War I, Russian diplomacy sought in vain to alter the status of the Black Sea straits, which was unfavorable to Russia. There were cases, in 1891 and 1894, for example, when the Turkish sultan allowed Russian warships to pass through the Bosporus and the Dardanelles, albeit without armament and without armed escort, but the non–Black Sea powers made it difficult to obtain such authorization, and during the Russo-Japanese War of 1904–05 Great Britain staged a naval demonstration near the Dardanelles to prevent Russian warships from passing into the Mediterranean and appearing in the Far East.

International supervision of the Black Sea straits was also disadvantageous for Turkey, since it infringed on Turkey's sovereignty, tended to turn Turkey into a semicolony of the imperialist powers, and led to a dangerous exacerbation of relations with Russia. In the late 19th and early 20th centuries, Great Britain and France enjoyed the greatest economic and political influence in Turkey. However, in the years immediately preceding World War I, German influence increased significantly.

After Turkey's entry into World War I as a German ally, the secret Anglo-French-Russian Agreement of 1915 was signed, providing for the inclusion of Constantinople (Istanbul) and the Black Sea straits within the Russian Empire. This agreement was expected to maintain the interests of Russian ruling circles in continuing the war with Germany until a victorious conclusion. (*See* ANGLO-FRENCH-RUSSIAN AGREEMENT OF 1915.)

After the victory of the Great October Socialist Revolution, Soviet Russia renounced the secret treaties of the tsarist government and the agreement on Constantinople and the Black Sea straits. The imperialist powers, on the other hand, set themselves the task of seizing the Black Sea straits. After the signing of the Moudhros Armistice of 1918, the navy of the Entente powers entered the Black Sea straits (*see* MOUDHROS ARMISTICE OF 1918). In 1920 the troops of the Entente occupied Istanbul. Their control of Istanbul and the Black Sea straits zone enabled the imperialist powers to organize an armed intervention into southern Soviet Russia, as well as into Turkey, with the help of the Greek Army. According to the Treaty of Sèvres of 1920, signed by the sultan's government, the issue of the Black Sea straits was resolved to the benefit of the imperialist powers [*see* SÈVRES, TREATY OF (1920)].

The Treaty of Sèvres never went into effect owing to the failure of the Anglo-Greek intervention in Turkey. V. I. Lenin worked out the principles for the resolution of the straits question that met the interests of both Soviet Russia and Turkey. They were set down in the Moscow Treaty of Mar. 16, 1921, between the RSFSR and Turkey, which envisioned that the international status of the Black Sea and Black Sea straits would be worked out by a conference "of delegates from the countries with a Black Sea coastline on the condition that the decisions reached not infringe on the complete sovereignty of Turkey or the security of Turkey and its capital Constantinople." Identical articles were included in the Treaty of Kars of 1921 and a Ukrainian-Turkish treaty of 1922 [*see* KARS, TREATY OF (1921)]. At the Lausanne Conference of 1922–23, the Soviet delegation worked hard to obtain a just resolution of the straits question (*see* LAUSANNE CONFERENCE OF 1922–23). The Lausanne convention on the straits, signed on July 24, 1923, stipulated that the Black Sea straits zone would be demilitarized and opened to passage by any warships. Because such a regime would subject the Black Sea countries to the threat of aggression, the Soviet Union refused to ratify the convention. In April 1936 the Turkish government, relying on the support of Great Britain, which sought to draw Turkey into the orbit of its Mediterranean Sea policy and to make use of Turkish naval bases, proposed that the powers that met in the Lausanne Conference conduct negotiations for a new convention on the Black Sea straits.

An international conference on the straits question opened in Montreux in June 1936; it ended on July 20, 1936, with the signing of a new convention on the Black Sea straits (*see* MONTREUX CONFERENCE OF 1936). This convention took into account, although not fully, the interests of the Black Sea countries. All ships of the Black Sea states were allowed to cross the Black Sea straits observing established rules of passage, whereas limitations on tonnage, class, and cruising time in the Black Sea were imposed on the warships of non–Black Sea powers. Passage by warships of countries at war was prohibited. Turkey had the right, in case of its entry into a war or being threatened by war, to permit or prohibit any warship to pass through the straits.

During World War II (1939–45), Turkey, declaring its neutrality after Germany attacked the USSR, nevertheless allowed the fascist aggressors to use the Black Sea straits for their purposes. In light of these circumstances, the Potsdam Conference of 1945 acknowledged that the convention concluded in Montreux would have to be revised (*see* POTSDAM CONFERENCE OF 1945). In 1946 the USSR began negotiations with Turkey, but the Turkish government rejected Soviet proposals. In 1953 the Soviet government informed Turkey that it had revised its former view with respect to these proposals. Thus, the convention of 1936 remains the international document regulating navigation in the Black Sea straits.

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A. F. MILLER [29–291–4]

BLACK TIKHORETSK TURKEYS, a pedigreed group of small turkeys developed between 1952 and 1957 on kolkhozes and sovkhozes in Tikhoretsk Raion, Krasnodar Krai, through the se-

lective breeding of local turkeys. The plumage is shiny black, with a bronze sheen on the tail. A tuft of black filamentous feathers extends from the base of the neck to the breast; these feathers are more developed in males. Adult males weigh 9–10 kg, and adult hens 4.5–5 kg. The young weigh 3.5–4 kg by 14 to 16 weeks of age and yield high-quality meat. The average egg yield is 80 to 90 per year; the hens are marked by a high level of fertility. Black Tikhoretsk turkeys are raised in Krasnodar Krai and Rostov and other oblasts. [29–305–4]

BLAST FURNACE SMELTING, a metallurgical process carried out in shaft furnaces, used mainly in nonferrous metallurgy for the smelting of lead bullion, copper, copper matte, and nickel matte. The charge is loaded from above and consists of lumped metal-bearing raw material, fluxes, and coke. As the coke is burned and the materials are smelted, the charge descends; the air or oxygen required for the combustion of the coke is blown through a tuyere, and the combustion products move toward the charge. An oxygen zone is created near the tuyeres, in which the coke is combusted primarily to CO_2, most of the heat is released, and the maximum temperature is reached. A reduction zone is formed beyond the oxygen zone, in which the hot gases react with the succeeding layers of coke in the reaction

$$CO_2 + C = 2CO$$

The gases become enriched with carbon dioxide as their temperature decreases since the reaction proceeds with the absorption of heat; the reaction virtually ceases at 800°C.

Reduction, sulfidizing, and oxidation variants of blast furnace smelting are used in nonferrous metallurgy. Reduction blast furnace smelting of lead produces lead bullion, slag, dust, and gases. Copper matte is also formed if the agglomerate has a high content of copper and sulfur. The exhaust gases pass through an electrical filter or bag filter that traps dusts with a high content of zinc and lead. Sulfidizing blast furnace smelting of nickel oxide ores with the addition of pyrites or gypsum is performed in a weakly reducing atmosphere and produces matte. Oxidation blast furnace smelting of copper sulfide ores is designed to produce copper matte and remove barren rock with the slag, as well as to oxidize a portion of the sulfur of the sulfides and remove it as sulfuric anhydride; two variants of the process are pyritic and semipyritic smelting. Copper-sulfur blast furnace smelting with the production of elemental sulfur is a combined oxidation-reduction process.

Blast furnace smelting is commonly characterized by various parameters. The unit smelting capacity may be defined as the weight of ore, agglomerate, or charge smelted in one day per square meter of cross-sectional area of the furnace in the plane of the tuyeres; it is 50–100 tons per sq m per day for lead sulfide and copper sulfide charges and 30–40 tons per sq m per day for nickel oxide ores. The unit coke consumption is the ratio of the weight of coke to the weight of loaded ore or charge. A third commonly used index is the degree of extraction of valuable metals. In comparison with reverberatory and fluidized-bed smelting, blast furnace smelting exhibits higher efficiency, lower temperature of the exhaust gases, and, consequently, higher thermal efficiency; in comparison with smelting in reverberatory and electric furnaces, it ensures greater desulfurization. The disadvantages of blast furnace smelting are the need for preliminary sintering of the raw material, the low concentration of sulfuric anhydride in the exhaust gases, and a high dust output.

Major trends in the effort to improve blast furnace smelting, in addition to further development of the design of shaft furnaces, include oxygen enrichment of the oxygen blast, heating of the blast, improvement of charge preparation, automation of control of the smelting process, and the combination of blast furnace smelting with processes for the subsequent extraction of valuable metals from slags and the improvement of gas and dust trapping.

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I. D. REZNIK [29–910–1]

BLIND TILLAGE, the first shallow loosening of the interrow spaces of sugar beets. The soil is tilled when sprouting occurs and distinctive rows have appeared. Blind tillage is done at a depth of 4–5 cm by tractor cultivators. Its purpose is to kill weeds, break up the soil crust, reduce evaporation, and ensure an influx of air to the roots. It is especially effective on wet clayey soils in regions having cold protracted springs. The yield of root crops is significantly reduced if blind tillage is done too late. Harrowing the fields before and after the appearance of sprouts is often substituted for blind tillage. [29–866–2]

BOARDING SCHOOL, as instituted in the USSR in 1956, a general-education school—most commonly an eight-year school—with residential facilities where the children live while attending classes (but not on Sundays or holidays or during vacations, which they spend with their families or relatives).

The chief purpose of the boarding school is to make public education available to orphans and children from low-income families. In the Far North, such schools are open to all children who have no regular means of transportation to school. Children who are physically or mentally handicapped are raised and educated at special boarding schools. The cost of supporting boarding-school students is partly covered by the parents; orphans, children from low-income families, and children who are physically or mentally handicapped are maintained at state expense.

The boarding schools have a staff of educational workers in addition to instructors. The academic study program is supplemented by Pioneer and Komsomol activities, clubs, study groups, work and socially useful activities, games, and sports. The students' activities are organized on a pedagogically and medically sound foundation—that is, the alternation of work and leisure and variation in the type of activity engaged in. In addition to classrooms, the boarding schools include production-work training shops, school garden plots, living quarters, sports facilities, and space for small-group activities. [29–1266–2]

BOAT (Russian, *shliupka*), an open vessel with a wooden, metal, or plastic hull. Boats may be propelled by oars or powered by internal-combustion engines; most rowboats also have rigging with removable masts. Boats are of several types, including naval ship's boats, lifeboats and working boats for merchant ships, lifeboats for lake and river vessels, boats used by shore rescue stations, and sports boats. Boats range in length from less than 3 m for a sculler to more than 11.5 m for the 22-oar naval launch. [29–1305–5]

BOATBILL (*Cochlearius cochlearius*), also boat-billed heron, a bird of the family Cochleariidae of the order Ciconiiformes. The body length is about 50 cm. The broad bill, which measures as much as 5 cm across, has a small hook on the end and resembles an overturned boat. The eyes are large. The plumage is mostly gray and black. The abdomen is brown, and there is a long black tuft on the back of the head. The boatbill is distributed in North and South America, from northern Mexico to northern Argentina. It is sedentary and nocturnal. The bird nests in trees. There are two to four eggs in a clutch; the eggs range from light blue to white with brownish speckles. The boatbill feeds on fish, frogs, small crustaceans, and small rodents. Some scientists classify the boatbill in the family Ardeidae. [29–136–3]

BOAT-HANDLING GEAR, on a ship, the structures, accessories, and mechanisms used to lower boats into the water, raise them on board, and store them on the ship.

Boat-handling gear includes the boats themselves, davits, boat winches, boat falls, boat cradles, lines, and covers. The davits, two for each boat, allow the boat to be swung out over the side under the force of gravity or under manual control (for example, with a worm drive). There are three types of davits: turning davits, which turn on a vertical axis; swing-out davits, which turn on a horizontal axis parallel to the longitudinal axis of the ship; and roller davits, which, together with the boat, move to the side of the ship on guided rollers. Work boats are sometimes lowered overboard and hoisted by a freight crane or boom. The lowering of lifeboats may be controlled from the ship or from the lifeboat. When not in use, boats are set on cradles, secured, and covered.

Classification societies regulate the strength of the parts of boat-handling gear, the maximum trim and roll angles under which the safe launching of lifeboats must be provided for, gear design, the hoisting rate for boats, and the number and capacity of lifeboats on a ship (specified with respect to the number of people on the ship and the ship's area of operation). [29–1306–1]

BOHEMIAN FOREST (in Czech, Český Les; in German, Böhmerwald), mountains in Czechoslovakia and the Federal Republic of Germany, in the southwestern part of the Bohemian Massif. The Bohemian Forest measures 80 km in length and rises to a maximum elevation of 1,042 m at Mt. Čerchow. The mountains, composed chiefly of gneisses, granites, and schists, are flat-topped ridges separated by valleys. The region has glacial lakes, beech and fir-spruce forests, mountain meadows, and peat bogs. Timber is harvested, cattle are grazed, and granite is mined in the area. [29–525–1]

BOHEMIAN GLASS, an art industry that developed in Bohemia in the 14th and 15th centuries. Bohemian glass became widely known in the second half of the 17th century, with the introduction of Bohemian crystal, thick-walled transparent vessels whose high calcium content made possible the cutting of deep facets.

From the 18th century to the early 20th century, Bohemian glass followed the main stylistic trends in European art. Modern Bohemian glass, while preserving the traditional methods of faceting and engraving, is noted for its integrated use of expressive artistic forms and its subtle light and color effects.

Masters of Bohemian glass production include Z. Seidl, J. Brichta, L. Smrčková, J. Soukup, and L. Metelák.

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[29–528–1]

BOHEMIAN MASSIF, a mountain massif in western Czechoslovakia and adjacent regions of Poland, the German Democratic Republic, the Federal Republic of Germany, and Austria. The massif is approximately 500 km long and reaches a width of 300 km. The maximum elevation is 1,602 m, at Mount Sněžka.

The rhomboid Bohemian Massif extends from east to west. Along the margins of the massif rise ranges of medium elevation: the Šumava and the Bohemian Forest in the southwest, the Erzgebirge (Krušné Hory) in the northwest, and the Krkonoše of the Sudetes in the northeast. The Bohemian-Moravian Highlands lie in the southeastern part of the massif. The interior of the Bohemian Massif, a broad depression known as the Bohemian Basin, consists of several lowlands separated by uplands and low-mountain massifs.

A protruding body of the ancient basement of the Hercynian folded region, the Bohemian Massif is composed of gneisses, migmatites, schists, and granulites of the Proterozoic and slates, quartzites, and sandstones of the Lower and Middle Paleozoic; the sedimentary mantle is represented by Cretaceous and Cenozoic rocks. Neogene and Anthropogenic (Quaternary) movements brought about fractures and faults along which volcanic lava flowed. Tectonic troughs in the northeastern rim are associated with the formation of the Upper Silesian Coalfield.

On the mountain slopes mixed and coniferous forests of spruce, fir, pine, beech, and oak grow on mountain brown forest soils and mountain podzols; above 1,400 m there are subalpine meadows and shrubs on mountain meadow soils. Such health resorts as Karlovy Vary and Mariánské Lázně have developed around the region's mineral springs. [29–525–2]

BOHEMIAN-MORAVIAN HIGHLANDS, the southwestern section of the Bohemian Massif in Czechoslovakia. The Bohemian-Moravian Highlands measure approximately 150 km in length and as much as 100 km in width. They rise to a maximum elevation of 837 m at Javorová Skála. The highlands are composed chiefly of granites and gneisses. The relief consists mainly of hills and low mountains cut by rivers, with individual rocky crests in the Žd'árské Vrchy and other regions. The highlands feature broad-leaved and coniferous forests, and landforms include mountains and pastures. [29–528–2]

BOMBIDAE, a family of large bumblebees that measure as much as 3.5 cm long and are densely covered with hair. The coloration is a combination of black, white, red-yellow, and yellow stripes. There are about 300 species, distributed mainly in temperate climates. The bees can tolerate northern climates; for example, their range includes Greenland, Novaia Zemlia, the Chukchi Peninsula, and Alaska. About 100 species occur in the USSR.

Social insects, the bees live in families consisting of three castes—males, reproductive females (queens), and nonreproductive females (workers). Families are formed in the spring, with only the fertilized queens surviving through the next winter. In the spring the queens build nests and form new families. The nests, which are usually spherical and contain irregular oval cells, are built in the abandoned burrows of rodents, in the ground, in the grass, or under roofs. The queen builds a brood cell from a mixture of wax and pollen and places a few eggs into it. She then builds a cell, or waxen pot, to store honey. The larvae are fed a combination of pollen and nectar in one common cell, a feature unique to the Bombidae. Prior to pupation, each larva builds its own cocoon. With the emergence of the workers from the cocoons, the queen no longer leaves the nest. The workers build new honeycombs and feed the brood, from which the reproductive males and females appear at the end of the summer. In the fall the young males and females leave the nest and mate. Soon thereafter the males die, and the young females find sheltered areas for hibernation. In old families that have survived until autumn, all the workers die by the time winter arrives. Families usually consist of 100 to 200 (rarely to 500) individuals.

The bees are the principal pollinators of valuable forage crops, including clover, alfalfa, and many other legumes. The nests are protected. Methods are being developed to resettle the bees artificially and to increase their numbers.

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G. M. Dlusskii [29–1313–1]

BOMBYCIDAE, a family of moths having a relatively stocky body, a rudimentary mouth, and pectinate antennae. The external edge of the forewings is dentate, with a crescent-shaped peak. The larvae have a spinelet on the eighth segment of the abdomen, and the anterior part of the body is narrow. The pupa develops in a silk cocoon.

There are about 20 species, distributed mainly in the tropics. The Chinese silkworm moth (*Bombyx mori*) is cultivated in the USSR. Wild species of the genera *Theophila* and *Oberthueria* also occur in the USSR.

In the 19th century the term "silkworm moth" was used to refer to a group of moth families that do not feed in the adult stage, including Notodontidae, Lymantriidae, Lasiocampidae, Bombycidae, and several others. Some species from these families continue to be referred to as silkworm moths, including *Lymantria dispar, Dendrolimus pini, D. sibiricus, Antheraea pernyi,* and *A. jamamai.* M. I. Fal'kovich [29–1109–2]

BOWING, in music, the elicitation of sounds from a stringed instrument by means of a bow. Sounds may be produced by a variety of techniques, including *détaché*, in which the bow is moved alternately up and down to produce staccato sounds, and legato, in which a series of uninterrupted sounds are produced by a continuous movement of the bow. Bowing technique imparts a different character to the sound. The technique to be used is indicated by the composer, or the player himself applies the bowing appropriate to the phrasing of the piece. [The Russian term for bowing—*shtrikhi*—is used broadly to refer to the production of sound on bowed stringed instruments, wind and percussion instruments, and the piano; in this wider sense it is roughly equivalent to "execution."] [29–1495–4]

BRIQUETTING, the processing of a material into briquettes—pieces having a uniform, geometric shape and practically identical weight. Briquetting creates additional raw material resources from fine materials, primarily fuels and ores, the use of which

would otherwise be inefficient or difficult; it also makes it possible to use waste products, such as dust, slags, and metal chips. In all cases, the usefulness of briquetting is judged by economic factors.

Depending on the material to be processed, briquetting may be done with binders at medium pressures (10–50 meganewtons per m^2) or without binders at high pressures (100–200 meganewtons per m^2). In order to produce briquettes of high quality, the material used must meet specific requirements for fractional composition, moisture content, temperature, and the like.

Briquetting was proposed in Russia in the 1830's by the Russian inventor F. P. Veshniakov, who developed a method of producing hard briquettes from waste wood charcoal and hard coal; Veshniakov called the fuel produced *karbolein*. The first factory for the briquetting of brown coal was put into operation in Germany in 1858; a briquetting factory for hard coal that used roller presses was set up in 1860. Briquetting was widely used in the second half of the 19th century to nodulize ore fines.

The mechanism of the principal stage of briquetting—compressing of the raw material into the desired shape—may be described as follows. At low pressures there is an external compacting of the material caused by reduction of the spaces between particles. The particles themselves are then compressed and deformed, and a molecular bond is created between the particles. High pressures at the end of the process cause a transition from elastic deformation of the particles to plastic deformation, which strengthens the briquette and enables it to retain a given shape. The physical and chemical properties of the raw material are a major factor affecting the nature of the deformations.

The following fuels are briquetted in factories primarily for power engineering and home and municipal use: residues of hard coals and of nearly hard, old brown coals with a relatively strong mechanical structure; common weak-structured, young brown coals; and peat. The ash content of the briquettes produced may reach 20 percent. The briquettes stand up well to being transported, withstand long storage in the open air, and do not fall apart until they have finished burning. Briquetting is used in various new coking processes designed to produce metallurgical coke from gas coals and weakly sintering coals. Lean coals, anthracite, old brown coals, and semicoke are briquetted with a binder—solid or liquid pitch from a hard coal, bitumen, or the like.

Hard coal is briquetted with a binder in the following stages: delivery of the raw material (charging of different types of coals); sorting of the coal and pulverizing to dimensions of 6 mm or smaller; drying of the coal to a residual moisture content of 3–4 percent; preparation of the binder (crushing and liquefaction); batching and mixing of the heated coal with the binder (6–10 percent) at a temperature of approximately 100°C to produce a homogeneous mass, or charge; cooling of the charge to 80°–90°C; compacting in roller presses at pressures of 15–30 meganewtons per m^2; and cooling of the briquettes to 40°C. Egg-shaped briquettes weighing 70–75 g are the most commonly used type; they withstand shipment well.

Fundamental disadvantages of briquettes containing a pitch or bitumen binder are the production of soot upon combustion and a low thermal stability, which seriously limit their use. Methods are being introduced for the treatment of such briquettes with hot gases containing a specific quantity of oxygen or with a solid heat-transfer agent. This causes an oxidation polymerization of the binder, as a result of which the briquette becomes stronger and is made to burn with a smokeless flame. Hot briquetting is widely used to produce a high-quality smokeless fuel or coke without a binder. The process consists in compacting sintering coals that have been preheated to a plastic state or a mixture of such coals and nonsintering coals (anthracite and lean and brown coals) and semicoke.

Young brown coals with high moisture contents (45–60 percent) ordinarily fall apart during storage and transporting. They may be briquetted without a binder for fluidized-bed combustion in the following manner: delivery of the coal; batching; sorting in rotary or screen sieves and pulverizing in impactors to a grain size under 6 mm; drying in steam-heated or gas-fired tube dryers to an optimum moisture content of 14–19 percent; supplementary crushing of large coal particles; cooling of the coal, which emerges from the dryers at a temperature of 85°–90°C, to a temperature of 35°–45°C in cooling installations (omitted in some cases); compacting at pressures of 100–200 meganewtons per m^2 in auger extruders or, less often, rotary presses; cooling of the briquettes, which leave the presses at a temperature of 70°–80°C, to a temperature of 40°C in cooling troughs and on screen conveyors; and delivery of the briquettes to the consumer. The briquettes produced have the shape of a parallelepiped with rounded edges and weigh 500–600 g.

Auger extruders are used to fashion semibriquettes from milled peat with a moisture content up to 25 percent. When the moisture content is higher (up to 50 percent), the peat is first dried in dryers to a moisture content of 12 percent. The dryers used—pneumatic steam-heated, steam-heated tube-type, gas-fired steam-heated, or pneumatic gas-fired—constitute the principal component of the briquetting process.

When pneumatic gas-fired dryers are used, the briquetting process for peat consists in the following steps: sorting and (in some cases) pulverizing of the delivered peat to dimensions of no more than 6–10 mm; drying by means of smoke-producing gases in a pneumatic gas-fired dryer (tube-type or with a grinding fan or hammer mill) with recovery of the dried peat in cyclone separators; compacting at pressures of 7–20 meganewtons per m^2; and cooling of the briquettes to a temperature of 40°C in cooling troughs.

The technology of briquetting has progressed through development and introduction of new processes and intermediate stages, new binders, and new equipment, both for the production of a high-quality smokeless fuel for household use and for the manufacture of a fuel for continuous coking processes; the latter is designed to broaden the raw material base and improve the economy of the coke industry.

The world production of coal briquettes amounts to approximately 110 million tons a year, of which briquettes made from brown coal account for 85 percent. In 1968 the USSR produced approximately 8 million tons of coal briquettes (70 percent from brown coal) and approximately 7 million tons of peat briquettes.

In the briquetting of metal ores, the raw materials used include iron ore fines (separate or mixed with a fuel), finely ground and powdered nonferrous ores, charge dust from blast furnaces, and other metallurgical wastes. The binders used include lime, various cements, and liquid glass. The briquetting is done in roller presses or auger extruders according to the following plan: batching and mixing of the ores with binders, compacting of the mixture, and consolidation of the briquettes to provide strength; the last step includes seasoning, roasting, steaming, and drying. Iron ore briquettes are used in open-hearth and blast furnaces; nonferrous ore briquettes are used in water-jacketed and reverberatory furnaces.

Metal chips and ferrous and nonferrous metal wastes may also be efficiently briquetted. The direct use of a loose, high-volume mass of metal presents several difficulties: oxidation during storage, inconvenience of transportation, the production of carbon monoxide fumes during combustion, and others. The briquetting of metal chips eliminates such problems and makes it possible to manufacture a totally useful metal product from the chips. The briquetting consists in compacting chips that have been finely crushed and freed of such impurities as oil; both hydraulic and mechanical presses are used. In some instances the process is facilitated by heating the material directly during compacting.

The briquetting process is also used for various other materials (*see* FOOD CONCENTRATES, FEED BRIQUETTES, and FEED BRIQUETTER).

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BRISTLE, the hair of domestic and wild hogs. Bristle consists of a broad base and a shaft, the upper part of which is separated into brushes, or flags. Histologically it is made up of squamous and cortical layers and a medulla. Bristle is similar to wool in chemical composition. Rigid and resilient, bristle has high tensile strength.

There are three basic sources of bristle. It may be obtained from leather factories after the processing of hog hides or from meat-packing plants after the scalding of carcasses. Bristle may also be obtained by combing the animals during the shedding period or by pulling. One hide yields 80 to 160 g of bristle. The amount and quality of bristles depend on the hog's breed, age, and sex, as well as on the growing region, the season of slaughtering, and the means of collection. Bristle is used for the manufacture of brushes for cleaning and painting. [29–1599–1]

BRISTLE PROCESSING AND BRUSH PRODUCTION, the technological processes involved in treating animal bristles and hair and manufacturing scrub and paint brushes. Brushes are also made from synthetic polymer materials (for example, polypropylene and polyvinyl chloride fibers) and plant fibers (for example, sorghum and sisal).

The processing of bristles includes removing foreign bodies and excess fat and moisture, laying the bristles out with the flags in one direction, sorting by length, and gathering into bundles. Bristles to be used in the manufacture of toothbrushes, shaving brushes, and other brushes for personal hygiene are also disinfected and bleached with hydrogen peroxide.

The processing of animal hair includes washing, sorting by color, initial combing to remove short hair and loosen tangled hair, gathering into bundles, toughening, cutting for size, a second combing to prepare for mixing, mixing, pushing against the butt end to even the hairs out, and tying into bundles.

The production of scrub brushes entails making and finishing the handles, drilling holes, attaching clusters of bristles, hair, or fiber substitutes by means of wire or strong thread, and finishing. Special types of brushes, for example, wire brushes, are manufactured at the same enterprises as scrub brushes.

The production of paint brushes includes making the handle and bands; connecting the bundles of bristles, hair, or fiber substitutes to the handle with the band; evening out the bottom end of the bundle; and removing poorly attached hairs.

By-products from bristles and hair are reprocessed at enterprises to make twisted hair for use in the manufacture of matresses and upholstered furniture. A. I. SHOBOROV [29–1601–1]

BRITISH BANK OF THE MIDDLE EAST, a British joint-stock bank founded as the Imperial Bank of Persia in 1889 under a concession granted by the shah of Iran for a period of 60 years.

Until 1930 the bank had the exclusive right to issue bank notes in Iran and functioned as a central bank. In 1935 its name was changed to the Imperial Bank of Iran. The bank's concession expired in August 1949; since its operations had already expanded beyond the borders of Iran, the bank became the British Bank of Iran and the Middle East. It worked with the Anglo-Iranian Oil Company until 1952, when it was no longer allowed to operate in Iran. In July 1952 it was reorganized as the British Bank of the Middle East.

In January 1960 the Hongkong and Shanghai Banking Corporation acquired 99.5 percent of the bank's shares, but the bank continued to function under its old name. In July 1973 the entire capital of the bank was transferred to the parent corporation. The British Bank of the Middle East, whose main headquarters is in London, has 66 branches (primarily in countries of the Middle East and North Africa) and two subsidiary banks. At the end of 1976 the bank had total assets of £1,571 million, capital and reserves of £42 million, current accounts and deposits of £1,413 million, and loans and discounted bills of £1,112 million. [29–892–7]

BROADBAND ANTENNA, an antenna whose main parameters and characteristics do not vary substantially over a rather wide frequency band. Broadband antennas are used to transmit, receive, or transmit and receive radio signals with a wide frequency spectrum, for example, in television, radar, or radio astronomy. [29–1230–1]

BROAD-LEAVED FORESTS, forests of deciduous (summergreen) trees with broad laminae. Broad-leaved forests are widespread in eastern North America, Europe, North China, and Japan as the native vegetation between the coniferous and boreal forests of the north and the steppes and the Mediterranean, or subtropical, vegetation of the south.

Broad-leaved forests are confined to humid and moderately humid regions with lessened continentality, even annual distribution of precipitation, and relatively high temperatures. Gray, dark gray, and brown forest soils are characteristic, with chernozems sometimes occurring.

The trees in broad-leaved forests constitute the first and second layers of foliage. An undergrowth stratum of shrubs makes up the third layer, and grasses and low brush make up the fourth and fifth layers. Beech and oak broad-leaved forests predominate in Europe, with hornbeam and linden forests less common. In addition to the principal trees, ash, elm, and maple commonly occur in European broad-leaved forests. In North America maple-beech, oak-hickory, and oak forests are most widespread. Oak-chestnut forests were common there until the chestnut was wiped out by the parasitic fungus *Endothia parasitica*. Other frequently encountered trees are the tulip tree, liquidambar, and American linden. In coniferous–broad-leaved forests, pines, spruces, larches, and other coniferous species constitute a significant part of the stand. Common members of the understory in the broad-leaved forests of Eastern Europe are hazel, hedge maple, Tatar maple, European bird cherry, and spindle tree. Mesophyllic eutrophic or mesotrophic species predominate in the grass cover of the broad-leaved forests; prominent species in European forests are mercury, goutweed, dead nettle, wild ginger, lungwort, woodruff, and hairy sedge. Vernal ephemeroid geophytes, whose leaves open and whose seeds mature before foliage appears on the trees, also are characteristic. Common species are corydalis, anemone, toothwort, snowdrop, squill, and star-of-Bethlehem.

In the southern hemisphere forests of evergreen beech (*Nothofagus*) are classified as broad-leaved forests.

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O. V. SMIRNOVA [29–1228–8]

BROAD SOCIALISTS, an opportunist group in the Bulgarian Workers' Social Democratic Party in the 1890's. In 1903 the Broad Socialists, who had been known as the *obshtodeltsi* (*obshchedel'tsy*) since 1900, formed the Bulgarian Workers' Social Democratic Party (Broad Socialists). [29–1227–5]

BROAD WHITEFISH (*Coregonus nasus*), a lake and river fish with a body length reaching 80 cm and a weight of 2–4 kg (sometimes to 16 kg). The broad whitefish is common in the basin of the Arctic Ocean from the Pechora to the Anadyr'. It is sometimes found in the salt waters of gulfs and bays. The fish reaches sexual maturity at six or seven years of age. Spawning occurs in October and November. The female deposits 13,000 to 135,000 large eggs that reach 4 mm in diameter. The broad whitefish feeds mainly on benthic invertebrates. It winters in river channels. The fish is commercially valuable.

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[29–613–5]

BROWN SWISS (also Schwyz), a breed of dairy and beef cattle. The breed was developed in Switzerland through the long-term selection of descendants of Shorthorn cattle brought there in ancient times. The animals are light gray to dark brown. A characteristic feature is the light coloring around the dark gray nose. The coloration is lighter along the upper torso, from the withers to the tail head. The males weigh 800–950 kg, sometimes reach-

ing 1,200 kg; the females weigh 550–600 kg, sometimes reaching 800 kg. Calves raised for meat weigh 260–300 kg at the age of one year. The milk yield is 4,000–4,500 kg, with the most efficient cows producing more than 10,000 kg. The fat content of the milk is 3.7–3.8 percent.

The Brown Swiss was first imported into Russia in the mid-19th century to improve local breeds. In the USSR, it is bred for both milk and meat. By crossing local cattle from various regions with the Brown Swiss and by reproducing the crosses, large groups of brown cattle were developed that later became the basis for various indigenous breeds, such as the Kostroma, Alatau, Lebedin, and Caucasian Brown cattle.

The Brown Swiss is bred in the German Democratic Republic, the Federal Republic of Germany, Austria, Italy, France, Spain, and Czechoslovakia, in the countries of North and South America, and in southern Africa. In the USSR it is bred in the central part of the RSFSR and in the Northern Caucasus.

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B. V. FANDEEV [29–1062–2]

BRUSH BORDER, the aggregate of rod-shaped structures on the surface of certain cells in animals and humans. The brush border consists of separate cytoplasmic processes arranged like a brush along the free margin of the cells of the excretory ducts of the salivary glands, the convoluted uriniferous tubules of the kidney, and certain other epithelial cells. By substantially increasing the cell surface, the brush border promotes more intensive absorption and excretion of matter. [29–1602–3]

BURIN, a tool used for engraving, consisting of a thin steel bar cut off obliquely at one end and sharpened; the other end is inserted into a wooden, mushroom-shaped handle that is trimmed off on the side. Burins used for engraving metal usually have a rhombic cross section; those used for engraving wood have a variety of cross sections. [29–1481–4]

BUS (bus bar), a copper, aluminum, or, less often, steel electrical conductor, usually rectangular or circular in cross section, used to handle large currents, for example, in switchgear. [29–1204–6]

BUTT SEAM WELDING, a type of resistance welding for joining the edges of sheets in a butt joint, used mainly in the manufacture of welded pipe. The metal in the weld zone is heated by an electric current in resistance pipe-welding machines, and the butt joint is then pressed by steel rollers. With steel pipe of small diameter (10–50 mm), the stock (a steel band) is first heated in a gas-fired furnace and formed into pipe; the lengthwise seam is welded by drawing through a mandrel rod at speeds up to 1,200 m per minute. Such units can produce up to 70 km of welded pipe per hour. [29–1332–3]

ČAČAK, a city in Yugoslavia, in the Socialist Republic of Serbia; situated in the Zapadna Morava River valley. Population, 39,000 (1973). Čačak has enterprises of the metalworking, machine-building, woodworking, pulp and paper, ceramics, and food-processing industries. Magnesite is mined nearby. [29–110–5]

CAECILIIDAE, a family of amphibians of the order Apoda. Caecilians reach a length of 1.1 m and resemble large earthworms. There are 25 genera, distributed in the tropics of Africa, Asia, and the Americas. The amphibians live mostly in soil or rotten wood. Some species inhabit ants' or termites' nests. [29–183–5]

ÇAJUPI, ANDON (pen name; real surname Cako, later Zako). Born Mar. 27, 1866, in the village of Şeperi; died July 11, 1930, in Al-Matariyah, near Cairo. Albanian poet and figure in the national renaissance.

Çajupi was educated in Switzerland. His collection of poetry *Dad Tomorri* (1902) consolidated the tendencies of critical realism in Albanian poetry. Çajupi appealed for armed uprising against Turkish domination in his poems, for example, "The Albanian" and "July." In his satirical works he strongly criticized the Albanian feudal system, as well as the bourgeois order in Egypt, where he spent most of his life. In the pamphlet *Salonican Club* (1909) he condemned the Albanian politicians who betrayed their country to Turkey and Greece. In several of his works he described the suffering of the common people.

Çajupi wrote a play about Skanderbeg entitled *Hero of the Land* (published 1937) and a collection of poetry, *The Old Testament* (published 1957). He also translated fables by La Fontaine, poems by Heine, and Indian poetry (*Flowers of the Hindis*, 1922).

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ČAKSTE, JĀNIS. Born Sept. 14, 1859, in Lielsesavas Volost (small rural district), Dobele District, Kurzeme Province, in what is now the Latvian SSR; died Mar. 14, 1927, in Riga. Latvian bourgeois political figure.

A member of a wealthy family, Čakste graduated from the law faculty of Moscow University in 1886 and began practicing law in Mitava (now Jelgava). In 1888 he became the publisher and editor of the bourgeois newspaper *Tēvija* (Fatherland). In 1906 he was a deputy to the First State Duma, where he voted with the Constitutional Democrats (Cadets). In 1916 and 1917 in Petrograd he served as chairman of the bourgeois Latvian Central Committee for the Protection of Refugees.

Čakste was hostile to the October Revolution. He was a member of the kulak Peasants' Union party, which later became semifascist, and he served as chairman of the People's Council, a counterrevolutionary body of the Latvian bourgeoisie. He was also a leader of the movement that fought from February 1919 to January 1920 with the help of foreign interventionists to suppress Soviet power in Latvia.

After the establishment of the bourgeois dictatorship in Latvia, Čakste served from 1920 to 1922 as chairman of the Constituent Assembly. Čakste was president of the bourgeois Latvian state from 1922 to 1927. [29–35–5]

CALIXTINES (Czech, *Kališníci*; Utraquists), members of a moderate wing of the Hussite revolutionary movement in Bohemia in the first half of the 15th century. The program of the Calixtines, which reflected the interests of minor and some major feudal lords and the middle strata of the urban population, was formulated in the Prague Articles of 1420. The Calixtines demanded that the Eucharist be given under both species (bread and wine) to all the faithful, laymen as well as clergy (in the Roman rite of Catholic Church, communion under both species is a privilege of the clergy). They also attempted to eliminate the dominance in Bohemia of German feudal lords and urban patricians. They tried to bring about the secularization of church lands and to secure the freedom to preach the Hussite creed. In November 1433 the Calixtines entered into an agreement with the feudal Catholic camp (*see* COMPACTATA) to oppose the Taborites, whom they decisively defeated at the battle of Lipany on May 30, 1434.

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See references under HUSSITE REVOLUTIONARY MOVEMENT. [29–112–2]

CALM, a condition of little or no wind. On the Beaufort scale, wind velocity during a calm is 0–0.2 m/sec. Calms are usually observed within stable anticyclones, in cols, and in the intertropical convergence zone. Calms occur more often in valleys and basins than in open areas with free circulation of air. There is little turbulence during a calm, and therefore harmful atmospheric aerosols (smoke and gas) may accumulate in the lowest atmospheric layer. [29–1479–1]

CALYX, the aggregate of usually green outer leaflets, or sepals, surrounding the corolla in flowers having a double perianth. The sepals are separate or fused.

The biological purpose of the calyx is to protect the flower's internal organs and the developing fruit and to ensure supplementary feeding. In a few plants (*Hydrangea, Erica,* and some Ranunculaceae) the calyx is large and brightly colored and serves, instead of a corolla (which is either absent or underdeveloped), to attract insects. In some plants (*Papaver*) the calyx falls off when the flower opens; in others (*Ranunculus*) it falls off after the completion of flowering. In the majority of plants, however, the calyx remains after flowering and may even proliferate and participate in fruit formation. In Umbelliferae, Compositae, and some other plants the calyx is completely reduced or converted into hairs. [29–111–4]

ČAPEK, JOSEF. Born Mar. 23, 1887, in Hronov; died Apr. 1945, in the Bergen-Belsen concentration camp in Germany. Czech artist and writer; antifascist. Representative of progressive Czech art.

Čapek studied at the School of Industrial Arts in Prague and in Paris. His first works, which he wrote jointly with his brother K. Čapek, were published in 1907. From 1910 through the 1920's he worked for progressive newspapers and journals, wrote critical articles and topical satires, and drew caricatures for the Brno newspaper *Národni novini.*

As an artist, Čapek strove for expressiveness and simplicity, introducing devices of cubism, fauvism, and primitivism. In his paintings he depicted the life of the urban poor, as in *Man With a Bag* (1926, National Gallery, Prague). He drew illustrations, including drawings, lithographs, and linocuts of laconic composition for works by Czech writers, including his brother's novels *The Absolute at Large* (1922) and *Krakatit* (1924) and his own *Tale of a Dog and a Cat* (1929).

Čapek combined subtle irony and the grotesque with dramatic force. In the cycles of paintings *Fire* and *Dream* (1938–39, National Gallery, Prague), he symbolically depicted the suffering of his people during the fascist dictatorship. His series of antifascist caricatures seethe with passionate anger.

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ČAPEK, KAREL. Born Jan. 9, 1890, in Malé Svatoňovice; died Dec. 25, 1938, in Prague. Czech writer.

Čapek graduated from the faculty of philosophy of Charles University in 1915. He was first published in 1907. Most of his early stories, dating from the years 1908 to 1913 and later included in the collections *The Garden of Krakonoš* (1918) and *The Luminous Depths* (1916), were written with his brother Josef Čapek.

The tragic events of World War I caused Čapek to undertake an intense search for the criterion of truth, to meditate on philosophical problems, and to seek the source of life's contradictions—as evidenced in the short-story collections *Crucifixion* (1917) and *Money and Other Stories* (1921). In such works Čapek came close to expressionism. At the same time, however, he came under the influence of pragmatism and relativism; specifically, he was influenced by the notion of a multiplicity of truths, or the idea that "everyone is right in his own way." Rejecting revolutionary struggle, Čapek tended toward moral and ethical humanism. Many of his works, including the poetic comedy *The Robber* (1920), are based on the juxtaposition of several "truths." Čapek conceives, as it were, of various alternatives simultaneously, but without relinquishing his own ethical ideal.

Čapek achieved world fame through his socially oriented works of science fiction, as represented by the play *R.U.R.* (1920) about a robots' rebellion (the word "robot" was coined by Čapek), the play *The Macropoulos Secret* (1922), and the novels *The Absolute at Large* (1922) and *Krakatit* (1924; English translation under the title *An Atomic Phantasy*, 1948). On the assumption that a discovery or invention can rapidly alter mankind's living conditions, Čapek's science fiction constructs a kind of imaginary sociophilosophical experiment, creating an artificial situation in which certain philosophical problems and modern trends are made particularly evident.

Much of Čapek's work is critical of inhumanity, militarism, and the church; nevertheless, the elemental nature of bourgeois socioeconomic processes is presented by him in absolute terms as a common feature of human development. Čapek's plays and novels are ironic and satirical utopias, warning against the danger of dehumanizing trends and the catastrophic potential inherent in contemporary social and international conflicts. His writings, while tending toward realism, occasionally show evidence of preconceived philosophical ideas.

Čapek's travel sketches of the early 1920's, such as *Letters from Italy* (1923) and *Letters from England* (1924), are outstanding for their realistically picturesque characterizations and poetic humor.

In the late 1920's and early 1930's, Čapek was close to T. G. Masaryk; the writer's bourgeois democratic illusions gained in strength, the marks of crisis grew more pronounced in his work—for example, in the play *Adam the Creator* (1927), which he wrote with his brother. Withdrawing temporarily from large-scale social and political problems and conflicts, Čapek now concentrated on writing short humorous works, such as those collected in *Tales From Two Pockets* (1929). His *Apocrypha* (1932) is a collection of humorously philosophical reinterpretations of familiar stories from the Bible.

The intensification of social conflicts and the "brute doctrine" of fascism revealed to Čapek the unfoundedness of the idea that "everyone is right in his own way." His philosophical victory over relativism is reflected in his trilogy—*Hordubal* (1933), *Meteor* (1934), and *An Ordinary Life* (1934). Faced with the renewed threat of war, Čapek turned toward active antifascism and voiced his criticism of Czechoslovakia's ruling circles. He openly expressed his sympathies toward the USSR.

Čapek's highest achievement was the novel *The War With the Newts* (1936), in which his traditional protest against the dehumanization of human relationships is channeled into a satire against bourgeois society, against militarism, and against the racist theories and policies of fascism. The novel combines the characteristic mystifications of science fiction and the genres of the animal parable, fictional social utopia, and political pamphlet. Čapek's antifascism and antimilitarism and his search for the ideal "whole man," capable of struggle, shaped the content of the play *Power and Glory* (1937), of the novel *The First Rescue Party* (1937), and of his last play, *Mother* (1938).

The suffering that Čapek experienced as a result of the Munich Pact of 1938, along with his persecution at the hands of fascist and profascist elements during the "second republic," aggravated the writer's ill health and hastened his death. Čapek's work has been an important influence in modern social science fiction and represents a notable contribution to classic world literature. There are two Čapek museums in Czechoslovakia—the suburban Čapek house Na Strži and the memorial museum at the writer's birthplace.

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S. V. NIKOL'SKII [29–49–1]

CAP OF MONOMAKH (Russian, *shapka Monomakha*), a symbol of autocracy in Russia. The crown of the Russian grand princes and tsars, the cap of Monomakh was made in Middle Asia during the 14th century. A pointed headdress with gold filigree, it is bordered with sable and embellished with precious stones. The crown is topped with a cross.

The legend that the crown was a gift from the Byzantine emperor Constantine Monomachus to his grandson Vladimir Vsevolodovich Monomakh, the grand prince of Kiev, arose in the late 15th or early 16th century as a unified Russian state took shape. The legend served as a basis for the political theory of Moscow as the third Rome.

The cap of Monomakh was first used in a coronation when Ivan III Vasil'evich crowned his successor with it. Ivan IV Vasil'evich (Ivan the Terrible) was crowned with the cap. In 1721 an imperial crown replaced the cap of Monomakh in the coronation ceremony. [29–848–2]

CAPSTAN, a ship's winch with a vertical drum for lowering and hoisting the anchor, taking up the slack in mooring lines, lowering fishnets and trawls, and the like. Capstans may be operated manually or by steam, electric, or hydraulic drives. The drives are usually set below deck. [29–1394–5]

CARBON TETRACHLORIDE (also tetrachloromethane), CCl_4, a colorless liquid, with a sweetish odor, a melting point of −22.9°C, a boiling point of 76.8°C, and a density of 1.593 g/cm^3 (at 20°C). Carbon tetrachloride is practically insoluble in water but is soluble in many organic solvents. It forms azeotropic mixtures with water (boiling point 66°C; 95.9 percent CCl_4), methanol (55.7°C; 79.4 percent CCl_4), and other liquids. It readily dissolves oils, greases, waxes, and many natural and synthetic resins and rubbers. Under ordinary conditions, it is resistant to the action of air, light, and concentrated acids; in the presence of iron or aluminum, it is decomposed by water into CO_2 and HCl. It interacts with the alcoholates of the alkali metals to form orthocarbonic-acid esters: $CCl_4 + 4NaOC_2H_5 \rightarrow 4NaCl + C(OC_2H_5)_4$; it takes part in the telomerization reaction together with olefins. The chlorine atoms in carbon tetrachloride can be replaced with F, Br, or I. For example, the Freons CCl_3F and CCl_2F_2 are commercially prepared from CCl_4 and HF.

Carbon tetrachloride is produced by the chlorination of methane or carbon disulfide, as well as by other methods. It is widely used in various industrial sectors as an incombustible fire-resistant solvent.

Poisoning. Carbon tetrachloride enters the body through the respiratory organs and the skin, inducing a narcotic effect on the central nervous system, a slightly irritating effect on the skin, and a toxic effect on the liver, kidneys, and other organs. Acute poisoning is accompanied by headache, vertigo, weakness, nausea, and vomiting. Severe poisoning cause dyspnea, cyanosis, and an increase in body temperature; strong agitation, loss of consciousness, sense disturbances, and paralysis are possible, as are sometimes toxic emphysema and hepatitis. Chronic poisoning is characterized by gastrointestinal disorders, weight loss, and anemia, as well as by irritation of the eyes and mucosa of the upper respiratory tract. Indications of severe cases are toxic hepatitis, polyneuritis, and kidney damage. Carbon tetrachloride induces dermatitis on contact with the skin.

Preventive measures include the replacement of carbon tetrachloride with less toxic solvents, prevention of carbon tetrachloride vapors from entering inhaled air, and personal safety measures. Preliminary and periodic medical examinations are also helpful. A. A. KASPAROV and V. N. FROSIN [29–365–1]

CARDING MACHINE, a machine for carding fiber materials for the production of textiles; one of the primary machines used in spinning. A distinction is made between carding machines proper and combing machines. In the former, tangled fibers are separated and fine, cohesive contaminants and defective fibers are removed by passing the fiber between the working members of a machine, which are covered by regular or metallic card clothing.

Two types of carding machines are used, depending on the material being processed and the type of production: machines with flats (for cotton and short chemical fibers) and machines with roller cards (for wool, bast fibers, and long chemical fibers). Various methods of feeding material to the machine are used to obtain a carded product of uniform thickness. Cotton is fed to flats in a layer of uniform thickness—a lap prepared by an opening-scutching machine. Roller-card machines are fed by a weighing device that periodically weighs out equal portions of the fiber material.

The primary working members of a carding machine with flats are a taker-in, a cylinder, a doffer roller, and flats. Flats are narrow plates of a spiked belt arranged above the cylinder and covering approximately half of the cylinder's surface. The lap proceeds from the feed plate to the taker-in, which is covered with teeth. The taker-in performs a preliminary carding of the fibers and removes contaminants and defects. The fibers are then fed to the cylinder, which is covered with a serrated or spiked belt. The primary carding process takes place between the cylinder and the flats; short fibers and contaminants adhere to the flats and are removed. The carded fibers are taken from the cylinder by the doffer roller, from which they are removed by a comb in the form of a thin web. After passing through a special funnel, the layer of fibers is transformed into a relatively dense, thin sliver which is deposited in a cylindrical container. Special carding machines with two cylinders are used to prepare sliver for spindleless spinning; such machines ensure higher quality carding.

The principal working members of a roller-card machine are the taker-in, the cylinder, from three to six pairs of worker rollers and stripper rollers set around the cylinder in pairs, a fancy roll, and a doffer roller. The taker-in separates large clumps of fiber material into smaller ones and prepares the material for the primary carding process between the cylinder and the worker rollers. Clumps and individual fibers that remain on the worker rollers after being processed against the cylinder are returned to the cylinder by the doffer roller. The rapidly revolving fancy roll has spikes that fit in the spaces between the spikes of the cylinder, thereby extracting the fibers from the surface of the cylinder. The fibers are then fed to the doffer roller, where they are arranged in a denser layer and made uniform in thickness and composition. The carded material from the doffer roller is removed by a comb, which makes a rapid vibratory motion.

Further improvements in carding machines are aimed at increasing efficiency and productivity by improving the precision of machine manufacture, increasing the speed of the working members, and equipping the machines with stronger preliminary carding units, compression rollers, and other devices.

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V. V. ZHOKHOVSKII [29–336–1]

CARDING OF FIBER MATERIALS, the process of separating clumps of fiber materials, such as cotton, wool, and chemical fibers, into individual fibers, accompanied by some straightening and blending, removal of contaminants and some short fibers, and the conversion of the opened bulk material into a unbroken, homogeneous product—the sliver or roving. It is one of the primary processes in spinning.

A distinction is made between carding proper and combing. The former process is used for card spinning, card and comb spinning, and condenser spinning and in the production of nonwoven materials and fulling and felt articles. During the process, fibers are subjected to the action of the needles or teeth of the working members of a flat or roller card. Combing is used only for card and comb spinning to produce fine, strong, uniform, and smooth yarn. It is done on a combing machine.

V. V. ZHOKHOVSKII [29–337–1]

CARDUUS (plumeless thistle), a genus of thorny plants of the family Compositae. There are about 120 species, distributed in Eurasia and northern Africa. The USSR has more than 30 species. The musk thistle (*C. nutans*), the welted thistle (*C. crispus*), and *C. acanthoides* grow as weeds in fields and along roads. Some species are nectar-bearers. The Russian common name for the genus—*chertopolokh*—is also used to designate other thorny plants of the same family (mainly in the genera *Cirsium* and *Xanthium*) or of other families (for example, *Eryngium planum* of the family Umbelliferae). [29–332–2]

CARPODACUS (rosefinches), a genus of birds of the family Fringillidae of the order Passeriformes. The birds are 22 cm long. The plumage of the male is pink and red; the female is brownish gray. There are about 20 species, distributed mainly in Central Asia. One species occurs in Europe, and three in North America. The USSR has five species: *C. erythrinus, C. roseus, C. rubicilla, C. grandis*, and *C. rhodochlamys*. The birds inhabit shrubbery thickets and the edges of forests, both in the plains and at high elevations in the mountains. *C. erythrinus* migrates long distances during the winter, whereas the other four species migrate short distances or descend into the foothills. A clutch contains three to six eggs, which are incubated for 13 or 14 days. The diet consists of seeds, berries, and, sometimes, insects. [29–506–1]

CASEMAKING CLOTHES MOTH (*Tinea pellionella*), a moth of the family of Tineidae. The wingspread reaches 17 mm. The fore wings are golden, and the posterior wings gray. The head is covered with yellow-gray hairs. The casemaking clothes moth is distributed worldwide. In the spring it deposits as many as 120 eggs on articles made of wool, fur, or feathers. Naked whitish caterpillars emerge from the eggs and live and feed on the wool, fur, and feathers. The caterpillars live in small tubular cases that they spin themselves. In the fall they attach their cases to ceilings, walls, or the inside of closets for overwintering. They pupate in the spring, and the moths emerge in ten to 20 days. Control measures include keeping premises clean and storing woolens and furs in special bags that contain naphthalene crystals. [29–1517–2]

CASPIAN TERN (*Hydroprogne caspia*), a bird of the family Laridae of the order Charadriiformes. The body is about 50 cm long and weighs about 650 g. The bird is gray above and white below, with a black head cap and black legs. The Caspian tern is distributed sporadically in Europe (except the north), Western and Southeast Asia, Australia, New Zealand, Africa, and North America. In the USSR it is found along the Baltic, Black, Azov, Caspian, and Aral Seas, as well as along lakes of Kazakhstan, Transbaikalia, and the southern Primor'e. The Caspian tern is a migratory bird. It nests in colonies on shoals and islands. A clutch contains two or three eggs, which are incubated by both parents for 22 or 23 days. The Caspian tern feeds on small fish, invertebrates, and, sometimes, the young of other birds. [29–123–3]

CASSIDINAE, a subfamily of beetles of the family Chrysomelidae (leaf beetles). The flat body is usually 4–20 mm long (some individuals reach a length of 10 mm in the USSR). The edges of the pronotum and elytra protrude to the sides, forming a shield that covers the top of the head and body (hence the common name of tortoise beetle for several species). The coloration varies and sometimes has a metallic or pearly cast. There are about 1,000 herbivorous species, distributed mainly in the tropics and subtropics. The USSR has 60 species. Some, for example, *Cassida nebulosa*, are agricultural pests. Adult beetles and the light green larvae, which carry their excrement on their backs, are found on the leaves of beet plants. [29–1613–4]

ČASTEK, SLAVOJAR (also Jaroslav Častek). Born Dec. 24, 1894, in Plzeň, Bohemia; died Feb. 6, 1920, in Penza. Internationalist and participant in the Civil War in Soviet Russia. Member of the CPSU from July 1918.

Častek was the son of a minor Czech merchant. As a lieutenant in the reserves, he was called to fight in the Austro-Hungarian Army during World War I. In January 1917 he was taken prisoner by the Russians. In March 1918 he joined the Red Army and became the commander of a combined international detachment in Penza, where he joined an organization of Social Democratic internationalists in April 1918. From May to July 1918, Častek fought in battles against the White Czechs near Penza and Syzran'. In September 1918, as a member of the International Regiment of the 1st Simbirsk Infantry Division, he took part in the liberation of Simbirsk, of which he became commandant.

In April 1919, Častek became chief and military commissar of the Directorate on the Formation of International Units of the Red Army. In July 1919 he took command of the International Regiment of the 1st Simbirsk Infantry Division. Častek died of typhus. [29–76–5]

CAST IRON, an iron alloy containing carbon, usually in amounts greater than 2 percent, and a number of impurities—silicon, manganese, phosphorus, and sulfur—and, sometimes, alloying elements; it hardens, forming a eutectic.

Cast iron is one of the most important primary products of ferrous metallurgy (*see* FERROUS METALLURGY and BLAST-FURNACE PRODUCTION), used for reconversion in the production of steel and as a component of the charge used for remelting into iron castings. One of the major construction materials, it is also used as a casting alloy. The widespread use of cast iron in machine building is based on its good casting and strength properties; some cast irons are only slightly inferior in strength to carbon steels (*see* INOCULATED CAST IRON). Cast iron accounts for about 75 percent of all metal used in modern machine building. The USSR is the world's leading producer of cast iron (1976).

History. The first information about cast iron dates from the sixth century B.C. Cast iron containing up to 7 percent phosphorus and having a low melting point was produced in China from high-phosphorus iron ores and was used for casting various items. Cast iron was also known to Greek and Roman metallurgists of the fourth and fifth centuries B.C.

The production of cast iron in Western Europe dates to the 14th century, when the first blast furnaces (bloomery furnaces) for smelting cast iron from ores appeared (*see* METALLURGY). The cast iron produced was used either for conversion into steel in bloomeries (*see* BLOOMERY CONVERSION) or for the production of various structural elements, such as pillars, and weapons, such as cannons and cannon balls. In Russia, the production of cast iron dates to the 16th century. It steadily expanded, and by the time of the reign of Peter I, Russia exceeded all other countries in the production of cast iron, only to lag behind the Western European countries a century later. The development of cupola furnaces (*see* FURNACE, CUPOLA) in the second half of the 18th century led to the separation of casting shops from blast furnace shops, that is, initiated independent iron casting (at machine-building plants). Malleable cast iron was first produced in the early 19th century.

The alloying of cast iron dates to the second quarter of the 20th century (*see* ALLOY CAST IRON). Alloying made it possible to greatly improve the properties of cast iron and produce special cast irons resistant to wear, corrosion, and heat. The development of methods of producing inoculated cast iron also dates to this period. Inoculated cast iron with inclusions of spheres of graphite instead of the usual graphite flakes was obtained at the end of the 1940's; such cast iron, called ductile cast iron, has considerably higher strength (σ_b), up to 500 meganewtons/m^2 (50 kilograms-force/mm^2) in the cast state and 1,200 meganewtons/m^2 (120 kilograms-force/mm^2) after heat treatment. A type of cast iron known as high-duty cast iron, possessing good mechanical properties despite the presence of graphite flakes, was obtained in the 1960's in electric furnaces from steel scrap with the addition of a carburizing agent (*see* IRON-CARBON ALLOYS).

Classification and properties. Cast iron obtained in blast furnaces is characterized either as basic pig iron, used for conversion into steel, or foundry pig iron, which serves as a basic component of the charge in iron casting.

Up until the 1970's, specular cast iron, which contains 10 to 25 percent manganese and is used as a deoxidizing agent in the production of steel and some special cast irons, was sometimes produced in blast furnaces. Natural alloyed cast irons are produced from iron ores containing chromium, nickel, titanium, and other

alloying elements. Various criteria are used at iron foundries in classifying cast iron used in the production of casts. Cast iron is classified as gray, white, or mottled according to the extent of graphitization, which determines the type of fracture. Cast irons can also be classified on the basis of the graphite inclusions, which can be flaked, spheroidal (ductile cast iron), vermicular, or in the form of rosettes (malleable cast iron). Depending on the nature of the metal base, cast iron can be classified as pearlitic, ferritic, pearlitic-ferritic, austenitic, bainitic, or martensitic. On the basis of use, a distinction is made between structural and special-purpose cast irons, and on the basis of chemical composition, between alloy and unalloyed cast irons.

GRAY CAST IRON. Gray cast iron, or simply gray iron, the most common form of cast iron, used in machine building, sanitary engineering, and building construction, has inclusions of graphite in the form of flakes. Items made of gray iron are characterized by resistance to the effect of external stress concentrators under cyclical loading and by a higher vibration absorption coefficient (two to four times greater than steel). An important structural feature of gray iron is its ratio of creep limit to tensile strength, which is higher than for steel. The presence of graphite improves the lubrication conditions upon friction, which improves the antifriction properties.

The properties of gray iron depend on the structure of the metal base and on the type, size, amount, and nature of distribution of the graphite inclusions. Pearlitic gray cast iron has high strength and is used for cylinders, bushings, and other stressed parts of engines and engine blocks. Gray iron with a ferrite-pearlite metal base is used for less critical parts.

WHITE CAST IRON. White cast iron, or simply white iron, is an alloy in which the excess carbon not found in the solid iron solution is present in a bound state in the form of the iron carbide Fe_3C (cementite) or special carbides (in alloy cast irons). The crystallization of white iron occurs in a metastable system with the formation of cementite and pearlite. Because of its poor mechanical properties and brittleness, white iron has limited use for simple articles subjected to conditions of high abrasive wear. The alloying of white iron with carbide-forming elements, such as chromium, tungsten, and molybdenum, enhances its resistance to wear.

MOTTLED CAST IRON. In mottled cast iron, or mottled iron, part of the carbon is in the free state in the form of graphite and part is in the bound state in the form of carbides. Mottled iron is used for the production of items operating under conditions of dry friction (brake shoes) and wear-resistant parts, such as roller, paper-making, and flour-milling shafts.

MALLEABLE CAST IRON. Malleable cast iron is made as a white-iron casting and then subjected to annealing in which graphitization takes place, which results in the decomposition of the cementite and the formation of flaked graphite. Malleable iron is more resistant to shocks and cuts than steel and performs satisfactorily at low temperatures. Its mechanical properties are a function of the structure of the metal base and the amount and compactness of the graphite inclusions. Depending on the type of thermal treatment, malleable iron may have a ferrite, ferrite-pearlite, or pearlite metal base. Malleable iron in a matrix of granular pearlite has the best properties and may be used instead of cast or hammered steel. Ferritic malleable iron is used when high ductility is required. To accelerate the graphitization process upon heat treatment, malleable iron is inoculated with tellurium, boron, or magnesium.

Malleable iron is used mainly in the production of automobiles, tractors, and agricultural machinery. There is a trend, especially in automobile production, to replace malleable iron with ductile iron, with spheroidal graphite, in order to provide stronger casts, decrease production time, and improve the final product.

DUCTILE CAST IRON. Ductile iron (also called nodular iron or spheroidal graphite iron) is characterized by spheroidal or nearly spheroidal graphite inclusions, produced by the inoculation of liquid cast iron with magnesium, cerium, yttrium, calcium, or some other element in the pure form or as a component of an alloy. Spheroidal graphite least weakens the metal matrix, which leads to considerable improvement in the mechanical properties of cast iron with pearlite or bainite structure, whose properties approach those of carbon steels. High ductility is observed for a pure ferrite matrix in the cast or heat-treated states.

Ductile iron has good casting and technical properties, such as flowability, low linear shrinkage, and good machinability by cutting, but it is similar to steel with respect to concentrated volumetric shrinkage. It is used to replace cast and hammered steel parts, such as the crankshafts of engines and compressors, as well as items made of malleable iron or ordinary gray iron.

Ductile iron with vermicular graphite inclusions, which appear as thickened, bent plates with twisted edges under a microscope, occupies an intermediate position between cast iron with spheroidal graphite and cast iron with graphite flakes. It has good technical properties and exhibits low volumetric shrinkage and high heat conductivity, which is almost the same as that of gray iron. It is used in the construction of diesel engines and other types of machinery.

ALLOY CAST IRONS. Alloying elements, such as nickel, chromium, copper, aluminum, titanium, tungsten, vanadium, and molybdenum, are added to cast iron to improve its strength and operational characteristics or to impart special properties, such as nonmagnetism, high-temperature strength, and resistance to wear, heat, and corrosion. Manganese in amounts greater than 2 percent and silicon in amounts greater than 4 percent are also considered as alloying elements. Alloy cast irons can be classified according to the content of the major alloying elements, for example, chromium, nickel, or aluminum cast iron. A distinction is made between low-alloy cast irons, with the content of alloying elements totaling less than 2.5 percent, medium-alloy cast irons, with 2.5 to 10 percent alloying elements, and high-alloy cast irons, with more than 10 percent alloying elements. Low-alloy cast irons are in a matrix of pearlite or bainite, medium-alloy cast irons are usually in a matrix of martensite, and high-alloy cast irons are primarily in a matrix of austenite or ferrite.

Cast irons with 5 to 7 percent silicon (Silals) are used as heat-resistant materials. Cast irons with 12 to 18 percent silicon (Ferrosilides) exhibit high corrosion resistance in solutions of salts, acids (except hydrochloric acid), and alkalies. Such cast irons alloyed with molybdenum (antichlor) are highly resistant to hydrochloric acid. Of all known cast irons, cast iron with 19 to 25 percent aluminum (Chugal', or aluminum cast iron) has the highest heat resistance in the air and in sulfur-containing media. The most common wear-resistant cast irons are alloyed with up to 2.5 percent chromium and up to 6 percent nickel (Nikhard cast irons). Austenitic nickel cast irons alloyed with manganese, copper, and chromium (Ni-resist alloys) are used as corrosion-resistant and high-temperature strong materials.

Marking of cast irons. The system of marking cast irons adopted in the USSR uses letters and numbers. The letters indicate the principal intended use of the iron product: P for basic iron, used in oxygen-converter and open-hearth production, and L for foundry iron, used for iron casting. Foundry coke iron is indicated by LK, and iron produced with charcoal, by LD. The silicon content decreases with increasing number; for example, LK5 contains less silicon than LK4. Each brand of cast iron, depending on its content of manganese, phosphorus, and sulfur, is placed, correspondingly, in a group, class, and category. Cast irons for foundry production, as a rule, are designated by letters indicating the principal type or intended use of the cast iron: SCh indicates gray iron, VCh indicates ductile iron, and KCh indicates malleable iron. Antifriction cast irons are designated by the letter A placed at the beginning, for example, ASCh, AVCh, and AKCh.

The numbers in the brands of unalloyed cast irons indicate the mechanical properties of the cast irons. Standardized tensile and bending strengths are given for gray irons in kilograms-force/mm^2, for example, SCh21-40. For ductile and malleable irons, the numbers indicate the tensile strength (in kilograms-force/mm^2) and relative elongation (in percent), for example, VCh60-2.

A brand of alloy cast iron is designated by a letter indicating the alloying elements and a number directly after each letter indicating the average content of the given alloying element. When the content of the alloying element is less than 1.0 percent, the numbers after the corresponding letter are omitted. The arbitrary system of symbols for the chemical elements is the same as for steel (*see* STEEL). An example of an alloy cast iron is ChN19Kh3, which is a cast iron containing about 19 percent nickel and about

3 percent chromium. If spheroidal graphite is required for an alloy cast iron, the letter Sh is placed at the end, for example, ChNl9Kh3Sh.

Cast iron in art. Cast iron has been used in artistic ironwork since the Middle Ages; for example, a remarkable sculpture, now lost, of a lion weighing 100 tons was cast in China in the tenth century A.D. Cast iron sculpture appeared in Germany in the 15th century and subsequently in other European countries; it appeared in Russia at the end of the 17th century. The production of objects from cast iron became widespread (park sculpture, memorials, fences, walls, and garden furniture). In the 20th century, the casting of objects from cast iron is nearly as widespread as casting from bronze, since cast iron objects, although more massive and characterized by the expressiveness of the heavy weight and muted tones, are less costly to produce.

Cast iron is used for various purposes in architecture (beginning in the late 18th century). The use of cast iron structural elements was characteristic of architecture of the 19th century (the age of cast iron).

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B. S. MIL'MAN, E. V. KOVALEVICH, and V. T. SOLENKOV [29–730–2]

ÇATAL HÜYÜK, a Neolithic settlement that flourished in the second half of the seventh and in the early sixth millennia B.C. on the Konya Plain in southern Turkey. Çatal Hüyük, which was excavated between 1961 and 1963 by the British archaeologist J. Mellaart, occupies an area of 12.8 hectares. The cultural level, which is more than 6 m thick, is divided into 12 horizons. The rectangular dwellings were made of mud brick; they were attached to one another and access to them was from the roof. The economy was based on land cultivation, as seen from the discovery of wheat, emmer, and barley grains, peas, vetch, and almonds and the discovery of sickle insets and grain mortars. Cattle raising was also developed to some extent.

Beginning with the oldest horizon (12th horizon), small articles made of native copper and lead were found, along with tools made of flint and obsidian. Primitive clay pottery was discovered in the tenth horizon, but none was found in a number of succeeding horizons, which yielded vessels of stone and wood only. Clay pottery reappeared in the upper horizons in the form of flat-bottomed vessels of more sophisticated workmanship and occasionally with painted designs.

A shrine was also discovered at Çatal Hüyük, with paintings and reliefs depicting hunting scenes, animals, birds, and geometric designs. Numerous stone statuettes of people and animals were unearthed. The dead were buried in a flexed position beneath the floors of the houses.

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CATTAIL INFECTION (also choke), a disease of grasses caused by the cattail fungus *Epichloe typhina*. Among the many plants affected by the disease are timothy, orchard grass, fescue, bromegrass, and couch grass. A thick feltlike body forms on the upper section of the plant stem prior to blooming; the growth is first white, then yellow, and finally brownish yellow. Plant development ceases, and spikelets do not form. The fungus spreads by means of conidia. The disease can be combatted by early cutting of the grasses for hay. [29–400–1]

CATTOPADHYAY, SARATCHANDRA (also Saratchandra Chatterji or Chatterjee). Born Sept. 15, 1876, in the village of Debanadapur, Bengal; died Jan. 16, 1938, in Calcutta. Indian Bengali-language writer.

From 1903 to 1916, Cattopadhyay lived in Burma. In the early 1920's he took part in the national liberation movement. Cattopadhyay at first wrote works containing elements of romanticism; later, however, he turned to realism. He dealt with the status of women in a caste society and criticized feudal and bourgeois mores in the novels *Gone Astray* (1917; Russian translation, 1971), *The Burned House* (1920; Russian translation, 1958), and *Village Society* (1916; Russian translation, 1971). The novel *Srikanta* (parts 1–4, 1917–33; Russian translation, 1960) presents a multifaceted depiction of Indian society.

Cattopadhyay was the author of *Make Way* (1926), the first anticolonial political novel in Indian literature. His novel *One Last Question* (1931) is concerned with the place of ethical and religious traditions in modern life.

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L. A. STRIZHEVSKAIA [29–689–1]

CEAUŞESCU, NICOLAE. Born Jan. 26, 1918, in the village of Scorniceşti, Olt District. A leader of the Rumanian and international communist and working-class movements; political and state figure of the Socialist Republic of Rumania (SRR).

The son of a peasant, Ceauşescu became active in the revolutionary working-class movement in 1932. He joined the Union of Communist Youth (UCY) in 1933 and shortly thereafter became a member of its central committee. In 1936 he joined the Rumanian Communist Party (RCP). He was persecuted for his revolutionary activities. In 1939 and 1940, Ceauşescu served as secretary of the Bucharest city committee of the UCY and was a member of the Central Commission on Work Among Youth of the Central Committee of the RCP. He was arrested in 1940 and remained in prison until 1944.

Ceauşescu served as secretary of the Central Committee of the UCY in 1944 and 1945. In 1945, at the National Conference of the RCP, he was elected a candidate member of the Central Committee. In 1945 and 1946 he served as secretary of the party committee of the first city district of Bucharest, and from 1946 to 1948 he was secretary first of the Dobruja regional party committee and then of the Oltenița regional party committee. Ceauşescu served as deputy minister of agriculture from 1948 to 1950 and as deputy minister of national defense from 1950 to 1954. He became a member of the Central Committee of the RCP in 1952.

Ceauşescu was elected a candidate member of the Politburo and secretary of the Central Committee of the RCP in 1954, and he became a member of the Politburo of the Central Committee of the RCP in 1955. He was elected first secretary of the Central Committee in March 1965 and general secretary of the Central Committee in July 1965. He served as a member of the Executive Committee and of the Permanent Presidium of the RCP from 1965 to 1974.

Ceauşescu became general secretary of the RCP in August 1969, a member of the Political Executive Committee of the Central Committee of the RCP in 1974, and chairman of the State Council of the SRR in December 1967. He was elected president of the SRR in March 1974. He became chairman of the National Council of the Democracy and Socialist Unity Front in 1968 (from 1968 to 1980 he was chairman of the Socialist Unity Front).

Ceauşescu was named a Hero of Socialist Labor of the Republic in 1964 and a Hero of the SRR in 1971 and was awarded the Order of Lenin in 1978. [29–109–6]

CEBOIDEA (New World monkeys), a group of higher primates. In most species the nasal septum is broad, and the nostrils are far apart and face outward. The body length ranges from 13 cm

(Goeldi's marmoset) to 75 cm (howler monkey), and the tail is from 19 cm (Goeldi's marmoset) to 90 cm (coaita). The tail in some species is prehensile. There are no cheek pouches or ischial callosities. The hair is dense and of varying color. There are 32 (marmosets) or 36 (cebids) teeth. Ceboidea include one superfamily that unites two families: Callithricidae and Cebidae. The monkeys are distributed in Central and South America. They are arboreal, diurnal (except *Aotus*), herd animals. Some live in small family groups. [29–1229–2]

ČECH, EDUARD. Born June 29, 1893, in Stračov; died Mar. 15, 1960, in Prague. Czech mathematician. Member of the Czechoslovak Academy of Sciences.

Čech's principal works deal with differential geometry and topology. He made important contributions to the theory of compact spaces and the general theory of homologous invariants. Čech was awarded the State Prize of the Czechoslovak Socialist Republic in 1951 and 1954.

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[29–372–3]

ČECH, SVATOPLUK. Born Feb. 21, 1846, in the village of Ostředek, near Benešov; died Feb. 23, 1908, in Prague. Czech writer.

Čech graduated from the faculty of law of the University of Prague in 1869. From 1878 to 1899 he was an editor of the progressive journal *Květy*. He began writing in the 1860's. In his verse anthologies *Morning Songs* (1887) and *New Songs* (1888) and the narrative poems *The Songs of a Slave* (1894) and *The Mowers* (1903), Čech criticized bourgeois society and praised the struggle of working people against oppression, expressing faith in their victory. His prose works include the satirical novella *A New Amazing Excursion of Mr. Brouček, This Time Into the 15th Century* (1888; Russian translation, 1953), in which Čech ridiculed the philistinism and unscrupulousness of the Czech bourgeoisie and glorified the heroic Hussite past. In the narrative poem *The Steppe* (1908) he hailed the Russian Revolution of 1905–07.

Čech's works reveal romantic tendencies but are essentially realistic. They influenced the development of Czech democratic and revolutionary poetry.

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[29–372–2]

ČELAKOVSKÝ, FRANTIŠEK LADISLAV. Born Mar. 7, 1799, in Strakonice; died Aug. 5, 1852, in Prague. Czech poet and folklorist.

Čelakovský studied at Charles University. During the years 1834–35 he edited the newspaper *Pražské noviny* and the supplement *Česká včela*. He taught at various universities from 1842 to 1952. Čelakovský published the collections *Slavic National Songs* (vols. 1–3, 1822–27), *Lithuanian National Songs* (1827), and *The Wisdom of the Slavic Peoples in Proverbs* (1851).

Čelakovský employed motifs of folk poetry in the poetry collections *Echoes of Russian Songs* (1829) and *Echoes of Czech Songs* (1839). He was the author of the philosophical and didactic narrative poem *The Hundred-petal Rose* (1840) and of numerous epigrams. He compiled anthologies of Russian and Polish literature. Čelakovský's works reflected the rise of the patriotic and democratic movement in Bohemia.

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Dolanský, J. *František Ladislav Čelakovský*. Prague, 1952.
Dejiny české literatury, vol. 2. Prague, 1960. [29–132–3]

CELESTA, a keyboard metallophone. The celesta was named for its unusually dulcet, bell-like, ethereal tone. The instrument, which resembles a small upright piano, has a piano action and a set of chromatically tuned steel plates or bars with a compass from middle C to C of the five-line octave; the plates or bars are placed in box-shaped resonators designed to intensify the fundamental of each tone. Many composers, including modern composers, have used the celesta in orchestral works to obtain special effects. [29–133–6]

CELLINI, BENVENUTO. Born Nov. 3, 1500, in Florence; died there Feb. 13, 1571. Italian sculptor, goldsmith, and writer.

Cellini studied with the goldsmith M. Bandinelli and was influenced by Michelangelo. He worked in Florence, Pisa, Bologna, Venice, Rome (1532–40), and Paris, as well as at the court of Francis I at Fontainebleau (1540–45).

One of the most notable masters of mannerism, Cellini produced virtuoso sculptures and jewelry marked by delicate, exaggeratedly elongated figures, often with complex curves. Examples are the saltcellar made for Francis I (gold, enamel, precious gems; 1539–43, Museum of Art History, Vienna), *Narcissus* (marble, 1540's, National Museum, Florence), and *The Escorial Crucifix* (marble, 1562, the Escorial, Spain). Cellini boldly resolved the problems of creating sculptures in the round, especially in the statue *Perseus With the Head of Medusa* (bronze, 1545–54, Loggia dei Lanzi), which, like many of Cellini's other works, is characterized by excessive detail.

Cellini gained world fame as a writer from his *Life*, which he dictated between 1558 and 1565 (1st ed., 1728; Russian translation, 1848). An autobiography reading like a picaresque novel, Cellini's *Life* is noted for directness of narration. Ignoring the norms of literary style and the rules of grammar, Cellini used the language of the streets to re-create vividly the personality of the late Renaissance man in Italy.

Cellini also was interested in art theory. In 1568 he wrote two treatises, one on goldsmithing and the other on sculpture.

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Camesasca, E. *Tutta l'opera del Cellini*. Milan, 1955.
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CENA, GIOVANNI. Born Jan. 12, 1870, in Montanaro Canavese; died Dec. 6, 1917, in Rome. Italian poet and journalist.

Cena studied at the University of Turin. He gained recognition with his first work, the narrative poem *Mother* (1897), which was devoted to the simple peasant woman. This was followed by *In umbra* (1899), a collection of lyrical poems depicting scenes of country life that were pervaded by love for the working people. Cena's poetry is notable for its unaffected speech, simplicity, and sincerity. In 1902, Cena became editor in chief of *Nuova antologia*, a literary and sociopolitical journal published in Rome that printed translations of works by M. Gorky, A. P. Chekhov, and V. G. Korolenko. Cena interpreted socialist ideas in the spirit of humanist enlightenment. His only novel, *The Forewarners* (1904; published in Russian as *At the Price of Life*, 1905), described the life of the urban poor.

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CENTERBOARD, a retractable keel made of metal sheet or, less often, wood, used on small sailing vessels, such as yachts; its primary function is to increase resistance to leeway. The centerboard can be retracted into a watertight slot for sailing in shallow waters. [29–1000–1]

CENTER BOARDER, a single-masted, shallow-draft racing or pleasure sailboat equipped with a centerboard. Center boarders range in length up to 12 m. They have a gaff or Bermuda rig and are sometimes equipped with an engine. Center boarders are not very seaworthy and therefore are usually used where large waves are uncommon—on rivers, lakes, and small reservoirs. Their shallow draft permits them to sail in shallow waters with the centerboard retracted. [29–1000–2]

CENTRAL POWERS, the coalition, comprising Germany, Austria-Hungary, Turkey, and Bulgaria, that opposed the Allied Powers and their supporters in World War I. The coalition was formed when Turkey (in 1914) and Bulgaria (in 1915) joined the Dual Alliance of Austria-Hungary and Germany, which had been created by the Austro-German Agreement of 1879. [29–347–2]

CEPPHUS, a genus of birds of the family Alcidae. The body is 32–40 cm long and weighs 340–600 g. The bill is black, straight, and thin. The plumage of the adults is black in summer and mottled in winter. The feet are red. The birds fly, swim, and dive well, but they walk poorly. The diet consists of small fishes and marine invertebrates. The birds nest in groups in the crevices of cliffs or amid rocks. The clutch usually contains two eggs. The young are born with dense, soft, dark down; they leave the nest fully fledged.

There are two (or three) species. The black guillemot, or sea pigeon (*C. grylle*), lives along the coasts of the Arctic, North Atlantic, and Pacific oceans; those occurring in the Pacific are sometimes regarded as the separate species *C. columba*. The sooty guillemot (*C. carbo*), which has a white circle around the eyes, is common along the coasts of the seas of Okhotsk and Japan. In some places the birds are used commercially for their meat and eggs. [29–640–1]

ČERMÁK, JAROSLAV. Born Aug. 1, 1830, in Prague; died Apr. 23, 1878, in Paris. Czech painter.

From 1847 to 1850, Čermák studied in Prague, Munich, Antwerp, and Brussels. Beginning in the 1850's he lived mainly in Paris and traveled through Europe, visiting Dalmatia and Montenegro in 1858.

Čermák at first employed academic devices; however, he later painted convincingly realistic pictures notable for their significant imagery. He depicted scenes from history, including the Hussite Wars (*Hussites Defending the Pass*, 1857, National Gallery, Prague), as well as the life of Slavic peoples and their struggle for freedom and the everyday life of Norman fishermen; he also did landscapes. Čermák was an outstanding painter of portraits, the best of which express deep emotion and reveal keen psychological analysis (*Portrait of J. E. Purkinje*, 1857, National Gallery, Prague).

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[Mokrý, F. V.] *Jaroslav Čermák*. Prague, 1953. [29–230–3]

CERNAVODĂ, a city in southwestern Rumania, in Constanţa District; a port on the Danube. Population, 13,000 (1975). Cement, hardware, and wine are produced in the city. The Danube–Black Sea Canal begins near Cernavodă. [29–231–4]

CERUTI, GIACOMO (nicknamed Il Pitocchetto, or the Little Beggar). Years of birth and death unknown. Italian painter of the 18th century.

From 1720 to 1750, Ceruti worked in Brescia and possibly also in Venice. He was one of the most original masters of 18th-century Italian genre painting. His works, executed with a restrained palette, reveal a love for the common people, in particular, sympathy for the misery of the peasantry. One example is *The Traveler*, one copy of which is housed at the Testori Collection in Novara. Ceruti also painted religious scenes and portraits.

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Morassi, A "Giacomo Ceruti." *Pantheon*, 1967, vol. 25, pp. 348–67. [29–333–1]

CESALPINO, ANDREA (also Andreas Caesalpinus). Born June 6, 1519, in Arezzo; died Feb. 23, 1603, in Rome. Italian physician, naturalist, and philosopher.

Cesalpino was a professor at the universities of Pisa (1555) and Rome (1592). A forerunner of W. Harvey in the study of blood circulation, he was the first to describe systemic circulation. Cesalpino laid the groundwork for plant morphology, anticipating the theories of metamorphosis and the homology of organs. In 1583 he proposed the first system of the plant kingdom, based mainly on the structure of seeds, flowers, and fruits. He distinguished two classes of trees and shrubs, 12 classes of subshrubs and herbs, and one class of aspermous plants. His classification system greatly influenced the development of botany. Cesalpino's philosophical views on nature were based on the teachings of Aristotle.

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De plantis libri XVI. Florence, 1583.
REFERENCE
Viviani, U. *Vita e opere di Andrea Cesalpino*. Arezzo, 1922. [29–124–5]

CESARO, ERNESTO. Born Mar. 12, 1859, in Naples; died Sept. 12, 1906, in Torre Annunziata, near Naples. Italian mathematician.

Cesaro was a professor at the University of Naples. In 1880 he developed methods of finding the sum of divergent series. Cesaro made important contributions to intrinsic geometry, in which curves and surfaces are defined in terms of quantities that do not change under transformations of coordinates.

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Introduzione alla teoria matematica della Clasticita. Turin, 1895.
Lezioni di geometria intrinseca. Naples, 1896.
In Russian translation:
Elementarnyi uchebnik algebraicheskogo analiza i ischisleniia beskonechno malykh, part 1 [2nd ed.]. Odessa, 1914. [29–125–1]

CESENA, a city in northern Italy, in Forlì Province, in Emilia-Romagna Region. Situated on the ancient Aemilian Way, near the Adriatic Sea. Population, 86,100 (1971). Industry includes machine building, the processing of fruits and vegetables, and the manufacture of building materials and wood products. [29–125–2]

ČESKE BUDĚJOVICE, a city in Czechoslovakia, in the Czech Socialist Republic; situated on the Vltava River. Administrative center of the province of South Bohemia. Population, 80,000 (1974).

Ceske Budějovice is a railroad junction and an important industrial center, accounting for one-fifth of South Bohemia's industrial labor force. A center for metalworking and machine

building, it manufactures motors, pots and pans, and needles. Light industry is also important; food products, pencils, furniture, paper, and ready-made clothing are produced.

Famous works of architecture in the city include the ruins of a 15th-century castle, a Gothic Dominican monastery with a church and cloister (13th century), and the Cathedral of St. Nicholas (13th–17th centuries) with the Black Tower (begun 16th century). Other structures of interest include the baroque town hall (1727–30) and the Piarists' College (18th century), as well as houses in the Gothic, Renaissance, and baroque styles. Modern structures include a stadium for swimming events (1971). The city has a museum of the revolutionary workers' movement (founded 1975). [29–338–2]

ČESKÝ KRUMLOV, a city in southwestern Czechoslovakia, in the province of South Bohemia; situated on the Vltava River.

Český Krumlov is known for its castle (13th–16th centuries) with its art collection and 18th-century theater, the Gothic Church of St. Vitus (14th century), the Corpus Christi Church (15th century), a Minorite church and monastery (14th–17th centuries), and the remains of the city fortifications (14th–16th centuries).

Other structures of note include the Renaissance town hall (c. 1580), the Jesuit College (16th–17th centuries), and 16th- and 17th-century houses with ornamental attics and ground-floor galleries. [29–339–1]

ÇEŞME, a city in western Turkey, on Çeşme Bay of the Aegean Sea. Population, approximately 6,000 (1975). Çeşme is a commercial center for tobacco, grapes, and figs. The battle of Çeşme took place in Çeşme Bay. [29–524–2]

ÇEŞME, BATTLE OF (1770), a sea battle that took place on June 26 (July 7), 1770, during the Russo-Turkish War of 1768–74, in Çeşme Bay in the Khios Channel of the Aegean Sea.

Operating in the Aegean Islands with nine ships of the line, three frigates, and one bombardier and under the nominal command of Count A. G. Orlov, the Russian fleet attacked the Turkish fleet on June 24 (July 5) in the Khios Channel northwest of Çeşme. The Russian fleet was under the immediate command of Admiral G. A. Spiridov. The Turkish fleet was commanded by Grand Admiral Gazi Hasan Paşa and consisted of 16 ships of the line, six frigates, six xebecs, 13 galleys, and 32 galliots. The Turkish flagship was sunk in the fighting. When the Russian ship of the line *Evstafii* exploded, the Turkish fleet, under covering fire from shore batteries, fled in panic and took shelter in Çeşme Bay, which was then blockaded by the Russian fleet.

On the night of June 25 (July 6), Spiridov sent advance units commanded by Rear Admiral S. K. Greig to the entrance of the bay. The units—four ships of the line, two frigates, and one bombardier—opened fire and, using incendiary shells, set fire to a number of Turkish ships. Four fire ships were then committed to the attack, one of which, commanded by Lieutenant D. S. Il'in, set fire to a Turkish ship of the line. The fire spread to other Turkish ships. Except for one ship of the line and five galleys, which were captured by the Russians, the entire Turkish fleet was destroyed by fire. The Turks lost more than 10,000 men, and the Russians, 11 men. As a result of the battle, the Russian fleet gained supremacy in the Aegean Sea. [29–339–2]

CETATE, a settlement in Rumania, on the left bank of the Danube, 20 km northeast of the city of Vidin.

During the Crimean War (1853–56), a battle was fought on Dec. 25, 1853 (Jan. 6, 1854) between Russian and Turkish troops near Cetate. After separating from the main force of the Danube Army to observe crossing points on the Danube, the forward detachment of Colonel A. K. Baumgarten—about 2,500 men, including 200 cavalrymen, and six artillery pieces—was unexpectedly attacked by an 18,000-man Turkish force approaching from the direction of Calafat and supported by 24 artillery pieces. The Russian troops repulsed several attacks, inflicting considerable losses on the enemy. At a critical moment in the battle, when the Russians had lost half their men and had run out of artillery shells, the 2,500-man detachment of Major General K. A. Bel'gard came to their aid and, with a decisive counterattack, overran the enemy. The Turks lost as many as 3,000 men, six artillery pieces, and three banners; the Russians lost about 2,000 men. [29–346–2]

CEVA, GIOVANNI. Born 1648; died 1734. Italian mathematician.

Ceva's most important contributions to mathematics were his results in the theory of transversals; they gave rise to a new, synthetic geometry. These results are presented in Ceva's work *De lineis rectis* (Concerning Straight Lines; Milan, 1678). [29–121–3]

CHABAN-DELMAS, JACQUES (real surname, Delmas). Born Mar. 7, 1915, in Paris. French political and state figure.

Chaban-Delmas began writing journalism in 1933. During World War II he was active in the Resistance. He became a deputy to the National Assembly in 1946 and was elected mayor of Bordeaux in 1947. He was a leader of two Gaullist parties: the Rally of the French People and the Union for the Defense of the Republic.

Chaban-Delmas was minister of public works in 1954 and 1955, minister of state in 1956 and 1957, and minister of national defense in 1957 and 1958. From 1958 to 1969 and from 1978 to 1981 he served as president of the National Assembly. As prime minister from 1969 to 1972 he carried out a flexible social policy and put forward a program designed to bring about a more just "new society." Chaban-Delmas became inspector general of finance in 1973 and ran for the office of president of the republic in 1974. [29–790–1]

CHABAZITE, a mineral of the zeolite group, with the chemical composition $(Ca, Na_2, K_2)Al_2Si_{3-8}O_{10-20}(5.4–9.4)H_2O$ and admixtures of Ba or Sr. Chabazite crystallizes in the trigonal system, forming rhombohedral crystals up to several centimeters in size. It also occurs in the form of crystalline aggregates and massive cryptocrystalline crusts. Chabazite is white or brownish, with a hardness of 4–5 on Mohs' scale and a density of 2,080–2,160 kg/m^3. It is formed in the pores and amygdules of effusive rocks and replaces volcanic tuff when acted upon by solutions of varied origin. It also occurs in hydrothermal veins and hot springs beds. Commercial deposits of chabazite are located in Bowie, Ariz. Structural analogues of chabazite have been synthesized. (*See also* ZEOLITES.) [29–788–2]

CHABOD, FEDERICO. Born Feb. 22, 1901, in Aosta; died July 4, 1960, in Rome. Italian historian. Director of the Italian Institute of Historical Research in Naples (1947); editor in chief of the journal *Rivista storica italiana* (1948–60).

During the fascist German occupation of Italy from 1943 to 1945, Chabod was active in the partisan movement in Valle d'Aosta. In 1946, after autonomy had been granted to the region, he headed its local government. His historical ideas were greatly influenced by the ethical and political world view of B. Croce. Chabod's research focused on political ideas, the bearers and originators of these ideas, and the ruling elite. Many of his works were devoted to the Renaissance. His best known work is *The History of Italy's Foreign Policy from 1870 to 1896*, of which only one volume was completed. In this work, Chabod presents a broad and many-sided picture of the ideological and political life of Italy after the country's unification.

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L'idea di nazione. Bari, 1967.
Scritti su Machiavelli. Turin, 1964. [29–793–1]

CHABROL, JEAN PIERRE. Born June 11, 1925, in Chamborigaud, Gard Department. French writer. Participant in the Resistance.

Chabrol studied at the University of Paris and became a con-

tributor to the newspaper *L'Humanité*. His novel *The Last Cartridge* (1953) deals with the war in Vietnam; its hero is a spiritually dynamic individual who remains true to his sense of social justice. Life in a proletarian district of Paris is the subject of the novel *The Wretched Settlement* (Populist Prize, 1955; Russian translation, 1957). A Rabelaisian love of life is displayed in the novel *The Wild Rose* (1957), and historical optimism is evinced in the novel *God's Madmen* (1961; Russian translation, 1963).

Chabrol's series of novels *The Rebels* consists of three volumes: *The Rebels* (1965; Russian translation, 1969), *The Beggarwoman* (1966), and *Better Weather* (1968); the heroes of these novels take part in events of European history between Hitler's rise to power and the victory of the Popular Front in France in 1936. The novel *The Cannon "Fraternité"* (1970; Russian translation, 1972) deals with the Paris Commune of 1871 and is imbued with a faith in the just cause of the universal brotherhood of the toiling masses. Chabrol's science-fiction novel *A Goat in the Desert* (1975) re-creates the dramatic fate of A. d'Aubigné.

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V. P. BALASHOV [29–793–4]

CHACO, a province in northern Argentina, in the basin of the Paraná and Bermejo rivers. Area, 99,600 sq km. Population, 566,600 (1970). The capital of Chaco is the city of Resistencia. Chaco is a major cotton-growing region. Livestock are raised for meat. Industry includes quebracho lumbering and the production of tanning extract. [29–34–3]

CHACONNE, an old dance. The chaconne originated in the late 16th century and acquired its characteristic stately, majestic quality in the 17th century. It is danced in a slow tempo, in ¾ time. J. B. Lully used chaconnes as concluding pieces in his ballets.

In the 17th and 18th centuries the chaconne developed as an instrumental piece with a theme repeated in the bass, in a manner similar to the passacaglia. A chaconne for violin with bass attributed to T. Vitali and the chaconne from J. S. Bach's Partita in D Minor for Unaccompanied Violin became especially popular. Many pieces have been composed in the chaconne form, including Beethoven's 32 Variations on an Original Theme in C Minor for Piano. Composers of the 17th and 18th centuries used the chaconne form in opera finales. [29–35–1]

CHACO WAR OF 1932–35, a war between Bolivia, which had ties with monopolies in the USA, and Paraguay, which was dependent on Great Britain.

The Chaco War was fought over a disputed border region in the Chaco, where petroleum deposits had been discovered in the 1920's. Armed clashes took place as early as 1927, and war broke out in July 1932. During the war, the USA openly supported, and supplied arms to, Bolivia. Great Britain did the same for Paraguay. By June 1934, Paraguay controlled most of the disputed territory.

Both sides suffered heavy casualties: a total of 250,000 were killed or wounded. The war exhausted the resources of both countries and sharply aggravated their internal political situations. In June 1935, after mediation by the USA, Argentina, Brazil, Chile, Peru, and Uruguay, a truce was declared. The peace treaty of July 1938 gave Paraguay most of the territory at issue. By the 1940's, however, the area was controlled by US oil monopolies. [29–35–4]

CHAD (République du Tchad; Republic of Chad), a state in Central Africa. Chad borders on Libya in the north, on the Sudan in the east, on the Central African Republic in the south, and on Cameroon, Nigeria, and Niger in the west. Area, 1.284 million sq km. Population, 4.160 million (1977). The capital is the city of Ndjamena (formerly Fort Lamy). For administrative purposes, the country is divided into 14 prefectures.

Government. In November 1979, a provisional government of the National Unity was formed as a result of a military coup.

Natural features. The northern half of Chad lies within the Sahara, while the southern half encompasses the Sahel and part of the natural region of the Sudan. Most of Chad is occupied by a flat plain, with elevations of 250–300 m in the west (the Bodele depression, 155 m) and 350–400 m and higher in the north, east, and south. In the north the plains are crossed by numerous wadis, and extensive areas are occupied by shifting sands. The Tibesti plateau, whose highest elevation reaches 3,415 m, is located in the extreme north. Rising in the northeast are the Erdi (1,115 m) and Ennedi (1,450 m) plateaus, while the Wadai (Ouaddaï) massif (with Mount Guéra at 1,790 m) is located in the southeast.

Chad lies in the northeastern part of the African Platform, within the Central African Shield, the Saharan Platform, and the Chad Syneclise. There are outcrops of metamorphic rocks of the Precambrian foundation in the Tibesti and Wadai massifs (highlands) and in the southwestern part of the country. The platform mantle is composed of diverse sedimentary rocks of the Paleozoic Era, Cretaceous period (the Tibesti massif and Erdi and Ennedi plateaus), and Cenozoic era (Chad Syneclise). The Tibesti and Wadai massifs have extensively developed Cenozoic volcanic rocks.

Minerals have been poorly studied. The northeastern shore of Lake Chad has deposits of natural sodium carbonate. Located in the southwest are deposits of bauxites (at Moundou, with known reserves of 10 million tons, and Laï, with 3.5 million tons; containing up to 57 percent Al_2O_3); iron-ore deposits are found in the eastern part of the Wadai massif (Hadjer) and near the city of Pala. There are also deposits of tin and tungsten ores (Tibesti), linked with rare-metal pegmatites, within which are also encountered tantalum and niobium ores, as well as some gold (Wadai), zinc (Tibesti), copper (Lake Léré), and uranium (Ennedi plateau). Deposits of petroleum have been discovered in the western and southwestern parts of the country, in the Chari (Shari) River basin.

North of 15°–16° N lat. the climate is tropical desert. The average January temperature is 15°C (on the Tibesti highland, below 10°C), while the average July temperature is 30°–35°C; daily temperatures fluctuate greatly, on an average 20°C. Annual precipitation amounts to 100–250 mm, although in places it is less than 50 mm; rainfall is infrequent and irregular. Strong winds causing sandstorms are characteristic. In the south the climate is equatorial monsoonal, with dry winters (October or November to April or May). The average temperature in January is 21°–24°C, and in April or May, 30°–33°C. The annual amount of precipitation increases from 250–500 mm in the north to 1,000 mm in the south.

There are no permanent surface streams in the northern part of Chad; the wadis fill up with water only after rainfall. In the south the river network is fairly dense. The principal navigable rivers are the Chari, which empties into Lake Chad (the eastern part of which belongs to the Republic of Chad), and its tributary the Logone. Other rivers include the Aouk and the Salamat, both tributaries of the Chari River, and the Batha, which empties into Lake Fitri. The rivers overflow considerably during the rainy season, flooding enormous areas and turning them into unbroken swamps; during the dry season they become very shallow.

The northern regions are dominated by stony deserts, nearly devoid of vegetation, alternating with sandy deserts, with thorny subshrubs and shrubs, such as camel thorn, tamarisk, and acacia. Date palms grow in the oases. Along the southern edge of the Sahara the vegetation is of the semidesert type. South of 15°–16°N lat. there are extensive desert-type savannas, with sparse grassy cover and acacia thickets growing on reddish-brown and brown soils. The extreme south has typical savannas, with baobabs and doum palms growing on leached out reddish-brown soils. The low-lying areas have black hydromorphic compact soils, enriched with carbonates. There are grassy swamps in the floodplains of the rivers and along the shores of the lakes.

The savannas are the habitat of many large mammals, such as the elephant, rhinoceros, including the white rhinoceros, buffalo, giraffe, and various antelopes. Predators include the lion, leopard, jackal, and hyena; certain savanna-type fauna, namely, lions

and antelopes, are also encountered on the edge of the desert zone; fauna is scarce deep within the desert. Hippopotamuses and crocodiles inhabit the lakes. Snakes, lizards, and insects abound. Characteristic among the birds are ostriches, along the edge of the Sahara, as well as various aquatic and swamp birds, along the rivers and lakes. Within Zakouma, the country's largest national park, elephants, rhinoceroses, giraffes, buffalo, antelopes, ostriches, and other animals are protected.

Population. The ethnic composition of the population is complex. About one-half of the population consists of peoples who speak the languages of the Central and Eastern Sudan, including Baguirmi (along with the related Sara, Laka, Bongo, and other languages), Mboum, Maba, Mimi, Massalit, Dago, and Tama. The desert regions north of Lake Chad are inhabited by the Tubu, who linguistically belong to the Kanuri-Tubu group, and Arabs, some of whom lead a nomadic way of life. South of Lake Chad are the peoples of the Hausa language family, including the Hausa, Moubi, Massa, and Kotoko. There is also a small number of Europeans, primarily French. The official language is French. The Arabic language is also widespread.

More than 50 percent of the population adheres to traditional local beliefs. The rest are mainly Muslims; there are some Christians—Roman Catholics and Protestants. The official calendar is the Gregorian.

In the period 1970–74, the average annual population growth amounted to 2.1 percent. The economically active population totals (1976) 1.5 million, of which 1.3 million are engaged in agriculture and only 24,000 in industry. The average population density is (1977) 3.2 persons per sq km. The southern part of the country is the most populated, while the northern part is the least populated. The urban population constitutes 15 percent (1977, estimate) of the total. The most important cities are Ndjamena (population, 300,000 in 1975, including the suburbs), Sarh, Moundou, and Abéché.

Historical survey. Archaeological finds reveal that the area now occupied by Chad was settled in ancient times. The earliest archaeological culture that has been studied in what is now Chad is the Sao culture, dating from the end of the first millennium A.D. (*see* SAO). The Kanem state emerged in the ninth century (*see* KANEM-BORNU EMPIRE). The Wadai (Ouaddaï) state formed in the eastern part of present-day Chad between the 12th and 14th centuries (*see* WADAI). In the 16th century, the Baguirmi (Bagirmi) state emerged in the central part of Chad. In the mid-18th century it seized part of Kanem-Bornu, but at the beginning of the 19th century Baguirmi itself came under the vassal dependency of the Wadai state. At the end of the 19th century, almost all of Baguirmi and part of Kanem-Bornu and Wadai were included in the Rabah, or Rabeh, state (*see* RABAH STATE). The peoples of the Rabah state stubbornly resisted the French colonialists, who in the late 19th century embarked on colonial expansion in Equatorial Africa. After the destruction of Rabah's army by French troops in 1900, Chad was proclaimed a French military territory, although the conquest of certain areas continued until 1914. In 1904, Chad was made a part of the French colony of Ubangi-Shari-Chad (or Ubangi-Chari-Chad), which in 1910 was included in the colonial federation of French Equatorial Africa. In 1914, Chad was separated from Ubangi-Shari and made an independent colony within French Equatorial Africa. France made Chad a military-strategic base of operations and the source of agricultural raw materials for the mother country. During World War II, Chad was one of the bases of the Fighting French, and military operations were conducted from its soil against Italian and German troops in Libya.

After World War II, the national liberation movement intensified in Chad. In 1946, Chad became an overseas territory of France within French Equatorial Africa. The struggle for Chad's independence was led by the Progressive Party of Chad (Parti Progressiste Tchadien; PPT), founded in 1947 as a local section of the African Democratic Assembly (*see* AFRICAN DEMOCRATIC ASSEMBLY). In 1957 a government council of Africans was founded in Chad. On Nov. 28, 1958, in accordance with the results of a referendum of Sept. 28, 1958, on the draft of the new French constitution, Chad was proclaimed a republic within the French Community, and F. Tombalbaye, the PPT leader, was named head of the government. On Aug. 11, 1960, Chad was proclaimed an independent state, and Tombalbaye became president. On Sept. 20, 1960, Chad became a member of the UN.

After the proclamation of independence, Chad's development proceeded amid an intense internal political struggle. In April 1962 a constitution was adopted that reaffirmed the presidential system that had emerged in the country. In 1962 all political parties except the PPT were disbanded, resulting in a one-party system; all opposition was prohibited, which was officially confirmed by a 1965 amendment to the constitution.

In the economic sphere the development of private capital was encouraged: various tax incentives were granted by the government, which also sought to attract foreign capital, primarily French. In 1963 a code on investments was adopted that granted various privileges to foreign entrepreneurs. At the same time, in order to overcome economic backwardness, the government broadened the state's role in all spheres of economic life. It strove to gain control of the credit and monetary system, and it endeavored to establish state-run enterprises and mixed enterprises (that is, partially state controlled), and to introduce economic planning; it also turned to social development.

In 1965 antigovernment demonstrations by the ethnic groups of the north and northeast increased. In 1966 leadership of the struggle was taken over by the underground military-political organization of the Chad National Liberation Front (Frolinat); the group's program sought the political and social renewal of Chad, the strengthening of its national independence, and the provision of equal rights for all citizens of the country. In order to suppress these outbreaks, French troops were brought into Chad in 1968, and remained until 1972. (French military units were sent to Chad after 1972 upon the request of the Chad government.)

In order to ease the situation in the country, a policy of national reconciliation was implemented in 1971. An extraordinary congress of the PPT was held in 1973, which adopted a resolution providing for its own dissolution and for the founding of a new political organization—the National Movement for Cultural and Social Revolution (Mouvement National pour la Révolution Culturelle et Sociale; MNRCS). Nevertheless, the domestic political situation remained tense. A military coup was staged on Apr. 13, 1975, as a result of which Tombalbaye was killed, the government was dissolved, constitutional guarantees were suspended, and the activities of political parties and trade unions were prohibited. In August the Supreme Military Council was proclaimed as the highest body of power; Brigadier General F. Malloum became president of the Supreme Military Council and head of state.

On Aug. 29, 1978, the Fundamental Charter of the Republic of Chad (Charte Fondamentale du Tchad) was proclaimed. According to the charter, F. Malloum became president, and H. Habré, leader of the Armed Forces of the North (FAN), a military and political group that split from Frolinat, became prime minister. In February 1979 the military forces supporting Habré, Frolinat, and other rebel groups confronted the army of Malloum in Ndjamena. In March 1979 the Malloum regime fell.

The struggle for power among certain ethnic groups continued. In August 1979 these groups reached an agreement in Lagos, and the Transitional Government of National Unity (Gouvernement de l'Union Nationale de Transition) was formed; it included representatives of all ethnic groups, on the basis of equal representation, from southern and northern Chad. Goukouni Oueddei became head of state and of government. As a result of armed conflict between FAN and Frolinat in March 1980, internecine conflict erupted again. In December 1980 the army under Goukouni Oueddei seized control of Ndjamena.

Since its independence, the Republic of Chad's foreign policy has been guided by the principles of nonalignment with power blocs and noninterference in the internal affairs of other countries. Chad supports peaceful coexistence, universal and complete disarmament, and the declaration of Africa as a nonnuclear zone. It opposes racism and apartheid and supports the eradication of the colonial system. Chad is a member of the Organization of African Unity and an associate member of the European Economic Community (Common Market). It supports close relations with France, with which in 1960 it signed a number of agreements on cooperation in various spheres; the agreements were reviewed in 1976.

The USSR recognized the Republic of Chad the day independence was proclaimed and established diplomatic relations in November 1964. An agreement on scientific and cultural cooperation was concluded between the USSR and Chad in 1966, a trade agreement in 1967, an agreement on economic and technical cooperation in 1968, and an agreement on air transportation in 1974. S. Iu. Sorokina

Economy. Chad is an agrarian country. Agriculture accounts for about 80 percent of the gross domestic product, while industry accounts for approximately 11 percent. In 1976 the per capita gross domestic product was $90. The key positions in the economy are occupied by foreign, primarily French, capital. The government's economic policy focuses on ways of attracting and encouraging foreign investments. At the same time, the complex problems of overcoming the country's economic backwardness have necessitated extensive involvement by the state in the economy, the establishment of state enterprises and mixed enterprises (that is, partially state controlled), and the introduction of planning in economic and social development.

AGRICULTURE. Agriculture is dominated by communal landownership, and land tenure is by subsistence and semisubsistence peasant farms. All farming operations are done by hand. The state grants credits to the peasants and establishes state forms of organization of agricultural production.

Agricultural land occupies 40 percent of the country's land area; 13 percent of the agricultural land is cultivated. The main branch of agriculture is crop production, which is widespread in the southern part of the country. The principal export crop is cotton, which is cultivated primarily in the southwest, in the Logone River basin. In 1976, 174,000 tons of raw cotton were harvested from an area of 330,000 hectares (ha). The principal food crops are millet (area, 900,000 ha; harvest, 523,000 tons in 1975), peanuts (56,000 ha, 45,000 tons), rice (53,000 ha, 37,000 tons), and wheat (5,000 ha, 4,000 tons). Date palms, which yielded 26,000 tons of dates in 1975, are grown in the oases of the southern Sahara.

The traditional occupation of one-third of the population is nomadic or seminomadic stock raising. Periodic droughts contribute to a considerable decline in the livestock population. In 1976 there were 4 million head of cattle and 5 million sheep and goats. There is also fishing, on Lake Chad, the Logone River, and elsewhere, yielding as much as 110,000 tons of fish annually. Fish are exported in dried or smoked form.

INDUSTRY. Industry is represented primarily by small-scale, mainly cottage-type, enterprises engaged in processing agricultural raw materials. Most of the major enterprises are in the food-processing industry; they include slaughterhouses and refrigeration plants, a meat-packing complex, a flour mill, rice mills, vegetable-oil mills, a sugar refinery, and a brewery. Enterprises of the textile industry include cotton-ginning mills and a textile complex in Sarh. A sugar-refining complex was under construction in 1978 in Sarh.

Electric power plants operate on imported petroleum. The generation of electric power amounted to 60 million kW-hr in 1975. Sodium carbonate is extracted (about 10,000 tons in 1974).

TRANSPORTATION. Motor-vehicle roads total 32,000 km, of which 255 km are paved with asphalt (1976). Motor vehicles number 12,000 (1976). There is shipping along the Logone and Chari rivers. Ndjamena has an international airport.

FOREIGN TRADE. In 1974 exports amounted to 9.1 billion francs CFA, and imports amounted to 20.9 billion francs CFA. The chief exports are cotton, which accounts for 70 percent of the export value, and livestock products, which account for 20 percent. The principal imports are industrial and transportation equipment (more than 40 percent), petroleum products (23 percent), foodstuffs (12 percent), chemicals (10 percent), and textile goods (8 percent). The principal trading partner is (1974) France, which bought 50 percent of the exports and provided 44 percent of the imports.

The monetary unit is the franc CFA. (As of July 1977, 244.1 francs CFA = US $1). S. Iu. Sorokina

Armed forces. The armed forces comprises the army (4,500 men), air force (300 men), and a police force (2,500 men). In addition there is a national guard and a nomad guard (4,200 men). General leadership of the armed forces is exercised by the Committee of National Defense, the president of which is also head of state; he also heads the Ministry of National Defense.

Medicine and public health. According to the World Health Organization, the birthrate in the period 1965–70 (on an annual average) was 47.7 per 1,000 population, and the mortality rate, 25; infant mortality is high (160 per 1,000 live births in the period 1965–70). The principal causes of death are infectious and parasitic diseases, as well as malnutrition. Also widespread are tuberculosis, venereal diseases, malaria, leprosy, gastrointestinal diseases, and childhood diseases.

In 1977, Chad had four hospitals, two polyclinics, 20 medical centers, and about 150 other medical establishments; the number of hospital beds totaled 3,500. There were 89 physicians (one physician per 50,000 inhabitants), of which 26 were Africans, three dentists, five pharmacists, and more than 1,000 secondary and other types of medical personnel. Physicians are trained abroad, while the secondary medical personnel are trained (since 1961) at a special medical school in Chad. Expenditures for health care amounted to 6.8 percent of the state budget in 1976.

A. S. Khromov

VETERINARY MEDICINE. Veterinary services in Chad are only in the formative stage. There is an acute shortage of veterinary personnel, and veterinary statistics have not been compiled. Enormous economic damage is inflicted by anthrax, as well as rinderpest, epidemic pneumonia, and parasitic diseases. Also widespread are bovine scabies, scabies of solid ungulates and camels, helminthiasis of camels, cattle, and swine, echinococcosis and cysticercosis of ruminants, fascioliasis, trypanosomiasis, and piroplasmosis. Cases have also been registered of rabies, streptotrichosis, and emphysematous anthrax, or blackleg (primarily among cattle and camels). Diseases caused by a deficiency in trace elements and vitamins are responsible for the low productivity of livestock.

As of 1976, Chad had 25 veterinarians. There is a veterinary research center in Ndjamena. Chad has 52 veterinary stations, including six border stations (1976), as well as a veterinary school. The USSR assists Chad in operating the veterinary center and in training veterinary specialists.

Education. The first European-type schools appeared in what is now Chad at the beginning of the 20th century. Before that there existed a rather well-developed network of Muslim educational institutions, including Koran schools and madrasas. By the time independence was declared (1960), about 10 percent of the children of the corresponding age group were attending primary schools and less than 1 percent were attending secondary schools. A state center for the elimination of illiteracy was founded in 1962. A 1967 law introduced four-year compulsory education.

To a large extent, Chad's school system is based on the French system. The administration of public education is under the jurisdiction of the Ministry of National Education, which monitors the work of both state and private educational institutions. Children from the age of six are accepted at the primary, six-year, school. The primary school is subdivided into three two-year cycles: preparatory, elementary, and intermediate. Rural localities have incomplete primary schools, with a four-year course of instruction. Competitive examinations must be passed in order to gain admission to secondary educational institutions. There are two types of secondary general-education schools: general-education colleges, with a four-year term of instruction, which provide an incomplete secondary education, and *lycées*, with a seven-year term of instruction, which provide a complete secondary education. *Lycée* graduates who have passed examinations for a baccalaureate diploma can enroll at a higher educational institution without taking examinations.

Vocational-technical education is poorly developed. Those completing primary school can go on to apprenticeship centers, with a term of instruction ranging from two to three years; there are also technical and business schools, with a term of instruction lasting six or seven years.

Instruction in all educational institutions is conducted in French. During the 1975–76 academic year, primary schools had an enrollment of more than 450,000 pupils, which amounted to about 50 percent of the total number of children of the corresponding age group. In the 1973–74 academic year, secondary schools had an enrollment of 12,900 persons, of which 11,400

were in general-education institutions, while the remainder were in vocational-technical and teacher-training educational institutions.

Located in Ndjamena is the University of Chad. Founded in 1971, it has faculties of literature, law, exact sciences, pedagogy, and zootechny; during the 1976–77 academic year, it had an enrollment of 600 students. The university library has 9,000 volumes. Also in Ndjamena are the National School of Administration, the Institute of Stock Raising and Veterinary Medicine, and the National Museum (founded 1963). V. P. BORISENKOV

Press and radio. Since 1979, a bulletin of the Chad Press Agency is published, although irregularly, in Chad. A radio station operates in the city of Moundou.

Architecture and art. Remains of the ancient Sao culture, primarily dating from the eighth through tenth centuries, have been discovered in the southern part of Chad; they include ruins of settlements and the remains of pottery for daily use and terra-cotta and bronze statuettes of people and animals. Particularly expressive are the clay human heads with sharply deformed facial proportions dating mainly from the tenth century. Rural villages consist of closely grouped huts, surrounded by an earthen wall or enclosure. The huts are circular or rectangular, with pisé walls and pointed roofs. In the cities, the houses have inner courts and flat roofs and are surrounded by crenelated walls. Weaving (bright, striped fabrics) and embroidery (geometric designs) are well developed, as are leatherwork (bags, saddles, footwear, vessels), metalworking (weapons with fine, geometrical ornamentation, copper and bronze ornaments, silver embossing), braiding and plaiting (baskets, cups, plates with geometric ornamentation), and pottery-making (basins, vases, jars with polychrome drawings).

Music. The diversity of Chad's music stems from the ethnic diversity of the population. The musical traditions of Chad's many ethnic groups are strictly regulated. Many difficulties in the development of music are linked with the castelike structure of society and to the limitations imposed by the social order; for example, not everyone has the right to play certain instruments.

The most important musical instruments are drums. Made of clay or various types of wood, they are cylindrical, in the shape of a truncated cone (with membranes consisting of a tough, viscous cake) and have one or two heads. A performer frequently plays two drums simultaneously, one of which seemingly represents the male voice, and the other, the female voice. Ensembles of three drums are popular, their mixed resonance producing a complex polyrhythmic texture. Other percussion instruments are also widespread, including various types of rattles and little bells; of particular importance are xylophones (balaphons), of which there are several varieties. Wind instruments and stringed instruments (for example, the lute) were evidently brought in from the Arab countries. The former include the *alghaita* (a type of oboe), a reed transverse clarinet, and a metallic horn (about 230 cm long). Usually the wind instruments are combined with drums; a typical professional ensemble consists of an *alghaita*, two or three drums, and a singer accompanying himself on the lute.

Songs and dances are diverse; many are connected with specific occupations (the hunters' dance *mdomdang*), rituals (*ndom mbessi, bajan*, and *n'dassdon*, dances accompanying initiation rites, and *klag*, a funeral dance), or holidays (*amgermane, mbille, sai, basaka*, and *joro-joro*). There is a rich repertoire of laudatory songs honoring famous events or persons. Most of the songs are characterized by the pentatonic scale, an octave range, a descending melodic line, and an antiphonal execution (soloist and chorus or a vocal exchange between two choruses).

Since the proclamation of independence, a great deal of attention has been focused on the development of music. The National Center, organized under the auspices of the university in Ndjamena, is involved in collecting and arranging folk music. In 1970 the National Dance Ensemble was established (with Ngorjo Buletit as artistic director), with which the work of many of Chad's musicians is connected, including that of the singers Magalvana Betara and Zaido Kema. The ensemble has toured abroad, including the USSR (1975).

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[29–4–4; updated]

CHAD, a lake in Africa with no outlet, located within the natural region of the Sudan in Nigeria, Niger, the Republic of Chad, and Cameroon.

The modern lake is the relict of an ancient landlocked basin of water, which during periods of increased climatic humidity repeatedly expanded—to as much as 400,000 sq km about 5,000 or 6,000 years ago—and then shrank in size. The area of the lake varies, depending on long-term fluctuations in the level, from 10,000 to 26,000 sq km; the maximum depth varies with the area from 4 to 11 m.

Lake Chad lies within a flat basin at an elevation of 240 m; the shores are flat and primarily swampy, bounded in the north by sand dunes. The open expanses of water in the northwestern, southern, and southeastern parts of the lake are separated by shoals—ancient submerged dunes overgrown with reeds and papyrus. Numerous islands, the peaks of semisubmerged dunes, are found along the northeastern and eastern shores.

The lake receives the Chari (Shari) River from the south, the Komaduga Yobé River from the west, and several smaller rivers. The average annual fluctuation of the water level is about 1 m; the highest levels occur in December or January, when the mean flow rate of the Chari is the highest; the lowest levels occur in July. The water of Lake Chad is fresh near the river mouths and slightly salty everywhere else; the negligible mineralization is explained by the continual replacement of the water in the lake as a result of the underground drainage of infiltration waters. In rare instances, during extraordinarily high levels, there is a temporary surface flow of the lake to the northeast, through the dry arm Bahr el Ghazal.

Manatees, hippopotamuses, and crocodiles abound in Lake Chad. There are numerous species of aquatic and swamp birds. The lake is used for fishing, yielding an annual catch of about 100,000 tons. It is navigable between the mouths of the Chari and Komadugu Yobé rivers.

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I. N. OLEINIKOV [29–4–3]

CHADAN, a city and the administrative center of Dzun-Khemchik Raion, Tuva ASSR. Chadan is located in the western part of the Tuva Basin, on the Chadan River of the Enisei basin, 225 km west of Kyzyl on the Kyzyl–Ak-Dovurak highway. Chadan has a butter factory and an industrial combine. Hard coal is mined in the area. [29–14–1]

CHAD LANGUAGES, a group of languages spoken in West and Central Africa and related to the Afrasian, or Afro-Asiatic, languages (*see* HAMITO-SEMITIC LANGUAGES).

The Chad languages are classified genealogically into numerous subgroups. The western subgroup, spoken in northern Nigeria, includes (1) Hausa; (2) Angas, Sura, Gerka, Ankwe, and Montol; (3) Karakare, Bolewa, Ngamo, and Kanakuru (Dera); (4) Warjawa and Afawa (Pa'a); (5) Bedde (Bade) and Ngizim; and (6) Ron, Fyer, Bokkas, Sha, and Kulere. The central subgroup, spoken in northeastern Nigeria, northern Cameroon, and Chad, includes (1) Tera and Ga'anda; (2) Bura, Margi, and Kilba; (3) Higi (Hiji), Bata, Hidkala (Laamang), and related languages; (4) Wandala (Mandara), Gamergu, Paduko, and Glavda; (5) Sukur, Matakam, and Gisiga; (6) Daba; (7) Gidder; (8) Kotoko, Logone, Buduma, and related languages; and (9) Musgoi, Masa, and related languages. The eastern subgroup,

spoken in Chad and the Central African Republic, includes Chire, Nancere, Somrai, Modgel, Sokoro, Mubi, Tumak, and Tuburi. There are more than 150 Chad languages.

The German scholars J. Lukas and D. Westermann classified the Chad languages by typological features into two independent groups, the Chad and Chado-Hamitic; only the latter were considered to be related to the Afrasian languages. J. Greenberg demonstrated that all the Chad languages are Afrasian.

The phonology of the Chad languages is characterized by a rich consonant system that includes glottalized obstruents: the injective (preglottalized) consonants ɓ and ɗ and such ejective consonants as ƙ and ƈ. The central subgroup has voiced and voiceless lateral sibilants. Vowels are short or long. Certain tones serve to differentiate lexical and grammatical meaning in otherwise identical words.

The morphological structures of the Chad languages are typologically diverse. Masculine and feminine genders are distinguished in many of the languages. Verbs have a highly developed system of aspect and tense forms; in many of the languages these forms are expressed by analytic markers that often form a single complex with personal adverbal markers of the subject. The highly developed system of derived forms of the verb, which includes the intensive, iterative, causative, and reflexive, is based on suffixes, internal inflection, reduplication, and, in some cases, prefixes. The central subgroup exhibits an opposition between inclusive and exclusive pronouns.

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V. Ia. PORKHOMOVSKII [29–14–5]

CHADOBETS, a river in Krasnoiarsk Krai, RSFSR; a right tributary of the Angara River. The Chadobets is 647 km long and drains an area of 19,700 sq km. It flows over the Central Siberian Plateau; there are rapids near the mouth. The Chadobets is fed by snow and rain. High water occurs in May and June, and there are freshets in summer. The mean flow rate 133 km from the mouth is approximately 63 cu m per sec. The Chadobets freezes over in October, and the ice breaks up in May. [29–14–3]

CHADOR, a white, blue, or, sometimes, black covering in which Muslim women used to wrap themselves from head to foot when they left the house. Only the eyes remained uncovered. The chador was worn by a number of peoples in Iran, Afghanistan, Azerbaijan, and the Arab countries, including Yemen and Iraq. It was used mainly in the cities. The chador is still worn by some women in Iran, Afghanistan, and certain Arab countries. [29–14–4]

CHADWICK, JAMES. Born Oct. 20, 1891, in Manchester; died July 24, 1974. English physicist. Fellow of the Royal Society of London (1927). Student of E. Rutherford.

Chadwick graduated from the University of Manchester and received the Ph.D. degree from Cambridge University. From 1923 to 1935 he taught at Cambridge University and was assistant director of the Cavendish Laboratory. From 1935 to 1948 he was a professor at the University of Liverpool. Beginning in 1948, he was master of Gonville and Caius College at Cambridge University.

Chadwick's main works were devoted to nuclear physics. His first papers were on radioactivity. In 1920, Chadwick experimentally confirmed that the charge of a nucleus was equal to the atomic number of the element. He then studied the artificial transmutation of elements under the action of alpha particles (with Rutherford). One of his major contributions was the discovery in 1932 of the neutron upon bombardment of a beryllium target by a stream of alpha particles, for which he was awarded a Nobel Prize in 1935. In 1934–35, Chadwick and his co-worker M. Goldhaber set up experiments on the photodissociation of the deuteron into a neutron and proton under the action of gamma quanta. From 1943 to 1945, Chadwick headed the group of British scientists who were working at the Los Alamos Laboratory (United States) on the atomic bomb.

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[29–124–1]

CHADYR-LUNGA, a city since 1958 and the administrative center of Chadyr-Lunga Raion, Moldavian SSR. Situated on the Lunga River, Chadyr-Lunga has a railroad station on the Bessarabskaia-Reni line. Industry includes an electrothermal-equipment plant, a tobacco-curing plant, the Soiuzzhivmash Experimental Plant, a meat-packing plant, a winery, and a rug-making factory. A museum of local lore and history is located in Chadyr-Lunga. [29–15–1]

CHAETA, one of numerous movable hairlike pectinate or hooked protuberances of the cuticle in invertebrates. Chaetae have many purposes. In some invertebrates they help support the body during digging (Echiuroidae, many annelid worms, Pogonophora) or crawling (annelid worms). In other invertebrates it serves a protective function (certain polychaetes and brachiopods), and in still others it is used in capturing prey (chaetognaths). In polychaetes, the chaetae are part of the primitive extremities—parapodia. Each chaeta consists of a single cell on the floor of a cutaneous invagination. The chaetae of arthropods are hairlike or feathery protuberances of the chitinous cuticle; they are sense organs (mainly of touch) and sometimes help protect the body, especially the wings, from excessive wetness. Some ticks and mites still preserve primitive metamerism in the arrangement of their chaetae. [29–1599–2]

CHAETODONTIDAE, a family of fishes of the order Perciformes. The tall, laterally compressed body usually reaches a length of 25 cm. The coloration is a bright mottling. The fishes are solitary. They are not good long-distance swimmers but when pursued by predators easily find a hiding place in the cavities or crevices of reefs. The fishes inhabit shallows of the world ocean and are most numerous in the tropics, where they invariably appear around coral reefs. There are about 150 species. Best known are the butterfly fishes and angelfishes (the latter are often assigned to the separate family Pomacanthidae).

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CHAETOGNATHA (arrowworms), a phylum of marine invertebrates having a transparent elongate body that measures 5 mm to 9 cm in length. There are lateral fins and a caudal fin. The head bears sickle-shaped bristles that serve to capture prey. The coelom is divided by transverse septa into a head, trunk, and tail. The digestive tract is straight. There are no circulatory or excretory systems. The nervous system consists of an epipharyngeal brain and a ventral ganglion that are connected by long longitudinal cords. Chaetognaths are hermaphrodites. They are predators that live amid marine plankton. There are six genera, embracing about 30 species. Chaetognaths are usually assigned to the group of deuterostome animals; sometimes the invertebrates are regarded as an independent taxonomic category higher than a phylum.

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A. V. IVANOV [29–1600–1]

CHAFFEE, ROGER BRUCE. Born Feb. 15, 1935, in Grand Rapids, Mich.; died Jan. 27, 1967, on a launch pad at Cape Kennedy. US astronaut and pilot; lieutenant commander in the US Navy.

Chaffee graduated in 1957 from Purdue University with a degree in aeronautical engineering and then served at a naval air station in Florida. He entered the Air Force Institute of Technology at Wright-Patterson Air Force Base, Ohio, in 1963. That same year, Chaffee was among a group selected for astronaut training by the National Aeronautics and Space Administration. He was chosen with V. Grissom and E. White to be a crew member on the first flight of the Apollo spacecraft. Chaffee died with Grissom and White in a fire that swept through the command module of the spacecraft during a launch rehearsal. A crater on the far side of the moon has been named for Chaffee. [29–110–1]

CHAGALL, MARC. Born July 7, 1887, in Liozno, near Vitebsk. French painter and graphic artist.

Chagall studied in St. Petersburg from 1907 to 1909 with L. Bakst and others. From 1910 to 1914 he lived in Paris, where he was influenced by cubism. In 1914 he returned to Russia, where he directed the Art School in Vitebsk (from 1917) and participated in the work of the College of Fine Arts. In 1922 he emigrated, settling first in Berlin and then in Paris.

Chagall is one of the most outstanding representatives of modernism. His works are characterized by a keenly subjective perception of reality, reflecting the spiritual crisis of the intelligentsia in the West. The inspiration for most of his works has been his Jewish childhood in a small village, scenes from which he interprets in a symbolic and mystical spirit. Chagall is known for an analogous arrangement of objects in unreal space, linear sketchiness and vagueness, and fantastic and vivid color. Characteristic works are *I and My Village* (1911, Museum of Modern Art, New York) and *Over Vitebsk* (1914, private collection, Toronto). Chagall illustrated N. V. Gogol's *Dead Souls* (etching, 1923–27) and the Bible (lithograph, 1931–36). He has painted a number of decorative works, including a mural for the Kamernyi Jewish Theater in Moscow (1920, Tret'iakov Gallery, Moscow), the sets for G. Balanchine's production of I. Stravinsky's ballet *The Firebird* (1944–45), and sketches for stained-glass windows for the cathedral in Metz (1958). In 1973, in connection with an exhibit of his lithographs, Chagall visted the USSR.

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CHAGAN, an urban-type settlement in Semipalatinsk Oblast, Kazakh SSR. Chagan is under the jurisdiction of the Semipalatinsk City Soviet. It has a railroad station 80 km northwest of Semipalatinsk. Industrial enterprises include a *keramzit* shop and a branch of the fur factory of the Semipalatinsk Leather and Fur Association. [29–1–2]

CHAGAN, a river in Orenburg Oblast, RSFSR, and Ural'sk Oblast, Kazakh SSR; a right tributary of the Ural. The Chagan measures 264 km in length and drains an area of 7,530 sq km. It originates on the Obshchii Syrt Upland. The river is fed mainly by snow.

The mean flow rate 40 km from the mouth is 7.7 cu m per sec. The Chagan usually freezes in November but sometimes as late as early January, and in the upper course it freezes through. The ice breaks up in late March or April. [29–1–1]

CHAGAS' DISEASE (also called American trypanosomiasis), a transmissible parasitic disease of humans and animals caused by trypanosomes. The disease was described in 1909 in Brazil (state of Minas Gerais) by the physician C. Chagas. It occurs in Central and South America, chiefly among the poorest strata of the population, who live in dwellings infested by transmitters of the disease (bloodsucking hemipterous insects, mainly triatomids). Humans and wild and domestic animals suffering from Chagas' disease are the sources of infection.

Infection occurs when the causative agent, together with insect feces, enters injured skin or the mucous membranes of the eyes, nose, and mouth. The main symptoms are fever and enlargement of the lymph nodes in the acute stage, with involvement of the heart and gastrointestinal tract when the disease becomes chronic. The main methods for controlling Chagas' disease are improvement of social and living conditions of the people, disinsectization, and destruction of infected animals. [29–800–2]

CHAGATAI, a medieval Middle Asian and Turkic literary language that reached its highest level of development and standardization as a classical language in the second half of the 15th century and in the 16th century in the Timurid principalities (the former Jagatai, or Chagatai, Khanate).

Turcologists have not been able to agree on a definition or chronology for Chagatai. According to P. M. Melioranskii, Chagatai existed from the 13th to 18th centuries. A. N. Samoilovich has divided the development of the Middle Asian and Turkic literary language into three periods, with the first beginning in the 11th century; he used the term "Chagatai" to refer to the third period, from the 15th to the early 20th century. Samoilovich's theory is widely accepted and, with minor refinements, has won the support of foreign Turcologists.

From the 1930's to the 1960's A. K. Borovkov, A. M. Shcherbak, and Uzbek linguists referred to Chagatai as Old Uzbek, which encompasses earlier texts in Turkic script (*see* UZBEK). The term "Chagatai" emphasizes the supradialectal nature of the literary language, which had taken on the linguistic traditions of an earlier language. As S. E. Malov showed, works in Chagatai were widely read by Turkic-speaking peoples inhabiting the region that extends from the Bosporus to the Altai and India; this dissemination was facilitated by the use of an Arabic script, which allowed for variations in vowel sounds.

In the 15th and 16th centuries there existed clearly distinguished prose and poetic variants of Chagatai, which in the work of A. Navoi and Baber completed the transition to a literary language. The basic morphological system of Chagatai, including such distinguishing features as declension, was finally reconciled with the Turkic urban koine of Andizhan of the 15th and early 16th centuries. The observable features of the underlying morphological system may be classified as Old Uzbek elements. The poetic variant of Chagatai, which retained the traditional mixture of forms of varied origin, had fewer such elements. Many scholars continue to posit a chronological boundary between Chagatai and Old Uzbek and, in attempting to establish a chronology for the language rely on historical and cultural factors.

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G. F. BLAGOVA [29–1–4]

CHAGAT-STROEV, PAVEL ALEKSANDROVICH (pen name of P. A. Trepikhin). Born 1887 in the village of Myiuta, in what is now Shebalino Raion, Gorno-Altai Autonomous Oblast; died 1938. Soviet Altai writer. In his publicist writings and poetry, Chagat-Stroev was inspired by the goals of socialist revolution. He wrote the narrative poems *The Wise Batyr* (1925), which was devoted to V. I. Lenin, and *Kara-Korum* (1927), which portrayed the revolutionary movement in the Altai. His works also include primers for Altai schools.

Chagat-Stroev was a member of the All-Russian Central Executive Committee, representing the Gorno-Altai Autonomous Oblast.

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CHAGDA, an urban-type settlement in Aldan Raion, Yakut ASSR. Chagda has a landing on the right bank of the Aldan River near its confluence with the Uchur River. Gold is mined in the area. [29–2–2]

CHAGIN, BORIS ALEKSANDROVICH. Born Mar. 10 (22), 1899. Soviet philosopher. Corresponding member of the Academy of Sciences of the USSR (1960). Member of the CPSU since 1920.

Chagin graduated from the Institute of the Red Professors in 1931. He began his teaching career in 1922, and in 1963 he became a senior research worker in the Leningrad subdepartment of philosophy of the Academy of Sciences of the USSR. His principal works deal with the history of Marxist-Leninist philosophy and with historical materialism. Chagin has been awarded the Order of Lenin, the Order of the October Revolution, four other orders, and various medals.

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CHAGODA, an urban-type settlement and administrative center of Chagodoshcha Raion, Vologda Oblast, RSFSR. Chagoda is situated on the Chagodoshcha River (Volga River basin), near the Chagoda railroad station on the Kabozha-Podborov'e line. It has enterprises of the glass and food-processing industries, a logging and timber distribution establishment, and a timber-chemistry plant. [29–3–2]

CHAGODOSHCHA (also Chagoda), a river in Leningrad and Vologda oblasts, RSFSR; a left tributary of the Mologa River (Volga River basin). The Chagodoshcha measures 242 km in length and drains an area of 9,680 sq km. It originates on the Tikhvin Ridge and is fed predominantly by snow. High water is in April and May. The mean flow rate 112 km from the mouth is 58 cu m per sec. The Chagodoshcha freezes in November or December, and the ice breaks up in April or early May. The lower 157 km are part of the Tikhvin Water System. [29–3–3]

CHAGOS, a British archipelago in the Indian Ocean. Area, approximately 200 sq km. The Chagos Archipelago consists of five groups of coral atolls, which represent the tops of peaks of the submarine Maldive Ridge and are surrounded by coral reefs. The economy is based on fishing and the raising of coconut palms. An American military base is located on Diego Garcia, which, with an area of 25 sq km, is the largest atoll in the archipelago. [29–3–4]

CHAGOS, a narrow trench in the central part of the Indian Ocean, at the foot of the submarine Maldive Ridge, east of the Chagos Archipelago. The Chagos Trench is bounded on the west by a ridge with a height of 1,000 to 2,000 m and on the east by a submarine swell with a height reaching 1,000 m. The trench is 900 km long and as much as 5,408 m deep. The width of its flat bottom is approximately 15 km. Foraminiferal oozes constitute the sediment in the Chagos Trench, which has a strong bottom current. [29–4–1]

CHAGOVETS, VASILII IUR'EVICH. Born Apr. 18 (30), 1873, on the *khutor* (farmstead) of Patychis, Romny District, Poltava Province, now Sumy Oblast; died May 19, 1941, in Kiev. Soviet physiologist, Academician of the Academy of Sciences of the Ukrainian SSR (1939).

Chagovets graduated from the Military Medical Academy in 1897. He studied physiology in I. P. Pavlov's laboratory at the academy from 1903 to 1909. In 1910 he became a professor at the University of Kiev (later the Kiev Medical Institute), occupying the chair of physiology in the medical faculty.

Chagovets primarily studied electrophysiology. He investigated the physicochemical nature of electric potentials in living tissues and the mechanism of the electrical stimulation of the tissues. Chagovets was the first to apply the theory of electrolytic dissociation to explain these processes. His ionic theory of the origin of bioelectric phenomena was of great importance to further studies of the mechanism of the occurrence of biopotentials. In 1906, Chagovets developed the capacitor theory of electrical stimulation of living tissues and proposed a physicochemical explanation of the stimulating action of an electric current. He demonstrated experimentally that living tissues polarize under the influence of an electric current, and he determined the magnitudes of electrical capacitance for several tissues.

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CHAGRA, a river mainly in Kuibyshev Oblast, RSFSR (the lower course is in Saratov Oblast); a left tributary of the Volga River. The Chagra River is 251 km long and drains an area of 3,440 sq km. It rises in the Kamennyi Syrt Upland and empties into the Saratov Reservoir. The river follows a sinuous path.

The Chagra is fed mainly by snow, and high water occurs in April. The mean flow rate 78 km from the mouth is 3.5 cu m per sec. In the summer the river in its upper course is an intermittent stream and divides into individual reaches. The Chagra freezes over in November or early December; the ice breaks up in April. [29–4–2]

CH'AHAERH (also Chahar), a province of China from 1928 until 1952. The capital of Ch'ahaerh Province was the city of Changchiak'ou (Kalgan). In 1947, northern Ch'ahaerh, which is inhabited primarily by Mongols, became part of the Inner Mongolian Autonomous Region. The remaining territory of the province was divided between Shansi and Hopeh provinces in 1952. [29–110–2]

CHAIA, a river in the Buriat ASSR and Irkutsk Oblast, RSFSR; a right tributary of the Lena River. The Chaia is 353 km long and drains an area of 11,400 sq km. It rises on the slopes of the Verkhneangara Ridge and flows primarily through the Severo-Baikal Highland. The Chaia is fed mainly by rain. High water occurs between May and September, when the river is swollen by rain freshets. [29–113–1]

CHAIA, a river in Tomsk Oblast, RSFSR; a left tributary of the Ob'. The Chaia River is formed by the confluence of the Parbig and Bakchar rivers. The Chaia is 194 km long and drains an area of 27,200 sq km. It is fed primarily by snow. High water occurs between mid-April and early July. The mean flow rate is 70 cu m per sec; the maximum flow rate is 950 cu m per sec, and the minimum is 20 cu m per sec. The river freezes over in November, and the ice breaks up in April. The Chaia is used for timber flotation and for shipping. [29–113–2]

CHAIKA, a passenger car with a large-displacement engine, manufactured at the Gorky Automotive Plant (GAZ) since 1950. The Chaika GAZ-13 has been in production since 1959, and the GAZ-14, since 1977.

A seven-passenger car, the Chaika has a chassis-mounted, limousine-type body with three seats. The middle seat is collapsible. The engine is V-eight with a carburetor and produces, in the GAZ-14 model, 162 kilowatts of power, or 220 hp. In addition to a three-speed automatic transmission with a torque converter and planetary gearing, the drive train includes a single-reduction hypoid differential. The Chaika has power steering, hydraulic brakes with vacuum assist, and an independent, wishbone-type front suspension with coil springs. The rear suspension consists of two lengthwise, semielliptic leaf springs. A fully equipped Chaika weighs 2,385 kg, and its maximum speed is 170 km/hr. [29–22–1]

CHAIKHANA, in Russian, a term for a tearoom in Middle Asia and Iran. [29–33–2]

CHAIKINA, ELIZAVETA IVANOVNA. Born Aug. 28, 1918, in the village of Runa, Peno Raion, Velikie Luki (now Kalinin) Oblast; died Nov. 22, 1941, in the settlement of Peno. Participant in the partisan movement during the Great Patriotic War of 1941–45; Hero of the Soviet Union (Mar. 6, 1942, posthumously). Member of the Communist Party from 1939.

Chaikina was the daughter of a peasant. In 1933 she was made head of a village reading room. She became secretary of the Peno raion committee of the Komsomol in 1939, and she served as secretary of the underground Peno raion committee of the Komsomol after the fascists invaded and occupied the area. In November 1941, having been betrayed, she was captured by the Fascists, cruelly tortured, and shot to death.

Enterprises, schools, and Pioneer brigades have been named for Chaikina. The Chaikina Museum of Komsomol Glory is located in Kalinin, and a monument to Chaikina (1944, sculptor N. V. Tomskii) has been erected in the settlement of Peno.

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Nasha Chaika. [Moscow] 1976. [29–23–2]

CHAIKOVSKAIA, ELENA ANATOL'EVNA. Born Dec. 30, 1939, in Moscow. Soviet figure skater. Master of Sport (1957) and Honored Coach of the USSR (1970). Skating choreographer. Champion of the USSR (1957).

Chaikovskaia graduated from the A. V. Lunacharskii State Institute of Theatrical Arts in 1964 and began coaching the same year. Among her students have been such repeated champions and prizewinners of international, European, and Soviet competitions as L. A. Pakhomova and A. G. Gorshkov, V. N. Kovalev, and N. V. Linichuk and G. M. Karponosov. Chaikovskaia has been awarded the Order of the Red Banner of Labor.

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CHAIKOVSKII, BORIS ALEKSANDROVICH. Born Sept. 10, 1925, in Moscow. Soviet composer. Honored Art Worker of the RSFSR (1969).

In 1949, Chaikovskii graduated from the Moscow Conservatory, where he had studied composition with N. Ia. Miaskovskii; previously he had studied with V. Ia. Shebalin and D. D. Shostakovich. In the late 1950's and early 1960's Chaikovskii emerged as a leading composer of Soviet symphonic and chamber music. His principal works include the Symphony No. 2 (1962; State Prize of the USSR, 1969), *Chamber Symphony* (1967), and the orchestral work *Theme and Eight Variations* (1974). Other notable works are a piano quintet; piano, violin, and cello concerti; six quartets; and *The Lyric Poetry of Pushkin* (1972), a cyclic vocal composition. Chaikovskii has also composed *The Signs of the Zodiac* (1974), based on Russian poems, and music for motion pictures and radio. [29–24–2]

CHAIKOVSKII, IAKOV GRIOGOR'EVICH. Born May 30 (June 12), 1901, in Ekaterinoslav, now Dnepropetrovsk; died July 8, 1947, in Dnepropetrovsk. Steelworker; founder of the Stakhanovite movement in the metallurgical industry. Member of the CPSU from 1936.

In 1936, Chaikovskii became the first in the country to make steel by a high-speed method. On Jan. 5, 1937, he smelted 18.6 tons of steel in 4 hours 20 minutes, using a hearth 1 m square in a furnace with a capacity of 8.4 tons. He was named the "Best Steelworker in the Soviet Union" in 1937. He became a foreman in 1938 and a shift supervisor in 1939. Chaikovskii worked at a metallurgical plant in Gorky in 1942 and at the Revda Metallurgical Plant in the Urals in 1943. From 1944 to 1947 he worked at the Komintern plant in Dnepropetrovsk. Chaikovskii was awarded the Order of Lenin.

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CHAIKOVSKII, NIKOLAI VASIL'EVICH. Born Dec. 26, 1850 (Jan. 7, 1851), in Viatka (now Kirov); died Apr. 30, 1926, in London. Russian political figure.

Of noble birth, Chaikovskii graduated from the University of St. Petersburg in 1872. He took part in the student disturbances of 1868 and 1869. An opponent of S. G. Nechaev, he was a member of the Chaikovskii circle; after that group was disbanded in autumn 1874, he emigrated. Chaikovskii settled in London in 1880 and helped organize the Foundation of the Free Russian Press.

Chaikovskii joined the Socialist Revolutionary Party (SR's) in 1904 and returned to Russia in 1906. In 1910 he broke with the SR's and withdrew from politics. During World War I, Chaikovskii was a leader of the All-Russian Union of Cities (*see* ZEMSTVO AND MUNICIPAL UNIONS). After the February Revolution of 1917 he became a member of the Central Committee of the Trudovik Popular Socialist Party.

After the October Revolution of 1917, Chaikovskii actively opposed Soviet power, helping organize the Union for the Rebirth of Russia. When interventionists landed in Arkhangel'sk in August 1918, he became chairman of the Supreme Administration of the Northern Oblast, and in September 1918 he was elected in absentia to the Ufa Directory. He emigrated in January 1919 and joined A. I. Denikin's government in early 1920. After Denikin was defeated, Chaikovskii took up residence in London.

REFERENCE

"N. V. Chaikovskii." *Katorga i ssylka*, 1926, no. 5, pp. 211–232. [29–24–3]

CHAIKOVSKII, a city under oblast jurisdiction and the administrative center of Chaikovskii Raion, Perm' Oblast, RSFSR. Located on the Votkinsk Reservoir. Railroad station (Saigatka) 260 km southwest of Perm'. Population, 64,000 (1977).

Chaikovskii was established as a settlement in 1955 during the construction of the Votkinsk Hydroelectric Power Plant. A city since 1962, it is named for the great Russian composer P. I. Tchaikovsky. Industry in Chaikovskii includes a silk combine, the Stroidetal' Plant, a repair and machine shop, a timber log pond, a sawmill, an operations and repair base for a river steamship line, a meat-packing plant, and a milk plant. Construction of

a plant for the production of synthetic rubber was in progress in 1978. A district heat and power plant is located in the city. Chaikovskii has a branch of the Perm' Polytechnic Institute, a secondary specialized polytechnic for light industry, medical and music schools, a museum of local lore, and an art gallery. [29–27–2]

CHAIKOVSKII CIRCLE (also Chaikovtsy, the Great Organization of Propaganda), a revolutionary Populist organization in Russia in the early 1870's.

The Chaikovskii circle was formed in St. Petersburg during the student disturbances of 1868 and 1869 by opponents of S. G. Nechaev. The name traditionally applied to the group is derived from one of its members, N. V. Chaikovskii. The nucleus of the organization was a student study group at the Medical and Surgical Academy that comprised M. A. Natanson, V. M. Aleksandrov, and A. I. Serdiukov; they were joined by Chaikovskii and F. N. Lermontov.

The major purpose of the group, besides self-education, was to unite progressive students of St. Petersburg and other cities and then to disseminate propaganda among workers and peasants in order to prepare the way for a social revolution. The Chaikovskii circle, opposed to the unscrupulous methods of Nechaev, placed high moral demands on its members; the group disapproved of struggle for political freedoms, which it believed to be advantageous only to the emerging bourgeoisie. These positions were formulated in *A Program for Study Groups and Practical Activity*, which was put together by the group in late 1870 and early 1871.

The first stage in the circle's activities was devoted to publishing. Assisted by N. P. Poliakov and K. T. Soldatenkov, it published and distributed scientific and revolutionary literature among the intelligentsia, including the first volume of K. Marx' *Das Kapital* and works by such writers as N. G. Chernyshevskii, N. A. Dobroliubov, A. I. Herzen, P. L. Lavrov, V. V. Bervi (N. Flerovskii), F. Lassalle, C. Darwin, and J. S. Mill.

In the summer of 1871, Natanson's circle joined with the women's study group of A. I. Kornilova and S. L. Perovskaia. The new organization was soon joined by such figures as S. M. Kravchinskii, S. S. Sinegub, D. A. Klements, N. A. Charushin, and L. E. Shishko. The central St. Petersburg circle, which comprised some 60 persons, formed a federation with circles in other cities, including Moscow (L. A. Tikhomirov, N. A. Morozov, and M. F. Frolenko), Odessa (F. V. Volkhovskii and A. I. Zheliabov), and Kiev (Ia. V. Stefanovich and P. B. Aksel'rod). The total membership of these organizations was about 100.

In 1872, the Chaikovskii circle began organizing workers' groups in order to train propagandists for activity in the villages. This organizational work was most successful in St. Petersburg and Odessa, where circles attracted some 400 workers. The workers trained in this manner, notably V. P. Obnorskii and F. I. Kravchenko, subsequently organized the first proletarian organizations: the Southern Union of Russian Workers and the Northern Union of Russian Workers. P. A. Kropotkin reported on the propaganda work in a programmatic note, which was discussed in the St. Petersburg circle in late 1873.

The final stage in the activity of the organization was the "going to the people" movement, which was initiated by members of the Chaikovskii circle. Mass arrests in 1873 and 1874 brought the circle to an end. Most of its members were convicted at the Trial of the 193 and later took part in all revolutionary Populist organizations.

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CHAILAKHIAN, MIKHAIL KHRISTOFOROVICH. Born Mar. 8 (21), 1902, in the city of Nakhichevan'-na-Donu, now within the city limits of Rostov-on-Don. Soviet plant physiologist. Academician of the Academy of Sciences of the USSR (1968); academician of the Academy of Sciences of the Armenian SSR (1971). Honored Scientist of the Armenian SSR (1967).

Chailakhian graduated from the University of Yerevan in 1926. In 1935 he became head of the laboratory of growth and development at the K. A. Timiriazev Institute of Plant Physiology of the Academy of Sciences of the USSR. From 1941 to 1948 he was chairman of the department of plant physiology and anatomy of the University of Yerevan (professor from 1943). Between 1941 and 1946 he also was chairman of the department of plant physiology and microbiology at the Armenian Agricultural Institute.

Chailakhian primarily studied plant growth and development (particularly ontogenesis) and the photoperiodic and thermal regulation of flowering. The founder of the hormone theory of plant development, he worked out methods of using plant hormones to regulate growth and flowering. These hormones included gibberellins—growth stimulators—used to increase crop yields and growth retardants used to prevent cereal grains from falling over onto the ground.

Chailakhian is a foreign member of the German Leopoldine Academy of Natural Scientists (1969). He has been awarded two orders of Lenin, two other orders, and medals.

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CHAIN, ERNST BORIS. Born June 19, 1906, in Berlin. British biochemist. Fellow of the Royal Society of London (1949).

Chain received a Ph.D. degree from the University of Berlin in 1930. In 1933 he emigrated to Great Britain. He conducted research at the School of Biochemistry in Cambridge from 1933 to 1935 and at Oxford University from 1935 to 1948. From 1948 to 1961 he was scientific director of the International Research Center for Chemical Microbiology in Rome; beginning in 1950, he was also a professor at the center. In 1961 he became a professor of biochemistry at the University of London.

Chain's major works deal with antibiotics, the mechanism of the action of insulin, the technology of microbiological products, the formation of lysergic acid, and fungal metabolites. In 1939 he headed research on the isolation and purification of penicillin, which finally yielded a salt of penicillin in crystalline form. He established the chemical structure of penicillin.

Chain is a foreign member of the Academy of Sciences of the USSR (1976). He received a Nobel Prize in 1945, with A. Fleming and H. Florey.

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Landmarks and Perspectives in Biochemical Research. London, 1964. [29–127–1]

CHAINIKOV, KUZ'MA PAVLOVICH (Kuzebai Gerd). Born Jan. 2 (14), 1898, in the village of Bol'shaia Dok'ia, in what is now Vavozh Raion, Udmurt ASSR; died Nov. 2, 1941. Soviet Udmurt poet and folklorist.

Chainikov studied at the V. Ia. Briusov Higher Literary Institute from 1922 to 1925. His works were first published in 1914. In his poetry collections *The Gusli Player* (1922), *The Flowering Land* (1927), and *Steps* (1931), he faithfully depicted the plight of the Udmurt people under tsarism. His vivid verses about the revolution, the Civil War, and the new life of the Udmurts were set to music as folk songs. Chainikov was the author of the first Udmurt narrative poem about V. I. Lenin (1925); his other narrative

poems include *War* (1916), *The Plant* (1921), and *Ten Years* (1931).

Chainikov also wrote elementary-school textbooks and readers. A student of Udmurt folklore, he published three anthologies of folk songs and a number of articles on the folklore and ethnography of the Udmurts.

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F. K. ERMAKOV [29–32–1]

CHAITYA, the name for various sacred objects in India. In art history, the term is usually used in reference to an architectural type characteristic of Buddhist architecture in ancient and medieval India. It consists of an elongated cave cut into a cliff, with a vaulted ceiling and a stupa in the back as an object of worship. [29–33–1]

CHAK, ALEKSANDR IANISOVICH (Aleksandrs Čaks). Born Oct. 27, 1901, in Riga; died there Feb. 8, 1950. Soviet Latvian poet.

Chak was the son of a tailor. In 1919, while studying at the medical school of Moscow University, he enlisted in the Red Army. In 1922 he returned to Latvia. Chak first published his works in 1925. He was the most prominent urban writer of Latvian lyric poetry, the poet of the working-class neighborhoods of Riga. His works also describe the ugliness of bourgeois reality. He wrote the collections *The Heart on the Sidewalk* (1928), *My Paradise* (1932), *The Mirrors of Fantasy* (1938), and *Poem About a Carter* (1930). The collection of narrative poems *Overshadowed by Eternity* (parts 1–2, 1937–39) deals with the heroism of the Latvian riflemen.

Chak's poetry of the Soviet period extols the peaceful life and the happiness to be found in constructive labor. Typical examples are the collections *The Patriots* (1948), *Under a High Star* (1948), and *To Struggle and Labor* (published posthumously in 1951).

Chak was a master of hyperbole and emotional free verse. He also wrote several collections of short stories. His books have been translated into the languages of the peoples of the USSR.

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I. KIRSHENTALE [29–33–3]

CHAKHRUKHADZE. Years of birth and death unknown. Twelfth-century Georgian author of odes.

Chakhrukhadze wrote a collection of panegyrical poems entitled *Tamariani*, in which he idealized the empress Tamara. The verse form he created was called *Chakhrukhauli* in his honor and was widely used in Georgian classical poetry.

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CHAKOVSKII, ALEKSANDR BORISOVICH. Born Aug. 13 (26), 1913, in St. Petersburg. Soviet Russian writer and public figure. Hero of Socialist Labor (1973). Member of the CPSU since 1941. Candidate member of the Central Committee of the CPSU since 1971.

Chakovskii, the son of a physician, graduated from the M. Gorky Institute of Literature in 1938. His first published writings—works of criticism—appeared in 1937. His first work of fiction was a trilogy devoted to the heroism of Leningrad in the Great Patriotic War: *It Happened in Leningrad* (1944), *Lida* (1945), and *Peaceful Days* (1947). Chakovskii further developed the distinctive style of this trilogy, at once lyrical and publicistic, in the novel *It Is Already Morning Here* (1949; State Prize of the USSR, 1950), which successfully evokes the spirit of socialist transformation in South Sakhalin in the postwar years.

Chakovskii dealt with the moral and ethical problems of Soviet society and the lives of young intellectuals who work in technical fields in the novels *A Year of Life* (1956) and *The Roads We Choose* (1960). Chakovskii is also the author of the novellas *The Light of a Distant Star* (1962) and *The Bride* (1966).

Chakovskii's major work is the novel *Blockade* (books 1–5, 1968–75; Lenin Prize, 1978). Portraying a panorama of the battle of Leningrad, the book interprets the historical significance of the battle within the context of the entire war and depicts the moral and political superiority of the Soviet soldiers over the enemy. Chakovskii has also written publicist works, for example, *Blessed Are the Poor in Spirit?* (1970).

Chakovskii was editor in chief of the journal *Inostrannaia Literatura* (Foreign Literature) from 1955 to 1963 and has been editor in chief of *Literaturnaia Gazeta* since 1962. He has been secretary of the administrative board of the Writers' Union of the USSR since 1962 and was a deputy to the seventh through ninth convocations of the Supreme Soviet of the USSR. He has been awarded two Orders of Lenin, the Order of the October Revolution, two other orders, and several medals.

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L. I. LEVIN [29–34–4]

CHAKRA, a steel throwing ring with a sharp outer edge, used in the ancient Indian army. The chakra was twirled around the middle finger and thrown at an enemy. [29–35–2]

CHAKRI (also Chakkri), the royal dynasty of Thailand (formerly Siam) since 1782. The Chakri dynasty was founded by the Siamese military commander Phya Chakri, who came to power after the execution of King Taksin. The kings of the Chakri dynasty are Rama I (1782–1809), Rama II (1809–24), Rama III (1824–51), Mongkut (Rama IV, 1851–68), Chulalongkorn (Rama V, 1868–1910), Vajiravudh (Rama VI, 1910–25), Prajahipok (Rama VII, 1925–35), Ananda Mahidol (Rama VIII, 1935–46), and Bhumibol Adulyadej (Rama IX, since 1946; crowned 1950). [29–35–3]

CHAKVA, an urban-type settlement in Kobuleti Raion, Adzhar ASSR. Chakva is situated on the Black Sea coast and has a railroad station on the Samtredia-Batumi line. The settlement has three tea factories, a tea-pressing plant, and facilities for the production of fruit wines and citrus liqueurs. There are tea and citrus-fruit sovkhozes in Chakva, and the settlement has a branch of the All-Union Scientific Research Institute of Tea and Subtropical Crops. Chakva also has tourist facilities. [29–34–1]

CHALAINOERH, a city in Northeast China, in Heilungkiang Province. Coal is mined near Chalainoerh. The city manufactures leather goods and such foodstuffs as flour and dairy products. [29–531–4]

CHALCALBURNUS, a genus of fishes of the family Cyprinidae. The body is elongated and of medium size. The posterior section of the keel, located behind the ventral fin, is free of scales. There are several species, inhabiting the basins of the Black, Azov, Caspian, and Aral seas, Van Lake, bodies of water in southern Iran, and the Tigris and Euphrates rivers. The USSR has a single species, *Chalcalburnus chalcoides*. There are about nine subspecies, which differ in their habits and life histories. For example, the Crimean (*C. chalcoides mentoides*) and Batumi (*C. chalcoides derjugini*) subspecies live permanently in fresh water; the Aral (*C. chalcoides aralensis*) subspecies lives in the Aral Sea; and the Caspian subspecies (*C. chalcoides chalcoides*) is anadromous. The type subspecies is *Chalcalburnus c. chalcoides*. The body has a length up to 40 cm and weighs up to 360 g. Spawning takes place in the spring in the Terek and Kura rivers; some individuals enter the Volga and Ural rivers. The females deposit 10,000–50,000 eggs. The diet consists of planktonic crustaceans, insects that have fallen into the water, and small fish. *Chalcalburnus* is commercially fished and bred.

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Z. V. KRASIUKOVA [29–1122–1]

CHALGRIN, JEAN FRANÇOIS. Born 1739 in Paris; died there Jan. 21, 1811. French architect.

Chalgrin studied under G. N. Servandoni and L. P. Moreau-Desproux. He visited Rome in 1758. Chalgrin's early structures, which are in the classical style, include several *hôtels* built in the 1760's and the Church of St. Philippe-du-Roule (1769–84). His masterpiece is the Arc de Triomphe on the Place de l'Etoile (now Place De Gaulle) in Paris (1806–37). Instead of copying classical triumphal arches, Chalgrin created an original composition: a rectangular mass cut through with a monumental passage.
[29–816–4]

CHALIAPIN, FEDOR IVANOVICH. Born Feb. 1 (13), 1873, in Kazan; died Apr. 12, 1938, in Paris. Russian bass. People's Artist of the Republic (1918).

The son of a clerical worker, Chaliapin in his youth was an apprentice to a cobbler and a turner and worked as a copyist. At the same time, he sang in a church choir. He was attracted to the theater at an early age and served as an extra in many theatrical and operatic performances. In 1890 he became a member of the chorus with the opera company in Ufa, where he also sang small solo parts, including Stolnik in Moniuszko's opera *Halka*. In 1891 he toured Russia with a Ukrainian operetta company. In 1892 and 1893 he studied with the opera singer D. A. Usatov in Tbilisi, where he began his professional stage career. During the 1893–94 season, Chaliapin performed many roles, among them Mephistopheles in Gounod's *Faust* and the Miller in Dargomyzhskii's *The Mermaid*. In 1895 he was accepted into the company of the Mariinskii Theater, where he sang several roles; however, the management of the imperial theaters failed to notice his talent.

In 1896, at the invitation of S. I. Mamontov, Chaliapin joined the Moscow Private Russian Opera, and it is here that his talent was finally discovered. His subsequent study and artistic collaboration with S. V. Rachmaninoff were very important. During his years with the Private Russian Opera, Chaliapin performed virtually all the principal roles of the repertoire: the title role in Glinka's *Ivan Susanin*, the Miller in Dargomyzhskii's *The Mermaid*, Boris Godunov and Varlaam in Mussorgsky's *Boris Godunov*, Dosifei in Mussorgsky's *Khovanshchina*, Ivan the Terrible and Salieri in Rimsky-Korsakov's *The Maid of Pskov* and *Mozart and Salieri*, Holofernes in Serov's *Judith*, and Nilakantha in Delibes's *Lakmé*. Chaliapin won great success during the company's tour in St. Petersburg in 1898. It was also then that V. V. Stasov became an avid admirer of his work, and over the years he wrote many articles about Chaliapin.

Beginning in 1899, Chaliapin sang at both the Bolshoi and Mariinskii theaters, as well as in provincial cities. In 1901 he gave a triumphant performance at the La Scala Opera in Italy. Soon after he began his continuous foreign tours, which brought him world acclaim. Chaliapin's performances in the Russian Seasons (1907 to 1909, 1913) in Paris were particularly important for the popularization of Russian culture, particularly the works of Mussorgsky and Rimsky-Korsakov.

Between 1899 and 1914, Chaliapin performed a series of new roles, including Farlaf in Glinka's *Ruslan and Liudmila*, Pimen in Mussorgsky's *Boris Godunov*, Eremka in Serov's *The Power of Evil*, the title roles in Rubinstein's *The Demon*, Rachmaninoff's *Aleko*, Boito's *Mefistofele*, and Massenet's *Don Quichotte*, and Philip II in Verdi's *Don Carlos*. He tirelessly worked to perfect the interpretations of his early roles, attaining the highest mastery.

Chaliapin's ideas and artistic principles were greatly influenced by his friendship with M. Gorky, which began in 1901. To a large degree, under Gorky's beneficial influence, Chaliapin came in contact with progressive social circles; he sang for workers and performed revolutionary songs.

After the victory of the October Revolution of 1917, Chaliapin became involved in the development of a new theatrical and musical culture. In 1918 he was artistic director of the Mariinskii Theater, and in 1919 he was elected to its managing board. During the 1918–19 season, he took part in many performances and concerts for workers and Red Army troops. However, the contradictory nature of his character and the instability of his political convictions contributed to Chaliapin's transformation into a touring performer, concerned only with his own financial enrichment.

In 1922, Chaliapin went abroad for a concert tour and did not return to the Soviet Union, settling in Paris. Torn away from his homeland and suffering constant sorrow, he created no new stage roles. In his work, however, he retained the best traditions of his native art, remaining a Russian artist to the end of his life.

Chaliapin was one of the greatest representatives of the Russian vocal school and a deeply national artist, who raised Russian realist musical dramatic art to extraordinary heights. He was both a talented singer and a talented dramatic actor. The roles he created were distinguished by a unity of vocal and stage conception. He had the rare gift of being able to transform himself entirely, creating each role with extraordinary realism and power. His voice, a high bass, was characterized by exceptional softness and beauty of timbre, combining sincerity with depth and power; it was able to transmit a wide range of emotions, from rapturous profound tenderness to high tragedy and biting sarcasm. Chaliapin also sang baritone parts, such as the title role in Tchaikovsky's *Eugene Onegin* and Rubinstein's *The Demon*. His masterful command of phrasing, nuance, and diction enabled him to imbue each musical phrase with imagery and profound psychological meaning. He combined an amazing freedom of execution with strict adherence to rhythm. Above all, Chaliapin sought to reveal all facets of a particular character, all the complexity and contradictions of the protagonist's inner world. His greatest roles were Boris Godunov and Mephistopheles.

In his performances, Chaliapin combined inspiration with enormous preparatory work on a role. He was innovative and often altered a role's interpretation. He strove for historical and everyday accuracy and for fidelity in the *mise-en-scène*. He also strove for vivid expressiveness in makeup (sketches of which he made himself) and costumes and for a faultless stage technique.

Chaliapin, a great chamber singer, interpreted with great sensitivity the songs and romances of Glinka, Dargomyzhskii, Mussorgsky, Rimsky-Korsakov, Tchaikovsky, A. G. Rubinstein, Schumann, and Schubert, as well as Russian folk songs. He was accompanied by first-rate pianists, and his duets with Rachmaninoff were particularly famous. Chaliapin was also an operatic stage director, mounting Massenet's *Don Quichotte* and Mussorgsky's *Khovanshchina*. In addition, he acted in films (*Ivan the Terrible, Don Quixote*). Chaliapin's wide-ranging creative talents were manifested in his gifted sculptures, paintings, and drawings. Chaliapin also exhibited a talent for writing.

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[29–817–4]

CHALIER, MARIE JOSEPH. Born 1747; died July 17, 1793. Figure in the French Revolution; left Jacobin.

On the eve of the revolution, Chalier was a partner in a commercial firm in Lyon. He became a municipal officer of Lyon in 1790 and chairman of the Lyon district tribunal in 1792. Defending the interests of the urban lower classes, Chalier advocated a price ceiling for produce and extra taxes on the rich. He demanded that a revolutionary tribunal and a revolutionary army be created in the department to suppress the resistance of the propertied classes. After a counterrevolutionary coup took place in Lyon on May 29, 1793, Chalier was guillotined. [29–816–5]

CHALK RIVER, a city in Canada, in Ontario Province, on the Ottawa River. Population, 6,000 (1971). With the city of Deep River, a residential area for scientists, and with Rolphton, which has a 20-megawatt experimental atomic power plant, Chalk River forms an important center for the study of Canada's nuclear energy problems. [29–679–4]

CHALLENGER, a three-masted English corvette with sail rigging and an 885-kilowatt (1200-hp) auxiliary engine. The *Challenger* was 62.5 m long and had a displacement of 2,300 tons.

The *Challenger* was refitted in 1872 into an oceanographic vessel for hydrologic, geological, chemical, biological, and meteorological research. Commanded by Captain G. Nares, the *Challenger* made a round-the-world cruise from 1872 to 1876, carrying an expedition headed by C. W. Thomson. The expedition collected data on the physical and chemical characteristics of the water, on bottom relief, and on the geologic structure of the floor of the world ocean.

The *Challenger* was the first of the world's oceanographic vessels. A modern US research vessel used for deep-sea drilling, the *Glomar Challenger*, was named in honor of the *Challenger*. Built in 1968, the *Glomar Challenger* has a 7.36-megawatt (10,000-hp) engine. It is 122 m long, has a displacement of 10,500 tons, and can run at a speed of 12 knots. [29–134–6]

CHALNA, a seaport in the extreme south of Bangladesh, 85 km from the Bay of Bengal; situated on the Pusur River, a deep arm of the Ganges. The port was established in 1950 to serve the western regions of the country; in 1975 it handled approximately 2 million tons of cargo. [29–36–2]

CHALNA, an urban-type settlement in Priazha Raion, Karelian ASSR. Chalna has a railroad station on the Petrozavodsk-Suoiarvi line. Industry is represented by the Shuia-Vidany logging and timber distribution establishment and mechanized state forestry establishment. A forestry school is located in the settlement. [29–36–3]

CHÂLONS-SUR-MARNE, a city in northeastern France, on the Marne River. Capital of Marne Department. Population, 63,000 (1975). A transportation junction, Châlons-sur-Marne is a wine-making center and a center of trade in champagnes. The city has some light industry and produces electrodes and musical instruments. [29–814–6]

CHALON-SUR-SAÔNE, a city in eastern France, in Saône-et-Loire Department, on the Saône River and the Canal du Centre. Population, 71,000 (1975). Chalon-sur-Saône is a transportation junction and a river port. Industries include metallurgy and machine building, with the manufacture of atomic power plant equipment, machine tools, riverboats, and locomotives. The city also produces metal structural components and photographic film and has a sugar factory. [29–815–1]

CHALUKYA, the name of several medieval dynasties and the states they ruled in the Deccan (southern India).

The first of the dynasties was the Early Chalukyas, who ruled from about A.D. 550 to A.D. 642 over an area that lay mainly in the western Deccan. The Chalukyas from Vatapi (now Badami) ruled the same area from about 655 to 753. The Chalukyas of Vengi (the Eastern Chalukyas) ruled the eastern Deccan (eastern Andhra Pradesh) from 615 to 1070. The Chalukyas of Kalyani, who ruled from 973 to 1187, laid claim to the entire Deccan.

The name "Chalukya" was also borne by a number of minor princely states ruled by families related to the Chalukya dynasties mentioned above. [29–36–4]

CHALUS, a city in northern Iran, in the *ostan* (province) of Mazanderan, on the coast of the Caspian Sea. Located on the Rasht-Gorgan highway. Population, approximately 30,000. Chalus has a textile combine that produces silk fabrics. [29–36–5]

CHALYSH, an urban-type settlement in Urgench Raion, Khorezm Oblast, Uzbek SSR. Chalysh is situated on the left bank of the Amu Darya, 20 km from the Urgench railroad station on the Chardzhou-Beineu line. Chalysh has a wine-making sovkhoz. [29–36–6]

CHAM (also Chiam; self-designation, *Tham, Kham*), a people living in southern Vietnam and in Cambodia. According to a 1970 estimate, the Cham in Vietnam number more than 60,000; in Cambodia, together with the Malays, they number approximately 150,000. Small groups of Cham live in Thailand and Indonesia. In antiquity the Cham developed an advanced civilization, which became the kingdom of Champa at the beginning of the Common Era. The Cham speak an Indonesian language. Approximately two-thirds of them are Hindus; the rest are Muslims. In Cambodia the Muslim Cham have intermarried with the related Malay people. The Cham engage primarily in fishing, stock raising, and the cultivation of rice in paddies; various handicrafts are highly developed.

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CHAMA CHA MAPINDUZI (CCM; Revolutionary Party), the ruling party of the United Republic of Tanzania.

The CCM was formed in January and February 1977 through the merger of the Tanganyika African National Union (TANU; founded 1954) and the Afro-Shirazi Party of Zanzibar and Pemba (founded 1957). It comprises workers, peasants, the progressive intelligentsia, and other strata of the working people. The party's policies, as set forth in its charter, follow the socialist course proclaimed in the Arusha Declaration, which was adopted by the TANU in 1967. The CCM directs the activities of various public organizations, such as trade unions and youth and women's organizations. Its foreign policy, which is anticolonialist and antiracist, advocates increased cooperation with the USSR and other socialist states.

The CCM is organized according to the production and territorial principle. The supreme body of the party is the National Conference; the supreme executive body is the Central Committee. The chairman of the CCM is J. K. Nyerere. [29–36–7]

CHAMBA, a people living in the region of the headwaters of the Benue River in Nigeria and Cameroon and in the Republic of Chad. With the related Duru, Li (Bali), Vere (Werre), Fali, Mbum, and Mumuye peoples, the Chamba number approximately 400,000 in Nigeria, approximately 200,000 in Cameroon, and more than 200,000 in the Republic of Chad (1970 estimate). Their language, which has been little studied, belongs to the group of languages spoken in the central and eastern Sudan. The Chamba profess Islam, although the traditional practices of nature and ancestor worship have been preserved in some areas. The principal occupation is cattle raising. [29–37–2]

CHAMBAL, a river in India, a right tributary of the Jamna River. The Chambal is approximately 830 km long and drains an area of approximately 135,000 sq km. It rises in the northern part of the Deccan Plateau, in the Vindhya Mountains, and flows over the Malwa Plateau; its lower course lies in the Gangetic Plain. The Chambal is fed by rain, and high water occurs in the summer. The mean flow rate is approximately 600 cu m per sec, with a maximum of approximately 20,000 cu m per sec. There are large hydroelectric complexes on the Chambal, including three power plants with a total output of 275 megawatts. The river also supplies an irrigation system that waters 440,000 hectares. Regu-

lation of the water flow has decreased the rate of erosion, which had been catastrophic. Some sections of the river are navigable. The city of Kota is situated on the Chambal. [29–37–3]

CHAMBERLAIN, ARTHUR NEVILLE. Born Mar. 18, 1869, in Edgbaston, Birmingham; died Nov. 9, 1940, at Heckfield House, near Reading. British state figure and leader of the Conservative Party. Son of Joseph Chamberlain.

Neville Chamberlain was educated at the exclusive Rugby School and at Mason College, Birmingham. For many years an entrepreneur, he served as lord mayor of Birmingham in 1915 and 1916 and was elected to Parliament in December 1918 as a Conservative. He held the posts of postmaster general in 1922 and 1923, minister of health in 1923, from 1924 to 1929, and in 1931, and chancellor of the exchequer from 1931 to 1937. Chamberlain served as leader of the Conservative Party in 1930 and 1931 and as prime minister and leader of the Conservative Party from 1937 to 1940.

Pursuing a policy of appeasement toward the fascist aggressors, Chamberlain signed the Munich Pact of 1938 with A. Hitler, B. Mussolini, and E. Daladier. His government was responsible for breaking off the Moscow negotiations of 1939 between the USSR, Great Britain, and France, which were aimed at containing the aggressors; during these talks he conducted secret negotiations with fascist Germany (*see* LONDON NEGOTIATIONS OF 1939). When appeasement failed, Great Britain entered World War II in September 1939 under extremely adverse conditions. The Chamberlain government then tried to direct German aggression eastward against the USSR. In May 1940, after Great Britain suffered major military defeats, Chamberlain was forced to resign as prime minister, but until September 1940 he remained a member of W. Churchill's coalition government and the leader of the Conservative Party.

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V. G. TRUKHANOVSKII [29–170–1]

CHAMBERLAIN, AUSTEN (also Joseph A. Chamberlain). Born Oct. 16, 1863, in Birmingham; died Mar. 16, 1937, in London. British state figure. Son of Joseph Chamberlain.

Austen Chamberlain, who was educated at the exclusive Rugby School and at Cambridge University, entered Parliament in 1892. He served as financial secretary to the treasury from 1900 to 1902, postmaster general in 1902, and chancellor of the exchequer from 1903 to 1905 and from 1919 to 1921. He was secretary of state for India from 1915 to 1917, a member of the war cabinet in 1918, minister without portfolio in 1921 and 1922, and foreign secretary from 1924 to 1929.

Chamberlain fought to establish Great Britain as the leading European power. He favored a strong and rearmed Germany, hoping to use it against the USSR and as a counterbalance to France; the signing of the Locarno Treaties of 1925 was a major step toward the realization of this policy. Chamberlain helped initiate the breaking off of diplomatic relations with the USSR in 1927 (relations were resumed in 1929 by the new Labour government) and sought to renew the military intervention in the USSR. He served as first lord of the admiralty in 1931. In his final years, Chamberlain spoke out in Parliament about the aggressive intentions of Germany. V. G. TRUKHANOVSKII [29–170–2]

CHAMBERLAIN, JOSEPH. Born July 8, 1836, in London; died there July 2, 1914. British state figure.

A manufacturer by profession, Chamberlain began his political career as a member of the radical wing of the Liberal Party. He was mayor of Birmingham from 1873 to 1876, when he entered Parliament. He served in W. Gladstone's cabinets from 1880 to 1885 and in 1886. In 1886, Chamberlain opposed the home rule bill, which was designed to grant autonomy to Ireland, and thereby split the Liberal Party; the separate, influential group that emerged under his leadership, the Liberal Unionists, later merged with the Conservatives.

From 1895 to 1903, Chamberlain was colonial secretary in Conservative cabinets. During the Boer War of 1899–1902 he was a major spokesman and organizer of British expansionist policy. Beginning in 1903 he conducted an extensive campaign aimed at replacing free trade, which did not suit the interests of the monopolies, with a policy of protection. In 1906, illness forced Chamberlain to retire from politics. [29–169–8]

CHAMBERLAIN, OWEN. Born July 10, 1920, in San Francisco. American physicist. Member of the National Academy of Sciences (1960).

Chamberlain graduated from Dartmouth College in 1941 and received a doctorate from the University of Chicago in 1949. From 1942 to 1946, he worked at the Los Alamos Scientific Laboratory on the development of the atomic bomb. He joined the faculty at the University of California at Berkeley in 1948, becoming a professor at the university in 1958.

Chamberlain's main works deal with nuclear physics and particle physics. In 1955, Chamberlain discovered the antiproton, for which he shared a Nobel Prize with E. Segré in 1959. [29–171–1]

CHAMBERLIN, EDWARD HASTINGS. Born May 18, 1899, in La Conner, Wash.; died 1967. American economist.

Chamberlin received his higher education at the University of Iowa, the University of Michigan, and Harvard University. Over a period beginning in 1920 he occupied various teaching posts at Michigan and Harvard, as well as at the universities of Paris and Copenhagen. Awarded honorary doctorates by many universities, he was a member of the American Economic Association, of which he became vice-president in 1944; the Royal Economic Society; and the Catholic Economic Association, of which he became vice-president in 1943.

Chamberlin's research was devoted to an analysis of the relations between monopoly and competition in the capitalist market. In the late 1920's and early 1930's he developed the main propositions of the theory of monopolistic competition; the theory was an undisguised apologia on behalf of monopolies, which he believed to be beneficial for capitalist society as a whole. He opposed state interference in the economy and defended "free competition." Chamberlin made slanderous attacks on the trade union movement and the working class.

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M. P. EVTIKHIEV [29–171–2]

CHAMBERS, ROBERT. Born Oct. 23, 1881, in Erzurum, Turkey; died July 22, 1957. American cytologist.

Chambers was appointed a professor at the Medical College of Cornell University in New York City in 1923 and was also a professor at New York University from 1928 to 1948. He was one of the first to work out the techniques of cell microdissection, or micrurgy. With the aid of a micromanipulator of his own design and a hydrostatically operated micropipette, Chambers and his coworkers were able to examine both isolated cells and cells in tissues, their research focusing on the physiochemical properties of cells.

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Höber, R. *Physical Chemistry of Cells and Tissues*, 2nd ed. Philadelphia-Toronto, 1946. (Contains bibliography.) [29–171–3]

CHAMBERS, WILLIAM. Baptized Feb. 23, 1726, in Göteborg, Sweden; died Mar. 8, 1796, in London. British architect.

Chambers served in the Swedish East India Company from about 1740 to 1749. In the years 1748–49 he traveled to India and China. He studied in France during the years 1749–50 and in Italy from 1750 to 1755. He worked in England beginning in 1755.

Chambers was the last important representative of Palladianism in English architecture. He was also one of the creators of the landscape garden and is known for his designs for Kew Gardens, Surrey (1757–62). Chambers made use of classical as well as Gothic and Oriental motifs in his park structures.

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A Treatise on Civil Architecture. London, 1759.
A Dissertation on Oriental Gardening. London, 1772.
REFERENCE
Harris, J. *Sir William Chambers, Knight of the Polar Star*. London–University Park, 1970. [29–126–2]

CHAMBÉRY, a city in southeastern France, in the Savoy Alps. Capital of Savoie Department. Population, 88,000 (1975). Chambéry has machine-building, chemical, textile, food-processing, leather, wood-products, and glass industries. [29–821–2]

CHAMBORD, COMTE DE (Henri Charles Ferdinand Marie Dieudonné d'Artois). Born Sept. 29, 1820, in Paris; died Aug. 24, 1883, at Frohsdorf, Austria. Duke of Bordeaux. Grandson of the French king Charles X, who abdicated in his favor after the July Revolution of 1830.

The Comte de Chambord became an émigré in 1830. He carried on intensive negotiations with the French monarchists, who in 1873 were prepared to restore the monarchy and make him King Henry V of France. The Comte de Chambord was, however, frightened by the masses' opposition to the restoration plan and, at the crucial moment, declined to lead the conspiracy. [29–821–3]

CHAMISSO, ADELBERT VON. Born Jan. 30, 1781, at the Château de Boncourt in Champagne, France; died Aug. 21, 1838, in Berlin. German writer and naturalist.

Chamisso, descended from a line of the Lotharingian nobility, served as an officer in the Prussian Army from 1801 to 1806. From 1812 to 1815 he studied botany, zoology, and medicine in Berlin. From 1815 to 1818 he took part in an expedition around the world on the Russian brig *Riurik*, during which he kept a diary, published as *Voyage Around the World* (1834–36). In 1819 he discovered the alternation of generations (metagenesis) in organisms of the subclass Salpae.

Chamisso's most famous work of fiction is the tale *Peter Schlemihl's Remarkable Story* (1814; Russian translation, 1841). Employing the story of a man who loses his shadow, Chamisso reveals the psychological plight of contemporary man, tempted by wealth and threatened by the loss of his personality. Chamisso can only partly be considered a romantic, as *Peter Schlemihl* is actually an example of late realist literary trends. Chamisso's lyric poetry expresses love for the common people, as well as an interest in social issues. These works include his translations of P. J. de Béranger as well as original works in the style of Béranger and the narrative poem *The Exiles* (1831). His "Frauenliebe und -leben" cycle (1830) was set to music by R. Schumann (1840).

WORKS
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Werke, vols. 1–3. Leipzig-Vienna [1907].
In Russian translation:
Izbr. proizv. v perevodakh rus. pisatelei. St. Petersburg, 1899.
Izbrannoe. Moscow, 1974.
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Istoriia nemetskoi literatury, vol. 3. Moscow, 1966.
Feudel, W. *A. von Chamisso*. Leipzig, 1971. (Contains bibliography.) A. V. MIKHAILOV [29–822–1]

CHAMONIX, a mountain valley in eastern France, along the upper course of the Arve River (a tributary of the Rhône). Elevations range from 1,000 m to 1,500 m. Chamonix is a U-shaped valley into which glaciers, including a tongue of the Mer de Glace, descend from the Mont Blanc Massif. The valley has pastures and meadows and is at one end of the tunnel through Mont Blanc. [29–824–1]

CHAMORROS, the indigenous population of the Mariana Islands, in Western Micronesia. Decimated in the 17th century by Spanish colonists, the Chamorros spoke a Malayo-Polynesian language. They engaged in land cultivation and were evidently at the stage of the disintegration of the primitive communal system. A small number of the surviving Chamorros intermarried with the Spanish and with the Filipinos and Mexicans serving in the Spanish armed forces. The name "Chamorros" is now applied to the resulting group, which is made up of métis and has retained the old language. According to a 1971 estimate, the Chamorros number approximately 65,000. They engage primarily in land cultivation and are nearly all Roman Catholics.

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Puchkov, P. I. *Naselenie Okeanii*. Moscow, 1967. [29–37–7]

CHAMOSITE (from the village of Chamoson in Switzerland). **(1)** A mineral of the subclass of phyllosilicates; an iron chlorite. Chamosite, whose chemical composition is $(Fe, Al, Mg)_3[(Si, Al)_4O_{10}](OH)_2(Fe, Mg)_3(O, OH)_6$, contains more than 30 percent iron oxides. The distance between layers in its structure is 14 angstroms.

(2) A mineral of the family of septechlorites; also known as berthierine or septechamosite. Its chemical composition is $(Fe^{2+}, Fe^{3+}, Al, Mg)_6[(Si, Al)_4O_{10}](OH)_8$. The mineral contains 40–45 percent iron oxides. The composition varies. The structure of chamosite resembles that of kaolinite; the distance between layers is 7 angstroms.

The two minerals may be found together and are difficult to distinguish. They crystallize in the monoclinic system (septechamosite also exhibits a hexagonal modification). They form green, yellow, or brown oolitic or fine-grained (to earthy) aggregates. The hardness on Mohs' scale is 3, and the density varies from 3,000 to 3,300 kg/m^3. Both are hypergenic in origin.

Chamosites are found in clay beds and sedimentary (oolitic) iron ores. Deposits in the USSR occur in the Urals (Alapaevsk, Aiat', and Khalilovo). Other deposits are found in the Lorraine Basin in France, Northhamptonshire in Great Britain, Thuringia in East Germany, and Nučice in Czechoslovakia.

L. G. FEL'DMAN [29–823–4]

CHAMOUN, CAMILLE. Born 1900 in Deir el Qamer. Lebanese statesman and political figure.

Chamoun received a law degree in 1924. He held various government posts during the 1930's and 1940's, and from 1952 to 1958 he was president of Lebanon. As president, Chamoun carried out a policy of rapprochement with the imperialist powers. He was forced to resign in September 1958 as a result of a popular uprising.

In 1958, Chamoun founded the National Liberal Party, the party of the reactionary Maronite bourgeoisie, landowners, and clergy, and became its chairman. He was a leader of the reactionary forces of the right during the Lebanese civil war of 1975–76. [29–829–4]

CHAMPAGNE, a historical region in northwestern France. Now the departments of Marne, Haute-Marne, Aube, and Ardennes. Area, 2,600 sq km. Population, 1,337,000 (1975). The principal city is Reims.

In 1974, 40.7 percent of Champagne's economically active population was employed in industry and construction, and 14.6 percent in agriculture. Such cities as Reims, St. Dizier, and Mézières have metalworking and machine-building industries. The region also has a textile industry, a knitwear industry (Reims, Troyes, and Sedan), a wood-products industry, and a paper industry.

Food products are manufactured; of particular importance is the production of champagne in Reims, Epernay, Châlons-sur-Marne, and Bar-sur-Aube. Agriculture is dominated by the cultivation of wheat, barley, Indian corn, and, on the slopes of the cuestas of Ile-de-France, grapes. Livestock is also raised.

Champagne is first mentioned in historical sources as a county formed between the late ninth and late tenth centuries. During the Middle Ages, Reims, Châlons-sur-Marne, Troyes, and Provins were noted for the production of woolen fabrics; sheep were raised in the region. In the 14th century wine-making became a major industry.

In the 12th and 13th centuries the trade fairs of Champagne played an important role in Western European commerce. The fairs were held in a fixed order in the cities of Lagny, Bar-sur-Aube, Provins, and Troyes, so that virtually throughout the year a fair was under way in some city of the region.

Champagne was first joined to the royal domain in 1284; the union became permanent in 1361. In the 14th century, during the Hundred Years' War of 1337–1453, Champagne was one of the main theaters of military action; as a result, the economic significance of the fairs declined. The Jacquerie, an antifeudal peasant uprising, spread to part of the region in 1358.

On the eve of the French Revolution, Champagne was one of the most backward provinces in France. When France was divided into departments in 1790, Champagne ceased to exist as an independent entity. [29–826–1]

CHAMPAGNE, a sparkling grape wine saturated with carbon dioxide by secondary fermentation of wine material that has been specially prepared and processed in hermetically sealed bottles or tanks. The increased content of carbon dioxide in champagne causes the wine's frothing and sparkling when the bottle is opened.

Champagne took its name from the French province of Champagne, where it was first made in the mid-17th century, and the process of saturating wine with carbon dioxide by secondary fermentation is referred to as *champagnization*. In accordance with French law, the name "champagne" can be used only for bottle-fermented sparkling wine produced in the province of Champagne. Sparkling wines from other wine-making regions of France are called *mousseux*. In the German Democratic Republic and the Federal Republic of Germany, German sparkling wines are produced under the name *Sekt*, and the Italian name is *spumante*. In the USSR the terms *Sovetskoe shampanskoe* and *Igristoe* are used. The different varieties of the latter include Donskoe, Sevastopol'skoe, Muskatnoe, and Tsimlianskoe.

Wine material obtained from special grape varieties is used to make sparkling wines. Wine may be secondarily fermented in the bottle or in the tank; tank fermentation may be done in several steps or by the continuous method.

Bottle fermentation begins with the preparation of a tirage mixture containing blended wine material, a sugar solution, and a separate pure yeast culture. The bottles are carefully corked and racked for fermentation and aging. After three to four weeks the sugar added to the wine ferments, and a pressure of up to five atmospheres develops in the bottles as a result of the formation of carbon dioxide. The aging of the wine in contact with the yeast (from the moment the wine is poured into the bottle until the yeast residue is removed) lasts three years. During this period the champagne acquires its characteristic flavor and bouquet, as well as its ability to sparkle and froth, as a result of complex physicochemical and biochemical processes.

Toward the end of the aging process the bottles are racked to clarify the wine and collect the sediment on the cork; this process is called riddling or *remuage*. The necks of the bottles are frozen to facilitate the collection of sediment on the cork, after which the bottle is opened and the sediment is removed, along with the cork; this process is called disgorging or *dégorgage*. A liquor of high-grade wine, sucrose, and brandy spirits is added to the bottle for the required sweetness. The bottle is then recorked, put through a final aging period, and packaged and shipped.

In step-by-step tank fermentation, the wine is fermented in large-capacity tanks (usually 5–10 cu m) for about one month. It is then cooled, filtered, and poured into bottles.

In the continuous tank-fermentation method, which was developed in the USSR, all steps from the initial processing of the wine material to the finished product are conducted in a continuous flow. In this procedure the blend of wine materials is biologically deaerated in fermenters with a high yeast concentration. It then undergoes pasteurization and additional fermentation with yeast in a series of fermentation tanks or a single tank with numerous chambers. After the addition of sugar solution it is enriched by biologically active substances in special devices called biogenerators, cooled to a temperature of about −5°C, and filtered. A final dose of sugar solution is added, and the wine is poured into bottles. The continuous method produces a champagne as fine as bottle-fermented varieties.

Soviet champagne contains 10.5–12.5 percent alcohol by volume. Different types of Soviet champagne are distinguished according to sugar content: brut (to 0.3 percent), extra dry (0.8 percent), dry (3 percent), semidry (5 percent), semisweet (8 percent), and sweet (10 percent). Bottle-fermented champagne is marked "aged" (*vyderzhannoe*) on the label.

Z. N. KISHKOVSKII [29–825–2]

CHAMPAGNE D'ARGENT, a breed of rabbit raised for its meat and pelt. Developed in India, the rabbit was named for the French province of Champagne, where the breed was improved. Adult rabbits weigh 3.7–4.0 kg; young rabbits at four months weigh 2 kg. A litter consists of six or seven young. The pelt is thick and silvery. The tip of the snout and the ears are dark silver. The rabbits are black at birth, acquiring their adult coloration at the age of five or six months. They fatten rapidly and yield a high-quality carcass. The rabbits are bred in France, Austria, Great Britain, the USA, and other countries. In the USSR they were bred prior to the development of the silver rabbit. [29–827–1]

CHAMPAIGN, a city in the northern USA, in the state of Illinois. Population, 62,000 (1975; including the neighboring city of Urbana and the surrounding metropolitan area, 165,000). Champaign's industries include machine building and the production of scientific equipment, instruments, and medicines.

[29–827–3]

CHAMPAIGNE, PHILIPPE DE. Baptized May 26, 1602, in Brussels; died Aug. 12, 1674, in Paris. French painter.

Champaigne worked in Paris from 1621. He executed ornamental compositions in palaces and churches, notably those in the Luxembourg Palace, on which he collaborated with N. Poussin. Influenced by Jansenism, Champaigne painted religious scenes distinguished for their ascetic restraint, such as *The Last Supper* (1648, the Louvre, Paris). In his severe, penetrating portraits he combined elements of Flemish realism and early French classicism; of special note are his likenesses of A. J. Richelieu, J. Mazarin, and A. d'Andilly. Champaigne also painted group portraits, notably, *Two Nuns* (1662, the Louvre).

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Dorival, B. *Philippe de Champaigne: Catalogue*, 2nd ed. Paris, 1952.

[29–827–4]

CHAMPART, in medieval France, the seigneurial requisition of a fixed portion, varying from one-twentieth to one-fourth, of the harvest. It was paid in grain, grapes, flax, and other produce. Lands held by enserfed peasants were subject to this requisition. During the French Revolution, decrees of Aug. 4 to 11, 1789, Mar. 15, 1790, and May 3, 1790, provided for the discontinuance of the requisition with compensation to the landowners. Under the Jacobin dictatorship, however, a decree of July 17, 1793, abolished the *champart* without compensation. [29–827–2]

CHAMPFLEURY (also Fleury, pen name of Jules-François-Félix Husson). Born Sept. 10, 1821, in Laon, Aisne Department; died Dec. 6, 1889, in Sèvres, Hauts-de-Seine Department. French writer.

Champfleury studied at a *collège* (a locally financed or privately owned secondary school) in Laon. In the mid-1840's he be-

gan contributing to magazines. His *Chien-Caillou* (1847) and other collections of short stories and sketches depicted the life of Parisian Bohemians.

A circle of writers formed around Champfleury; their hypercritical work was labeled "realism" by their literary opponents. Champfleury adopted the term, applying it to his own aesthetic theories, which combined tenets of realism with ideas close to those of naturalism and of "art for art's sake." He considered the portrayal of the lower classes of society to be the chief task of literature. Champfleury embodied his aesthetic views in such novels as *The Sufferings of Schoolmaster Delteil* (1853) and *The Bourgeois of Molencharat* (1855).

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In Russian translation:
"Iz knigi *Realizm*." In the collection *Literaturnye manifesty frantsuzskikh realistov*. [Leningrad, 1935.]
REFERENCES
Istoriia frantsuzskoi literatury, vol. 2. Moscow, 1956.
Reizov, B. G. *Frantsuzskii roman XIX v*. Moscow, 1969. [29–837–3]

CHAMPIGNY-SUR-MARNE, a city in France, in Val-de-Marne Department, on the Marne River. Population, 76,000 (1975). Champigny-sur-Marne has machine-building and food-processing industries. [29–827–5]

CHAMPION, an athlete or team victorious in an official championship. The word is also applied by analogy to those who place first in a number of different sports events or in combined events, for example, in the Olympic Games and Spartakiads. [29–173–3]

CHAMPIONSHIP, an official major competition in any sport, held among sports associations or within a specific region (raion, city, oblast, nation, continent, world), in which the team or player capturing first place is declared the champion. In certain instances, "championship" (*chempionat*) is distinguished from "first place" (*pervenstvo*). In football and hockey, for example, adults compete for the USSR championship, and junior-class athletes and sports clubs compete for first place.

The Russian term *chempionat* is also used at livestock fairs in determining the best specimens of a given breed. [29–173–4]

CHAMPLAIN, SAMUEL DE. Born 1567 in Brouage, near Rochefort; died Dec. 25, 1635, in Quebec. French hydrographer. Explorer of Canada and the northeastern USA.

Champlain made a journey along the St. Lawrence and Saguenay rivers in 1603. Between 1604 and 1606 he explored various parts of the Atlantic coast of North America, including the peninsulas of Nova Scotia and Cape Cod, the Bay of Fundy, and Massachusetts Bay; he discovered the island of Nantucket. In 1608 he founded the city of Quebec near the mouth of the St. Lawrence River.

Champlain explored the Richelieu River, a right tributary of the St. Lawrence, in 1609. On that trip he discovered the Adirondacks, the Green Mountains, and the lake that was later named for him. Between 1609 and 1615 he undertook trips in search of a water route to the Pacific Ocean. In 1615 and 1616, Champlain journeyed by way of the St. Lawrence and Ottawa rivers and Lake Nipissing to Lake Huron deep within the North American continent.

WORKS
Oeuvres de Champlain, 2nd ed, 6 vols. Paris, 1870.
REFERENCE
Magidovich, I. P. *Istoriia otkrytiia i issledovaniia Severnoi Ameriki*. Moscow, 1962. [29–828–1]

CHAMPLAIN, a lake in the northeastern USA and in Canada. Lake Champlain has an area of 1,137 sq km and reaches a depth of 183 m. The basin is of tectonic origin. The lake drains into the St. Lawrence River and is part of the waterway that connects the Hudson River with the St. Lawrence. The cities of Burlington and Plattsburgh are situated on Lake Champlain. [29–828–2]

CHAMPOLLION, JEAN-FRANÇOIS. Born Dec. 24, 1790, in Figeac; died Mar. 4, 1832, in Paris. French scholar; founder of Egyptology. Member of the Académie des Inscriptions (1830).

After many years of studying the inscriptions of the Rosetta Stone, Champollion, in September 1822, set forth the main principles for the decipherment of the hieroglyphic writing of the ancient Egyptians. He also established the sequence of development of Egyptian writing—hieroglyphic, hieratic, and demotic. From 1828 to 1830 he headed an archaeological expedition to Egypt, where he collected and copied an enormous number of texts, ideograms, and records, which were published after Champollion's death in *Monuments de l'Egypte et de la Nubie*. In 1831, Champollion accepted the chair of Egyptology, created especially for him, at the Collège de France; he was the first to compile a grammar and dictionary of the Egyptian language, which was published posthumously.

Champollion was an honorary member of the St. Petersburg Academy of Sciences (1826).

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L'Egypte sous les Pharaons, vols. 1–2. Paris, 1814.
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Hartleben, H. *Champollion, sein Leben und sein Werk*, vols. 1–2. Berlin, 1906.
Pourpoint, M. *Champollion et l'énigme égyptienne*. Paris, 1963. [29–828–3]

CHAMSON, ANDRÉ. Born June 6, 1900, in Nîmes, Gard Department. French writer. Member of the Académie Française (1956). Participant in the Resistance.

Chamson graduated from the faculty of letters of the University of Paris. In his early novels, such as *Roux, the Bandit* (1925) and *The Men of the Road* (1927; Russian translation under the title *People From the Mountains*, 1937), Chamson showed himself to be an acute observer of social change in the French countryside.

During the 1930's, Chamson took part in the struggle of the Popular Front and wrote the antifascist books *The Year of the Vanquished* (1934; Russian translation, 1936) and *The Galley* (1939); he also produced a series of essays about republican Spain. The novel *The Well of Miracles* (1943, published 1945; Russian translation, 1947) is filled with loathing for occupiers and traitors.

Chamson focused on the spiritual degeneration of man in the bourgeois world in *The Man Who Walked Before Me* (1948) and continued his sharp criticism of social mores in the novel *The Snow and The Flower* (1951). His novels *The Meeting of Hopes* (1961) and *The Magnificent Woman* (1967) were received sympathetically by French democratic critics. Chamson's book *The Sum of Our Days* (1954) is autobiographical.

WORKS
La Tour de Constance. Paris, 1971.
In Russian translation:
"Eto nekhoroshii adres." *Znamia*, 1967, no. 3.
"Po griby." In *Frantsuzskaia novella 20 v 1900–1939*. [Moscow, 1973.]
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Rolfe, L. *The Novels of A. Chamson*. New York [1971].
M. N. VAKSMAKHER [29–829–3]

CHAMZINKA, an urban-type settlement and the administrative center of Chamzinka Raion, Mordovian ASSR. Chamzinka has a railroad station on the Krasnyi Uzel–Kanash line, 44 km northeast of the city of Saransk. Industry is represented by the Avtozapchast' Plant, a butter factory, and a bulb-base shop of the Svetotekhnika Saransk Production Association. The settlement also has a poultry farm and a people's amateur theater. [29–37–5]

CHAN (also Laz), the unwritten language of the Laz (Chan). Chan is a Kartvelian language; with Megrelian, it is often regarded as a dialect of San, or Mingrelo-Chan. Three dialects of Chan are spoken on the Black Sea coast of Turkey: Khopa, Vitse-Arkhaba, and Atina.

Chan has a simple vowel system (*a, e, i, o,* and *u*) and 32 consonants. Nominal stems are stable, and there are seven cases: nominative, ergative, dative, genitive, ablative, instrumental, and allative. Categories of the verb include person, number, tense, version, voice, potential, causative, and aspect; the category of mood includes 14 modal and tense forms. Directional preverbs are common. The vocabulary of Chan abounds in Turkisms and contains Georgian and Greek loanwords.

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Ch'ik'obava, Arn. *Chanuris gramatikuli analizi tek'stebit'urt'*. Tiflis, 1936.
M. E. ALEKSEEV [29–42–4]

CHANBA, SAMSON IAKOVLEVICH. Born June 18, 1886, in the village of Atara, in what is now Ochamchira Raion, Abkhazian ASSR; died 1937. Soviet Abkhazian writer and state figure. Member of the CPSU from 1921.

Chanba, the son of peasants, graduated from the Khoni Teachers Seminary in 1914 and worked as a teacher. From 1921 to 1925 and from 1930 to 1932 he was people's commissar of education in Abkhazia. From 1925 to 1930 he served as chairman of the Central Executive Committee of the Abkhazian ASSR.

Chanba wrote in both Russian and Abkhazian. His works were first published in 1916. His romantic narrative poem *Mountain Maiden* (1919) was followed by the plays *Makhadzhiry* (1920, staged 1928), *Apsny Khanym* (1923), and *From the Past* (1929). These plays, based on themes drawn from revolutionary history and everyday life, were the first examples of Abkhazian drama. Chanba also wrote short stories of great psychological depth. His novella *Seidyk* (1934), which is concerned with the initial period of collectivization, was one of the first significant prose works in Abkhazian literature.

WORKS
In Russian translation:
Izbrannoe. Sukhumi, 1960.
REFERENCE
Lakoba, N. *Samson Chanba: Zhizn' i tvorchestvo*. Sukhumi, 1972.
KH. S. BGAZHBA [29–38–3]

CHANCELADE, a commune in southwestern France, where in 1888, during excavations of a rock-shelter near the city of Périgueux, investigators found a human skeleton from the Upper Paleolithic period, along with implements and primitive art objects of the Magdalenian culture. Anthropologically, the person from Chancelade was a variant of Upper Paleolithic man of Western Europe, who lived 12,000 to 15,000 years ago. [29–834–5]

CHANCELLOR, RICHARD. Date of birth unknown; died Nov. 10, 1556, off the coast of Scotland. British navigator.

In 1553, Chancellor commanded one of the three ships in H. Willoughby's expedition, which had been sent by an English trading company to search for a northeast passage to India. Chancellor rounded the northern part of the Scandinavian and Kola peninsulas and sailed to the mouth of the Severnaia Dvina. He was received in Moscow by Ivan IV. After obtaining a charter for free trade with Muscovy, he left the city in March 1554. An account of the expedition was written by C. Adams, one of Chancellor's companions.

In 1555, Chancellor visited Moscow a second time. On the return voyage he perished during a storm.

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CHAN CHAN, the ruins of the capital of the legendary kingdom of Chimor (the Chimú archaeological culture); located in Peru, near Trujillo, in the Moche River valley. Chan Chan, which dates from the first half of the second millennium B.C., had an area of about 18 sq km. Its center comprised rectangular palace complexes, with high (to 9 m) walls of mud brick; each complex included courtyards, storehouses and other outbuildings, and necropolises. Many walls were covered with textile-like reliefs depicting rows of geometricized birds, animals, and people. The edge of the city was randomly built up with dwellings of the common inhabitants.

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V. A. BASHILOV [29–44–2]

CHANCHIANG, a city in Kwangtung Province, China, on the coast of the South China Sea. Population, more than 200,000 (1970). Chanchiang is a terminus of the Lit'ang-Chanchiang Railroad and a seaport. It has chemical, machine-building, construction, match, textile, and food-processing industries. From 1898 until 1945, Chanchiang was part of France's Canton concession. [29–535–2]

CHANCHIBADZE, PORFIRII GEORGIEVICH. Born Dec. 13 (26), 1901, in the city of Makharadze, Georgian SSR; died Mar. 14, 1950, in Moscow. Soviet military leader. Colonel general (1945). Hero of the Soviet Union (Apr. 19, 1945). Member of the CPSU from 1930.

The son of a Georgian peasant, Chanchibadze joined the Red Army in 1921. He graduated from infantry school in 1922, advanced courses for command personnel in 1927, two courses at the M. V. Frunze Military Academy in 1940, Vystrel courses in 1940, and the Higher Academic Courses at the Higher Military Academy in 1948. During the Great Patriotic War of 1941–45, Chanchibadze commanded a motorized rifle regiment, a rifle division, and a corps between 1941 and 1944. In June 1944 he assumed command of the Second Guards Army. He fought in the battles of Moscow and Stalingrad, in the liberation of the Crimea, the Donbas, and Byelorussia, and in the East Prussian Operation. After the war he held various command positions in the military.

Chanchibadze was a deputy to the second convocation of the Supreme Soviet of the USSR. He was awarded two orders of Lenin, three orders of the Red Banner, Orders of Suvorov First and Second Class, the Order of Kutuzov Second Class, the Order of Bogdan Khmel'nitskii Second Class, the Order of the Red Star, and various medals. [29–44–5]

CHANCROID (soft chancre; also called venereal ulcer in Russian), an infectious disease in man, caused by the streptobacillus *Hemophilus ducreyi*, or Ducrey's bacillus (described in the late 1880's and early 1890's by the Russian O. V. Petersen, the Italian A. Ducrey, and the German P. Unna) and transmitted mainly through sexual intercourse.

The causative agent of chancroid is found in the discharge from the chancre; under a microscope it looks like a short rod with rounded ends and a slender middle. Two to five days after infection, a pustule forms over a bright red edematous spot at the site of entry of the infection; the pustule opens three or four days later and becomes a small painful ulcer with ragged edges, undermined by a purulent deposit and with a soft base encircled by a red edematous rim. The purulent discharge from such ulcers reaches the surrounding tissues and gives rise to numerous new ulcerations, which become scarred after a month or two. When the streptobacilli penetrate the regional lymphatic nodes, the latter become enlarged (bubo formation); they coalesce and fuse with the skin, soften, and open to form ulcers. The process is accompanied by local pain, high temperature, and general malaise.

Treatment includes the use of antibacterial agents and immersion of the affected area in a warm manganese bath. (*See* VENEREAL DISEASES for a description of preventive measures.)

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CHANDAR KRISHAN (also Krishan Chandar). Born Nov. 19, 1913, in Wazirabad; died Mar. 7, 1977, in Bombay. Indian Urdu-language writer.

Krishan Chandar graduated from Farman Christian College in Lahore, in 1934. In 1953 he became secretary-general of the Association of Progressive Writers of India. In his short stories of the 1930's and in his first novel, *Defeat* (Russian translation, 1958), he described events realistically while romantically idealizing reality. His later works reveal a more profound critical realism, and the novella *When the Fields Awakened* (1951; Russian translation, 1953), which describes an antifeudal peasant uprising in Telingana, contains features of socialist realism. His novella *The Traitor* and the short-story collection *We Are Savages* (1949) describe the partition of India in 1947.

In his novels, novellas, and short stories, Chandar dealt with topical issues of Indian reality, portraying the life of the peasants, the urban poor, and the artistic intelligentsia. He also published satirical works, such as the trilogy *The Ass's Adventure* (1958–65) and the novellas *The Children From Dadar Bridge* (1958; Russian translation, 1973) and *The Paper Boat* (1966, Russian translation, 1972).

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A. S. SUKHOCHEV [29–39–4]

CHAND BARDAI. Lived in the second half of the 12th century. Indian poet and storyteller.

Chand Bardai wrote in a Rajasthani dialect. He is the author of the heroic epic poem *Prithiraj Raso*, which recounts the life of the Delhi prince Prithwiraj III. According to legend, Chand Bardai lived at Prithwiraj's court. The poem, which long existed only in oral form, glorifies the military victories and romantic exploits of the feudal lords. The modern version, with later additions, dates no earlier than the 17th century. Approximately 50 known manuscript versions exist, the earliest of which dates from 1610.
V. I. BALIN [29–39–2]

CHANDERNAGORE, a city and port in northeastern India, in the state of West Bengal, near the city of Calcutta, on the Hooghly River (a branch of the Ganges) in the Ganges delta. Population, 76,000 (1971). Chandernagore has a railroad station; its port is accessible to oceangoing vessels. The city has a jute factory; cotton fabrics are also produced. From 1673 until 1950, Chandernagore was a French possession. [29–40–1]

CHANDIGARH, a union territory of India, that is, an administrative and political unit in India controlled by the central government. Located in the northwestern part of the country, in the foothills of the Himalayas, Chandigarh has an area of 114 sq km. The population was 300,000 in 1975. The city of Chandigarh is the capital of the union territory. [29–40–2]

CHANDIGARH, a city in northwestern India, at the foot of the Himalayas. Capital of the states of Punjab and Haryana (although not a part of either one) and of the Union territory of Chandigarh. Population, 257,000 (1971). Chandigarh manufactures woolens, knitwear, and pharmaceuticals. The city has a university.

The greater part of Chandigarh was built between 1951 and 1956 in accordance with a plan by a team of Indian and foreign architects headed by Le Corbusier. It combines a geometric system of transportation lines with picturesque landscaped pedestrian paths. It features principles of modern architecture and urban planning, including the use of dwelling units fully serviced with public utilities and transportation arteries differentiated according to purpose. Structures in the city also incorporate traditional Indian architectural devices, including the *jali*, or open-work lattice. [29–40–3]

CHANDLER, SETH CARLO. Born Sept. 17, 1846, in Boston; died Dec. 31, 1913, in Wellesley, Mass. American astronomer.

Chandler graduated from Harvard University in 1861 and was a staff member of the Harvard Observatory from 1881 to 1904. His principal works are devoted to latitude variations and the motion of the earth's poles. On the basis of approximately 33,000 observations he concluded that latitude variations consist of two periodic components: one with a period of a year and one with a period of 14 months (Chandler period). Chandler also investigated variable stars. [29–174–4]

CHANDPUR, a city in Bangladesh, in Chittagong Division, in the Ganges delta. Population, 34,800 (1961). Chandpur has a railroad station and is a river port. The city's principal industries are jute processing, oil milling, and sawmilling, including the production of matches. [29–40–4]

CHANDRA, ROMESH. Born Mar. 30, 1919, in Lyallpur. Figure in the Indian working-class movement; one of the leaders of the world peace movement; journalist.

Chandra received degrees from a university in Lahore and from Cambridge University. From 1934 to 1941 he was chairman of the Students' Union in Lahore. He became a member of the Communist Party of India (CPI) in 1939, of the Central Committee of the CPI in 1952, of the National Council of the CPI in 1958, and of the Central Executive Committee in 1958; from 1963 to 1967 he was a member of the Central Secretariat of the National Council of the CPI. From 1963 to 1966, Chandra was editor of the central organ of the CPI, *New Age*. He served as general secretary of the All-India Peace Council from 1952 to 1963. In 1953 he joined the World Peace Council, and in 1966 he became the council's general secretary and a member of its presidium; in 1977 he was elected president of the organization.

Chandra was awarded the F. Joliot-Curie Gold Peace Medal in 1964. He received the International Lenin Prize for Strengthening Peace Among Nations in 1968, and he was awarded the Order of Friendship of Peoples in 1975. [29–40–5]

CHANDRAGUPTA, the name of two ancient Indian rulers belonging to the Gupta dynasty.

Chandragupta I. Ruled from 320 to about 340, according to some sources.

Descended from a family of minor rulers of Magadha, Chandragupta I strengthened his position and became ruler of all Magadha by military conquest and the conduct of a successful foreign policy; particularly important was his marriage to Princess Kumara Devi of the Lichchhavi tribe. Chandragupta founded the Gupta empire; the Gupta Era, which began with his accession, was widely used as a chronological frame of reference in ancient and medieval India.

Chandragupta II. Grandson of Chandragupta I. Ruled from 380 to 415, according to some sources.

Chandragupta II ascended the throne after deposing his older brother Ramagupta. He thus inherited a fully developed empire, which he subsequently greatly enlarged. His most important territorial gain was the conquest of the "state of the western rulers" (Gujarat), which gave the empire access to the Arabian Sea. Chandragupta's reign marked the height of Gupta power and was a period of economic well-being for ancient India. Moreover, his rule, which has come to be known as the Golden Age of the Guptas, was a time during which ancient Indian culture flourished.
[29–41–1]

CHANDRAGUPTA MAURYA (also Candragupta Maurya), ruler of the ancient Indian state of Magadha (317–293 B.C.); founder of the Maurya dynasty.

There is little authentic information about Chandragupta's life. Both aristocratic and humble (sudra caste) origins have been ascribed to him. In his youth he served under the Nandas, the rulers of Magadha; he fought them for the throne, but he failed and fled to the northwestern part of the country. There he joined with the invading Greco-Macedonians and convinced Alexander the Great to wage war against the Nandas. After Alexander had left India, Chandragupta led a struggle to expel all the Greco-Macedonians from the country. He succeeded in doing so and resumed the fight for Magadha. After deposing Dhana Nanda, he ascended the throne himself.

In subsequent wars, Chandragupta subjugated all of northern India and founded the Indian Mauryan empire. In 305 B.C. he repulsed the invasion of Seleucus I Nicator. In accordance with the peace treaty they signed, Chandragupta gave Seleucus 500 elephants, in exchange for which he acquired a large area west of the Indus River and received the daughter of Seleucus as his bride. According to some sources, Chandragupta adopted Jainism in 293 B.C. and became a monk.

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CHANDRASEKHAR, SUBRAHMANYAN. Born Oct. 19, 1910, in Lahore, India (now in Pakistan). American physicist and astrophysicist.

Chandrasekhar graduated from the University of Madras in 1930. He received a Ph.D. degree from Cambridge University in 1933 and taught at Cambridge until 1936. He moved to the USA in 1936, becoming an American citizen in 1953. In 1937 he joined the staff of Yerkes Observatory and the faculty of the University of Chicago; he became a professor at the university in 1942.

Chandrasekhar's main works deal with stellar structure, stellar atmospheres, and the dynamics of stellar atmospheres, as well as with mathematical physics, in particular, the theory of stochastic processes. Chandrasekhar developed a theory of white dwarfs that predicts the existence of a mass limit for white dwarfs, which is known as Chandrasekhar's limit, and gives a universal relationship between the mass and the radius of a star; the relationship specifies the final stages of stellar evolution. Chandrasekhar also studied the dynamics of stellar systems and radiative transfer in plane-parallel stellar atmospheres. He examined problems of hydrodynamic and hydromagnetic stability in the framework of the general theory of relativity.

Chandrasekhar became a fellow of the Royal Society of London in 1944 and is a member of both the American Academy of Arts and Sciences and the National Academy of Sciences.

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O. V. KUZNETSOVA [29–41–2]

CHANDYR, a river in Iran and the Turkmen SSR, a left tributary of the Sumbar River of the Atrek River basin. The Chandyr, which is 90 km long and drains an area of 1,820 sq km, rises in the mountains of the Kopetdag. It is fed by springs and rain, and to a lesser degree, by snow. The river, which dries up in summer, reached a maximum measured flow rate of 422 cu m per sec in 1963. The Chandyr is used for irrigation. [29–41–3]

CHANG (also *chank*), an Uzbek and Tadzhik hammered stringed instrument; a type of dulcimer. The *chang* is a flat, wooden, trapezoidal box and is sometimes mounted on small legs; some instruments have round sound holes in the upper soundboard. The metal strings are grouped in threes, except for the bass string, which is single. The instrument produces a bright tone with a lasting resonance and is played by striking the strings with flexible bamboo or wooden sticks. Tempered *changs*, with a chromatic range, are primarily used in small ensembles, but they also appear in modern folk orchestras in the Uzbek SSR and the Tadzhik SSR. Besides the standard version, there are piccolo, tenor, and bass *changs*.

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CHANG CH'IEN. Date of birth unknown; died circa 103 B.C. Chinese diplomat and traveler.

In 138 B.C., Chang Ch'ien was sent on a mission to Central Asia by Emperor Wu Ti in order to conclude an alliance with the Yüeh-chih tribe against the Hsiung-nu. He was captured by the Hsiung-nu, however, and did not escape and resume his journey westward until ten years later. On the return trip he was detained again by the Hsiung-nu, but he quickly escaped. In 115 B.C., Chang Ch'ien was dispatched at the head of an embassy to the ruler of the Wu-sun tribe, which roamed the area west of China's borders; he persuaded the Wu-sun ruler to form an alliance with China. [29–534–4]

CH'ANGCHIH, a city in China, in Shansi Province; located near the upper course of the Chang Shui of the Hai Ho basin, on the Loess Plateau. Population, 180,000 (1959). Industry includes ferrous metallurgy, machine building, the mining and processing of coal, and the production of textiles. [29–44–3]

CHANG CHIH-TUNG. Born Sept. 2, 1837, in Nanp'i Prefecture, Chihli Province; died Oct. 5, 1909, in Peking. Chinese state figure.

Chang Chih-tung was governor-general of Kwangtung-Kwangsi from 1884 to 1889 and of Hupeh-Hunan from 1889 to 1907; from November 1894 to February 1896 he served as governor-general in Nanking. In 1907 he became a member of the supreme ruling body, the Military Council, in Peking. He advocated moderate bourgeois reforms of the Chinese economy, political system, and culture. Chang Chih-tung opened a number of modern industrial plants in Wuhan, Nanking, and Canton. In the same cities he also founded several general-education schools and military academic institutions similar to those in Europe. [29–534–5]

CH'ANGCHOU (also Wuchin), a city in China, in Kiangsu Province. Population, more than 300,000 (1971). Ch'angchou has a railroad station and is a landing on the Grand Canal. Economic activity includes rice polishing, fishing, and the production of textiles and vegetable oil. [29–44–4]

CHANG CHÜEH (also Chang Chiao). Year of birth unknown; died 184. Leader of the Rebellion of the Yellow Turbans in China.

For ten years Chang Chüeh preached the "way of the great peace," an appeal for social equality and struggle against the Han Dynasty that was couched in the language of Taoist mysticism. In March 184 he assumed leadership of an armed uprising begun by his followers in North and Central China. Chang died from wounds received in battle. [29–534–3]

CH'ANGCH'UN, a city in Northeast China, on the It'ung Ho. Capital of Kirin Province. Population, more than 1.5 million (1970).

Ch'angch'un is an important railroad junction and has an airport. The city's machine-building industry, one of the largest in China, was developed between 1953 and 1957 with the help of the USSR. Ch'angch'un produces motor vehicles, rolling stock, tractors, agricultural machinery, machine tools, electric machines and equipment for the textile industry, checking and measuring devices, semiconductor devices, and motion-picture equipment. The city has a metallurgical plant. The chemical industry is represented by a pharmaceuticals plant and by plants producing mineral fertilizers, rubber, industrial rubber goods, synthetic fiber,

and plastics. There are also plants of the wood-products, paper, ceramic, textile, leather, food-processing, and tobacco industries. Cottage industries produce such articles as rugs. Ch'angch'un has a branch of the Chinese Academy of Sciences and a university.

Ch'angch'un arose in the early 19th century and after the construction of the Chinese Eastern Railway between 1897 and 1903 developed into a large commercial and transportation center. In 1931 the city was occupied by Japanese imperialists, who declared it the capital of the puppet state of Manchukuo and renamed it Hsinching, or New Capital. It was liberated by the Soviet Army in August 1945 but after the withdrawal of Soviet troops was seized by the Kuomintang in 1946. In October 1948 the Kuomintang was driven out of Ch'angch'un by the People's Liberation Army of China. [29–45–1]

CH'ANGCH'UN CONFERENCE, negotiations that took place from Sept. 4 through Sept. 26, 1922, in Ch'angch'un, China, between representatives of the Far East Republic (FER) and the RSFSR on one side and Japanese representatives on the other.

The successes of the People's Revolutionary Army of the FER, the strengthened international and domestic position of Soviet Russia and its allied republics, the sharpening of imperialist contradictions in the Far East, and growing difficulties in Japan's internal politics forced the Japanese government to resume the negotiations that were broken off at the Dairen Conference of 1921–22. In May and June 1922, Japan proposed that negotiations begin. On June 30 the government of the FER agreed on condition that the talks be conducted between Japan on one side and the FER and the RSFSR on the other. On July 19 the Japanese government accepted the proposal of the FER and declared that it would evacuate its troops from the Primor'e by Nov. 1, 1922, at the latest.

From the outset the Japanese delegation attempted to limit the conference to Far Eastern issues of interest only to Japan and suggested the conclusion of a treaty with the FER alone. The delegation of the RSFSR and FER opposed this proposal but agreed to adopt the Dairen draft as a basis for negotiations. The Japanese then announced that their government had agreed to conclude a treaty with both the FER and the RSFSR provided that the treaty was restricted to questions affecting the Far East; after the treaty was signed, negotiations could begin on an agreement that would apply to the entire RSFSR.

Japan also stated that it would not evacuate Northern Sakhalin until the issues raised by the Nikolaevsk incident were settled. In the early morning of Mar. 12, 1920, Japanese troops in Nikolaevsk-na-Amure, in violation of an agreement, had attacked partisans in the city and had been defeated; the Japanese government, using the incident as a pretext for continuing its intervention, had then occupied Northern Sakhalin. The delegation of the FER and RSFSR categorically opposed linking the evacuation of Northern Sakhalin with a settlement of the Nikolaevsk issues.

The negotiations in Ch'angch'un were broken off by the Japanese. In early October, White Guard detachments were routed in the Spassk Operation of 1922; the People's Revolutionary Army of the FER approached Vladivostok, which on October 25 was abandoned by the Japanese and the remaining White Guards. In accordance with an agreement of Jan. 20, 1925, on the basic principles of mutual relations between the USSR and Japan, Japanese troops were removed from Northern Sakhalin by May 15 of that year, thus ending the period of foreign intervention in the Far East.

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CHANG GO, a Korean percussion instrument, a type of drum with two heads. [29–47–2]

CHANG HENG. Born A.D. 78; died A.D. 139. Chinese astronomer.

Chang Heng was one of the first to explain the cause of lunar eclipses and the phenomenon of lunar phases. He correctly described the apparent motion of celestial bodies and designed and built several astronomical instruments. His book, *The Armillary Sphere*, which appeared circa 120, presented in detail the theory of the "infinite sky." The theory holds that the universe is boundless in time and space. [29–533–3]

CHANG HSIEN-CHUNG. Born 1606; died 1647. A leader of the Peasant War of 1628–45 in China.

In 1630, Chang Hsien-chung headed a rebel detachment in Shensi Province. In 1635, with Li Tzu-ch'eng, he conducted a campaign in Anhwei Province; he began independent operations in the province in the following year. In 1638 he surrendered to the government and was appointed garrison commander at Kuch'eng, in Hupeh Province. Chang raised another rebellion in 1639 and fought in Hunan and Hupeh. In 1644 he seized the city of Ch'engtu, the capital of Szechwan Province, and proclaimed himself "sovereign of the Great Western State." In January 1647, Chang was defeated by Manchu and Chinese feudal lords. [29–532–4]

CHANG HSÜEH-LIANG. Born 1898. Chinese military and political figure. Son of the warlord Chang Tso-Lin.

After his father's murder in 1928, Chang Hsüeh-liang became ruler of the three northeastern provinces that make up Manchuria; in December 1928 he recognized the authority of the Kuomintang government in Nanking. In 1931, on orders from Chiang Kai-shek, his army gave up Manchuria to the Japanese without a fight. Chiang Kai-shek made use of Chang's army in 1935 and 1936 to combat the Chinese Red Army. In 1936, Chang signed a peace agreement with the Chinese Red Army and helped organize the arrest, on Dec. 12, 1936, of Chiang Kai-shek, who had arrived in Sian (*see* SIAN INCIDENT). After Chiang Kai-shek was released on Dec. 25, 1936, Chang was arrested and imprisoned. In 1946 the Kuomintang took Chang to Taiwan. [29–532–3]

CHANGI, a Georgian plucked stringed instrument, an angular harp. The body of the *changi* resembles an elongated rectangle, to which is attached at a right angle a neck with tuning pegs. The instrument's six to 11 strings are made of twisted horsehair or silk and vary in thickness. The six-string, or Svanetian, *changi* is widely used to accompany singing. The modern *changi* has 16 horsehair or 23 gut strings. Other modern types of *changi* are of different sizes and have 13 gut or nylon strings, which are tuned chromatically. The modern *changi* is used in the State Folksong and Folkdance Ensemble of the Georgian SSR, an orchestral group.

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CHIANG KAI-SHEK (also Chiang Chieh-shih). Born Oct. 31, 1887, in Fenghua, Chekiang Province; died Apr. 5, 1975, in Taipei. Head of the Kuomintang regime; overthrown by the people's revolution in China in 1949.

The son of a merchant, Chiang Kai-shek graduated from military academies in Paoting and Tokyo. Pretending to be a left-wing member of the Kuomintang, he supported Sun Yat-sen in the first half of the 1920's. As commander in chief of the National Revolutionary Army he took part in the Northern Campaign of 1926–27. On Apr. 12, 1927, Chiang carried out a counterrevolutionary coup and established a reactionary dictatorship in China. For more than 20 years he wielded enormous power, holding the posts of chairman of the Central Executive Committee of the Kuomintang (from 1926), chairman of the Executive Yuan, president of the republic, and commander in chief of the armed forces; he assumed the title of generalissimo.

Between 1930 and 1934, Chiang undertook five punitive campaigns against the soviet regions (*see* SOVIETS IN CHINA). After the Japanese attacked China on July 7, 1937, he was forced to form a

united anti-Japanese national front, which rested on the agreement of the Communist Party of China (CPC) and the Kuomintang to carry out combined operations. Chiang continued to use large forces, however, to blockade the region along the Shansi-Kansu-Ninghsia border, which was controlled by the CPC.

After Japan surrendered on Sept. 2, 1945, Chiang rejected the offer of the CPC to form a coalition government and in June 1946 began a new civil war. In late 1949 the People's Liberation Army of China liberated virtually all mainland China from the Kuomintang. Chiang fled with his remaining troops to Taiwan, where he established himself with the military and financial support of the USA. V. I. ELIZAROV [29–42–2]

CHANGKUANGTS'AILING, a mountain range in northeastern China; part of the Manchurian-Korean Mountains. The range measures 420 km in length and rises to a maximum elevation of 1,404 m. It is composed chiefly of granites and gneisses. The range has coniferous and broad-leaved forests. [29–532–1]

CHANG LO-HSING. Year of birth unknown; died 1863. A leader of the Nien Rebellion of 1852–68 in China.

The son of a prosperous peasant, Chang became a salt trader. In early 1853 the insurgents of the Chihhochi region in Anhwei Province elected him their leader. In February 1853 the authorities succeeded in winning Chang to their side, but in August 1854 he rejoined the insurgents, who, in August 1855, proclaimed him supreme leader of the rebellion. From 1857 to 1861 he fought together with the Taiping rebels. In March 1863 his detachments were defeated, and Chang was taken prisoner and executed. [29–532–2]

CH'ANGPAI SHAN (in Korean, Paektu-san), a volcanic plateau in the Manchurian-Korean Mountains, situated mainly in China and partly in the People's Democratic Republic of Korea. The Ch'angpai Shan has elevations ranging from 1,000 to 2,000 m, with a maximum of 2,750 m at the volcano Pait'ou Shan. It is deeply dissected by the Yalu, Man, and Tumen rivers and their tributaries. Coniferous forests and dwarf cedar thickets grow on the plateau. [29–38–4]

CH'ANGSHA, a city in China, on the Hsiang Chiang; capital of Hunan Province. Population, 825,000 (1970). Ch'angsha is a transportation junction. Industry includes food processing, nonferrous metallurgy, the production of textiles (mainly cotton), and machine building (the manufacture of machine tools, instruments, and agricultural equipment). The city is the center of a rice-growing region.

Settlements existed at what is now Ch'angsha as early as the fifth century B.C. The area was a center for the formation of the ancient Chinese Ch'u kingdom, which played an important political role during the Chan Kuo period (fifth to third centuries B.C.). Wood and bronze objects excavated at burials of the period have helped scholars establish the major features of the Ch'u culture, and discoveries of painted human figures have helped in determining the physical type of the people. Ancient Chinese texts inscribed on bamboo tablets have been found near the city. During the rule of the Han Dynasty (third century B.C. to third century A.D.), the production of lacquer ware and bronze mirrors developed in Ch'angsha.

Under the Ch'in Dynasty (221–207 B.C.), Ch'angsha became the seat of a district. Later it was at various times the seat of a district, region, and prefecture. Under the Ch'ing Dynasty (1644–1911) and after the establishment of a republic it was the capital of Hunan Province.

In 1904 one of the first bourgeois revolutionary organizations in China, the Hua-hsing Hui, was established in Ch'angsha. In 1910 a popular uprising known as the rice revolt took place in the city, and in 1920 one of China's first Marxist circles arose in Ch'angsha. In 1941 and in 1944 and 1945 the city was occupied by Japanese troops. In August 1949, Ch'angsha was liberated from the rule of the Kuomintang by the People's Liberation Army of China. [29–46–1]

CHANG SUNG-OP (pseudonym, O Wong). Born 1845; died 1899. Korean painter.

In the 1890's, Chang Sung-op was a member of the Tohwaso, which served as an academy of painting in Seoul. He was a representative of the "birds-and-flowers" school and of the traditional Korean painting technique in india ink and watercolors. His works include *Shepherd With Buffalo and Butterflies* (Central Historical Museum, Pyongyang). [29–43–1]

CHANG T'AI-LEI. Born 1898 in Ch'angchou; died Dec. 12, 1927, in Canton. Figure in the Communist Party of China (CPC).

The son of an office worker, Chang T'ai-lei graduated from Peiyang University in Tientsin in 1919. He took part in the anti-imperialist May Fourth Movement in 1919. In 1920 he joined a Communist circle and helped found the Chinese Socialist Youth League. In 1921 he became a member of the CPC and attended the Third Congress of the Comintern as a delegate of the CPC; there he met V. I. Lenin. Chang helped organize a united anti-imperialist front based on cooperation between the CPC and the Kuomintang.

Chang became a candidate member of the Central Committee of the CPC in 1925 and a member of the Central Committee in May 1927. He took part in the Nanch'ang Uprising of 1927. At the extraordinary conference of the Central Committee of the CPC held on Aug. 7, 1927, he was elected a candidate member of the Central Committee's Provisional Politburo and was appointed secretary of the Kwangtung provincial committee of the party. In December he was the principal organizer and leader of an armed uprising in Canton (*see* KUANG-CHOU UPRISING OF 1927). Chang was assassinated by counterrevolutionaries. [29–532–5]

CHANG T'AI-YEN. Born 1868 in Hangchou; died 1936 in Suchou. Chinese political figure.

Chang was a leader of the Kuang Fu Hui, a revolutionary organization founded in 1904. In 1906 he joined the T'ung-meng Hui and became editor of its journal, *Min pao* (The People). His journalism, which called for the overthrow of the Manchu Ch'ing dynasty, reflected the influence of Great Han and Pan-Asian theories. During the Hsinhai Revolution of 1911–13, Chang supported Yüan Shih-k'ai. During the Revolution of 1925–27 he opposed the Communist Party of China and friendship with the USSR. In later life Chang withdrew from politics. [29–533–1]

CH'ANGTE, a city in China, in Hunan Province, in the basin of Tungt'ing Hu. Population, 111,000 (1959). Ch'angte is a logging center. Bamboo is among its products. The city also has a food-processing industry. [29–42–1]

CHANG T'IEN-I. Born 1906 in Nanking. Chinese writer.

Chang T'ien-i served as a deputy in the National People's Congress of China. His published works include the novels *One Year* (1933) and *In the City* (1935), the novellas *Notes From the World of the Spirits* (1931) and *On Ch'ing-ming Day* (1936), and the short-story collections *The Bees* (1933), *Moving* (1934), *Finale* (1935), and *Stories About Strange People* (1936). Chang T'ien-i was psychologically convincing in his depiction of the intellectual who is torn by contradictions. The author voiced his opposition to militarism, corruption, bribery, and careerism. During the Sino-Japanese War of 1937–45 he wrote satirical works, such as the short story "Mr. Hua Wei" (1938).

After the establishment of the Chinese People's Republic in 1949, Chang T'ien-i edited the journal *Jen-min wen-hsueh* (People's Literature). He also wrote children's books—*The Story of Lo Wen-ying* (1954; Russian translation under the title *Young Pioneer Friends*, 1956), *Big Lin and Little Lin* (1949; Russian translation, 1958), and *The Secret of the Precious Pumpkin* (1949; Russian translation, 1958).

Information about Chang T'ien-i has been unavailable since the mid-1960's.

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CHANG TSAI. Born 1020; died 1077. Chinese philosopher; one of the founders of neo-Confucianism.

Chang Tsai held that the universe is one but differs in its manifestations; its unifying "material force" is the *ch'i*, which as a result of objective necessity sometimes comes together, forming a multitude of things, and sometimes is dispersed, reverting to the *hsü*, or Great Vacuity. Another one of Chang Tsai's basic tenets was that every human relationship is associated with a particular requirement. Such relationships, however, are always contained within love; consequently, the man who loves becomes identified with Heaven and Earth, which give birth to everything and everyone. Chang Tsai also advocated a return to the *ching t'ien* system, which equalized the availability of land for peasant use.

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CHANG TSO-LIN. Born 1876; died June 21, 1928, in Mukden. Chinese general and head of the Fengt'ien clique of warlords.

During the Russo-Japanese War of 1904–05, Chang was head of one of the Hung hu-tzu bands, which aided the Japanese in Manchuria. In 1906 he and his band were incorporated into the Chinese Army, and Chang was soon appointed a division commander. He became de facto ruler of Manchuria during the Hsinhai Revolution of 1911–13 and, after the death of Yüan Shih-k'ai in 1916, absolute dictator; he was supported by the Japanese.

In 1926 and 1927, as commander in chief of an army that united the forces of various warlords of Central and North China, Chang fought against the revolutionary army of the Canton (later Wuhan) government. In April 1927, on his orders, police raided the Soviet embassy in Peking; 25 Chinese Communists, led by Li Tachao, were arrested and executed. In 1928, Chang attempted to align himself with the USA. Chang was killed in a train explosion planned by Japanese intelligence. [29–534–1]

CH'ANGTU, a city in China, in the Tibetan Autonomous Region; situated in the valley of the Lants'ang Chiang (Mekong River), at an elevation of more than 3,000 m. Population, approximately 10,000. Ch'angtu is a commercial and transportation center on the Szechwan-Tibet Highway. Its industries include the repair of motor vehicles and the manufacture of leather products. [29–37–4]

CHANG WEN-T'IEN (pseudonym, Lo Fu). Born 1900 in Nanhui District, Kiangsu Province; died July 1976 (?). Chinese political figure.

A member of a well-to-do family, Chang graduated from an engineering school in Nanking. He studied in the USA from 1921 to 1923, and in 1925 he joined the Communist Party of China (CPC). He studied in Moscow from 1926 to 1930. Chang became a member of the Central Committee of the CPC in 1931 and served on the Politburo of the Central Committee from 1931 to 1956. In 1934 he was elected chairman of the Council of People's Commissars of the Chinese Soviet Republic (*see* SOVIETS IN CHINA). In 1935 he became general secretary of the Central Committee of the CPC, but in 1943, during the Rectification Campaign, he was removed from his post.

Between 1946 and 1950, Chang was successively head of the organizational department of the Central Committee of the CPC, secretary of the Liaotung provincial committee of the party, and a member of the Northeast Bureau of the Central Committee. He was ambassador of the People's Republic of China (PRC) to the USSR from 1951 to 1955 and deputy foreign minister of the PRC from 1954 to 1959. In 1956 he became a candidate member of the Politburo of the Central Committee of the CPC.

In 1959, with P'eng Te-huai and others, Chang opposed the adventurist policy of the "three red banners": the new "general line," the "great leap forward," and the "people's communes." Because of his opposition he was accused at the Eighth Plenum of the Central Committee of the CPC in 1959 of antiparty activity and was removed from his posts. Chang then disappeared from political life. [29–531–5]

CHANHU-DARO, the remains of a multilevel Bronze Age settlement in Pakistan, located near Sarkand, in the northern part of Sind. Chanhu-Daro was investigated in 1931 by the Indian archaeologist N. G. Majumdar and was excavated in 1935 and 1936 by the British archaeologist E. Mackay. The lower layers have been traced back to three periods of the Harappa civilization (23rd to 17th centuries B.C.). After a short interval, the settlement was again populated, by bearers of the Jhukar culture (c. 16th and 15th centuries B.C.) and still later by bearers of the Jhangar culture (12th and 11th centuries B.C.). Information from Chanhu-Daro has been used by a number of researchers to illustrate the displacement of the indigenous population of the Indus Valley (Harappa civilization) by alien tribes of Vedic Aryans.

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N. IA. SHCHETENKO [29–43–3]

CHAN KUO (Warring States), a period in the history of ancient China that lasted from 403 B.C. to 221 B.C. and was characterized by an exacerbation of the hegemonic struggle among the major kingdoms (Ch'in, Han, Wei, Chao, Yen, Ch'i, and Ch'u). The Chan Kuo period was also a time of rapid economic, social, and cultural development in China. The wars among the kingdoms ended with the formation of the centralized Ch'in Empire. [29–535–1]

CHANNEL, a beam or strip, usually made of metal, with a squared-off, U-shaped cross section, with a height of 50–400 mm and a wall thickness of 4–15 mm. Steel channels are produced primarily by hot rolling billets in section mills (*see* ROLLED SECTION). Channels with thin flanges are produced on section-bending machines; those made of nonferrous metals are usually manufactured by extrusion through a shaped slot. Several dozen shapes and sizes of channels are produced. They are primarily used in construction. [29–997–4]

CHANSON. (1) Polyphonic songs of the 15th and 16th centuries. The chansons, which were preceded by the ballades, virelays, and rondeaux of Guillaume de Machaut (14th century), were developed by Franco-Flemish composers of the Netherlands school. In the 16th century they took on a strikingly national character and were often imitative and descriptive in nature; at the same time, homophony became more predominant. In this period chansons were written by C. Jannequin, the greatest composer of the French Renaissance, and by such composers as C. Sermisy, P. Moulu, P. Certon, G. Costeley, C. Le Jeune, and C. Goudimel. In the early 17th century the chanson was superseded by the homophonic art song.

(2) Songs of the French music hall of the late 19th and 20th century. The music hall singers—the *chansonniers*—often themselves compose, or help compose, the music and words of the chansons they perform.

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V. N. BRIANTSEVA [29–835–1]

CHANSONNETTE (Russian, *shansonetka*), a short song of a playful, even frivolous, nature. The chansonnette is performed with a variety of expressive gestures, and occasionally the vocalist

dances as well as sings. In Russian the term *shansonetka* also refers to a female singer who performs chansonnettes, as in the French cabarets or the cafés chantants of prerevolutionary Russia. [29–835–2]

CHANSONNIER, a French music hall singer who often writes, as well as performs, his material. The art of the *chansonnier* continues a tradition that was developed by the poet P. J. de Béranger and the songwriter P. Dupont (19th century), as well as by G. Montegues (20th century), whom V. I. Lenin heard sing. Among the greatest *chansonniers* are M. Chevalier, G. Brassens, E. Piaf, and C. Aznavour. [29–835–3]

CHANTILLY, a city in northern France, in Oise Department. Population, 11,000 (1968). Chantilly is a transportation junction. Its industries produce precision machinery, photographic materials, and ceramic ware.

The city is famous for the Grand Château de Chantilly, which was erected between 1527 and 1530 under the direction of the architect P. Chambiges in the French Renaissance style. The château passed to the Condé family in 1643 and was thereafter gradually rebuilt according to the plans of F. Mansart and other architects, such as A. Lenôtre, who designed the park. The Grand Château de Chantilly now houses the Musée Condé, a collection of old French art.

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CHANY, an urban-type settlement and the administrative center of Chany Raion, Novosibirsk Oblast, RSFSR. Chany is located on the Baraba Steppe and has a railroad station on the Omsk-Novosibirsk line, 402 km west of Novosibirsk. Industry is represented by a butter combine, a meat-packing plant, and a brickyard. [29–47–1]

CHANY, a closed salt lake on the Baraba Steppe, in Novosibirsk Oblast, RSFSR. Lake Chany is at an elevation of 106 m, and its area ranges from 1,990 to 2,600 sq km, depending on seasonal and annual fluctuations in the water level. The average depth is 2.2 m, and the maximum depth is approximately 10 m. The shoreline is highly irregular, and there are many long and narrow islands that are oriented in a northeast-southwest direction. The lake is joined with Lake Maloe Chany by a channel. Lake Chany is fed mainly by snow, and the water level varies by approximately 3 m. The lake freezes over in the second half of October or the first half of November, and the ice breaks up in May. There is local navigation. Fish caught in the lake include Siberian roach, pike, Eurasian perch (*Perca fluviatilis*), crucian carp, and the carp *Cyprinus carpio*. [29–46–4]

CH'AOAN (also Ch'aochou), a city in South China, in Kwangtung Province. Landing on the Han Chiang. Population, 104,000 (1959). Industry includes machine building, food processing, and the manufacture of wood products and paper. The city also has cottage industries. [29–47–3]

CHAOCH'ING, a city in southern China, in Kwangtung Province. Port on the river Hsi Chiang. Population, more than 100,000 (1970). Chaoch'ing is a center for the processing of agricultural produce from throughout the province. It produces machinery, chemical fertilizers, and matches. [29–535–4]

CHAO K'UANG-YIN (temple name, T'ai-tsu). Born 927; died 976. Chinese emperor (960–976); founder of the Sung Dynasty.

From 951 to 960, before becoming emperor, Chao K'uang-yin was an important warlord in the Chou (Hou Chou) kingdom. He took part in the struggle against the combined forces of the Khitans and the Northern Han state. With the support of the troops under his command, he proclaimed himself emperor during his campaign of 960. Chao K'uang-yin fought successfully against feudal fragmentation; he unified South China, and he restricted the rights of warlords and major feudal lords by appointing officials from the central region to the various districts and prefectures. [29–535–3]

CHAO SHU-LI. Born 1906 in Ch'inshui County, Shansi Province. Chinese writer. Member of the Communist Party of China. Deputy to the All-China National People's Congress since 1949.

Chao was educated at a pedagogical school. In his youth he gave performances at which he sang antimilitarist songs, and in 1928 he was imprisoned by the Kuomintang authorities for his work on behalf of the Communist Party of China. In 1936 he headed a people's governmental body for a small rural district in the northern liberated areas. Chao used his experience in agrarian reform as the basis of the short stories "Hsiao Erh-hei's Marriage" (1943) and "Rhymes of Li Yu-ts'ai" (1943), which were written in the traditional style of folk prose. The short stories "Meng Hsiang-ying Starts a New Life" (1944) and "The Marriage Registration" (1950), the novella *Changes in Lichiachuang* (1946; Russian translation, 1949), and the novel *Sanliwan Village* (1955) realistically describe transformations in the countryside and changes in people's mores and in their attitudes toward labor and society. In the early 1960's, Chao published short stories dealing with rural life.

Chao's fate since the mid-1960's is unknown.

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CHAPAEV, VASILII IVANOVICH. Born Jan. 28 (Feb. 9), 1887, in the village of Budaiki, now within the city limits of Cheboksary, Chuvash ASSR; died Sept. 5, 1919, near Lbishchensk, now Chapaev, Ural'sk Oblast, Kazakh SSR. Hero of the Civil War of 1918–20. Member of the CPSU from September 1917.

The son of a poor peasant, Chapaev joined the army in 1914 and fought in World War I. For his bravery he was awarded three Crosses of St. George and a medal, and he was promoted to subensign. In 1917 he was hospitalized in Saratov. Later that year he moved to Nikolaevsk (now Pugachev, Saratov Oblast), where in December he was chosen commander of the 138th Reserve Infantry Regiment. In January 1918, Chapaev was appointed commissar of internal affairs of Nikolaevsk District. In early 1918 he formed a Red Guard detachment and suppressed the kulak–Socialist Revolutionary revolts in the district. In May 1918 he became commander of a brigade fighting against the Ural White Cossacks and the White Czechoslovak Corps, and in September 1918 he became head of the 2nd Nikolaevsk Division.

In November 1918, Chapaev was sent to study at the Academy of the General Staff, where he remained until January 1919. He was then sent to the front at his own request and was appointed to the Fourth Army as commander of the Special Aleksandrov Gai Brigade. In April 1919 he took command of the 25th Rifle Division, which distinguished itself in the Buguruslan, Belebei, and Ufa operations during the counteroffensive of the Eastern Front against Kolchak's troops. On July 11 the 25th Division, under the leadership of Chapaev, liberated Ural'sk.

During the early hours of Sept. 5, 1919, White Guards launched a sudden attack on the headquarters of the 25th Division in Lbishchensk. Chapaev and his comrades fought courageously against the enemy's superior forces. After emptying all of his cartridges, the wounded Chapaev tried to swim across the Ural River, but he was struck by a bullet and killed.

Chapaev was awarded the Order of the Red Banner. His legendary deeds have been portrayed in, for example, the film *Chapaev* and D. A. Furmanov's novella *Chapaev* (Furmanov was military commissar of the 25th Division).

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[29–47–4]

CHAPAEV (until 1939, the village of Lbishchensk), a city and the administrative center of Chapaev Raion, Ural'sk Oblast, Kazakh SSR. Chapaev is a landing on the Ural River, 130 km south of Ural'sk. An industrial combine and the V. I. Chapaev Memorial Museum are in the city. [29–48–1]

CHAPAEVKA (also Mocha), a river in Kuibyshev Oblast, RSFSR; a left tributary of the Volga. The Chapaevka is 298 km long and drains an area of 4,310 sq km. It rises on the upland known as the Sinii Syrt and flows through a wide valley before emptying into the Saratov Reservoir. Fed mainly by snow, the river flows intermittently in its upper course. The mean flow rate 179 km from the mouth is 2.53 cu m per sec. The Chapaevka freezes over in November, and the ice breaks up in April. The river is navigable for the 34 km from the city of Chapaevsk to the Volga. [29–48–2]

CHAPAEVO, an urban-type settlement in Kegichevka Raion, Kharkov Oblast, Ukrainian SSR. Chapaevo is 11 km from the Kegichevka railroad station on the Krasnograd-Lozovaia line. The settlement has a sugar factory and an asphalt concrete plant. [29–48–3]

CHAPAEVSK (until 1929, Ivashchenkovo), a city (since 1927) under oblast jurisdiction in Kuibyshev Oblast, RSFSR. Located on the right bank of the Chapaevka River, a tributary of the Volga. Railroad station on the Syzran'-Kuibyshev line, 43 km southwest of Kuibyshev. Population, 87,000 (1976). Chapaevsk has a chemical-fertilizer plant, a silicates plant, a plant for the manufacture of reinforced-concrete products, a cannery, a milk plant, meat-packing and food-processing combines, a clothing factory, and a motor-vehicle transportation combine. Educational institutions include a chemical engineering technicum. Chapaevsk was named for V. I. Chapaev. [29–48–4]

CHAPALA, a lake in Mexico, in the southern part of the Meseta Central. Chapala is approximately 1,500 m above sea level. It has an area of 1,038 sq km, which makes it the largest lake in the country. The average depth of Chapala is about 7 m, and the maximum depth, 33 m. The lake has been drying up in recent decades. The Lerma River flows into Chapala, and the Río Grande de Santiago flows out of it, emptying into the Pacific Ocean. There are lakeshore health resorts on Chapala, and the city of Ocotlán is on its northeast shore. Chapala supplies water to Guadalajara. [29–48–5]

CHAPARRAL, a thicket of primarily hard-leaved evergreen shrubs (mainly 1.5–2 m tall) distributed in the southwestern United States (California, Arizona) and in Mexico. Chaparral is analogous to the European maquis.

Chaparral is usually found on shallow rocky soil on the lower slopes of mountain ranges. It gives way to forest higher up the slope and to prairie and semidesert lower down. Chaparral usually develops in places where forest fires have occurred. (Such vegetation appeared long before man learned the use of fire.) In California chaparral covers 4 million hectares. Chaparral is a plant community consisting of a large number of species, most commonly *Adenostoma fasciculatum*, four species of scrub oak, seven species of bearberry (*Arctostaphylos*), and five species of *Ceanothus*. Many of the plants are capable of forming root undergrowth after being reduced to ashes. Chaparral is sometimes used as pasture and is important in water retention.

T. A. Rabotnov [29–48–6]

CHAPEL (*chasovnia*), in Christian architecture, a small building or structure for prayer without a special place for an altar. Orthodox chapels are usually separate buildings located in cities and villages, on roads, in cemeteries, and elsewhere. [29–75–1]

CHAPELAIN, JEAN. Born Dec. 4, 1595, in Paris; died there Feb. 22, 1674. French writer and literary theorist.

Chapelain was a founding member of the Académie Française. In his *Letter on the Twenty-four Hour Rule* (1630) and his two treatises on representative poetry (1635), he anticipated N. Boileau's work on the literary theory of classicism. He wrote odes, sonnets, madrigals, and works of historiography and literary history. Chapelain's epic poem *The Maid* (cantos 1–12, published 1656; cantos 13–24, published 1882) was burlesqued by Voltaire.

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[29–848–5]

CHAPLIN, BORIS NIKOLAEVICH. Born Sept. 8, 1931, in Moscow. Soviet diplomat. Candidate of technical sciences (1963), docent. Member of the CPSU since 1961.

Chaplin is the son of an office worker. After graduating from the Moscow Mining Institute in 1955, he worked as a foreman and head of a section at mines in the Kuznetsk Coal Basin. From 1965 to 1968 he was second secretary of the Oktiabr'skii raion committee of the CPSU in Moscow, and from 1968 to 1974 he was first secretary of the Cheremushki raion committee of the CPSU in Moscow. In 1974, Chaplin was named ambassador extraordinary and plenipotentiary of the USSR to the Socialist Republic of Vietnam (until 1976, the Democratic Republic of Vietnam). He became a candidate member of the Central Committee of the CPSU in 1976.

Chaplin received the State Prize of the USSR in 1967, and he has been awarded three orders and various medals. [29–51–1]

CHAPLIN, CHARLES SPENCER. Born Apr.16, 1889, in London; died Dec. 25, 1977, in Vevey, Switzerland. American film director, actor, and screenwriter.

A British national by birth, Chaplin was the son of music-hall entertainers. He made his stage debut at the age of eight, and from 1907 to 1912 he worked his way up as a gifted comic actor in the English pantomime troupe of F. Karno. His American film career began in 1914, when he appeared in the comic film short *Making a Living* and in the full-length film *Tillie's Punctured Romance* (Russian title, *A Young Miss*). Chaplin perfected his skills as a comic screen actor by performing in M. Sennett's comedy shorts, and in 1914 he also began working as a director. Thereafter he acted almost exclusively in his own films, of which he was also the director and screenwriter and for which he frequently composed the music.

Chaplin's devices were parody and the grotesque, and he made use of such means of expression as pantomime and the devices of the folk theater, music hall, and circus. He worked at creating the distinctive traits of the character he portrayed—Charlie the tramp, a figure that subsequently gained world fame; gradually the tragicomic aspect of the character became more pronounced.

As a master of comedy, Chaplin reached the highest level of his craft in the films *The Tramp, His New Job, A Night in the Show, The Adventurer, The Pawnshop, Easy Street, The Immigrant, A Dog's Life*, and *Shoulder Arms* (made between 1915 and 1918) and in *The Kid* (1920). In Chaplin's films, the interweaving of the comic and the tragic perception of life grew increasingly evident, and the tendency toward social satire was clearly distinguishable. Chaplin's hero—Charlie the tramp—was an embodiment of the world's poor, the rejects of capitalist society.

Beginning in 1923, Chaplin produced the full-length films *A Woman of Paris* (1923), *The Gold Rush* (1925), and *The Circus* (1928), which are world masterpieces of screen comedy; their criticism of bourgeois society is combined with a profoundly humanist depiction of simple and unfortunate people. Other motifs, explored in greater depth in *City Lights* (1931) and *Modern Times* (1935), are the illusory nature of hope and the tragic fruitlessness of the struggle against social injustice on the part of the "little fellow." The realistic quality of these films is combined with the vividness of comic situations, the hero's touching steadfastness, and the humanistic treatment of the theme of love and the search for happiness.

Chaplin's *The Great Dictator* (1941) was a pointed satire on

fascism, and his political activity during World War II, together with his calls for support of the Soviet people in the war against fascism, placed Chaplin in the ranks of the progressive figures of world culture. His postwar film *Monsieur Verdoux* (1947), which exposed the hypocrisy of capitalist society, evoked a vicious campaign against him as the film's director by reactionary circles in the USA. *Limelight*, made in 1952, expressed Chaplin's thoughts on art, talent, and old age.

Because of the persecutions he was subjected to, Chaplin was forced to leave Hollywood, and in 1952 he settled in Switzerland. *A King in New York*, a film that Chaplin produced in Great Britain in 1957, was a satire on the American way of life; *A Countess from Hong Kong*, made in 1967, was a traditional comedy.

As one of the greatest actors and directors, Chaplin exercised a profound influence on world cinema. In 1954 he was awarded the International Peace Prize for his outstanding contribution to the cause of peace and friendship among nations.

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N. P. ABRAMOV [29–52–1]

CHAPLIN, NIKOLAI PAVLOVICH. Born Dec. 6 (19), 1902, in the village of Rognedino, in what is now Roslavl' Raion, Smolensk Oblast; died Sept. 23, 1938. Figure in the Communist youth movement in the USSR. Member of the Communist Party from 1919.

The son of a priest, Chaplin studied at a *Realschule*. In 1918 he established one of the first Komsomol cells in Smolensk, and in 1919 he served as chairman of a district committee of the Russian Communist League of Youth (RKSM). In 1920 and 1921, Chaplin was secretary of the Tiumen' Provincial Committee and of the Smolensk Provincial Committee of the RKSM, and he was a member of the Smolensk Provincial Committee of the RCP(B). He became head of the political education department of the Central Committee of the RKSM in 1921 and secretary of the Central Committee in 1922. In 1922 and 1923 he was secretary of the Transcaucasian Krai Committee of the RKSM and a member of the krai committee of the RCP(B). Chaplin served as first secretary of the Central Committee of the Komsomol from 1924 to 1926 and general secretary from 1926 to 1928. In 1930 he served as second secretary of the Transcaucasian Krai Committee of the ACP(B).

Beginning in 1931, Chaplin engaged in party and economic work. He was a delegate to the Twelfth through Sixteenth Congresses of the party, and from 1924 to 1930 he was a candidate member of the Central Committee of the ACP(B) and of the Orgburo of the Central Committee. He was a delegate to the second through eighth congresses of the Komsomol, and from 1921 to 1928 he was a member of the Central Committee of the Komsomol. Chaplin was a member of the Central Executive Committee of the Transcaucasian Federation, the Central Executive Committee of the USSR, and the All-Russian Central Executive Committee. He wrote on problems of the youth movement.

Chaplin was awarded the Order of Lenin.

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CHAPLIN, VLADIMIR MIKHAILOVICH. Born 1859; died Nov. 10, 1931. Soviet scientist and teacher, a specialist in heating and ventilation engineering.

Chaplin graduated from the Moscow Higher Technical School; in 1898 he became a professor there. In 1905 he developed Russia's first forced-circulation hot-water heating system; this system is still of value in present-day sanitary engineering. Beginning in 1910, Chaplin dealt with problems of the ventilation of industrial enterprises. [29–51–2]

CHAPLINKA, an urban-type settlement and the administrative center of Chaplinka Raion, Kherson Oblast, Ukrainian SSR. Located 16 km from the Kalanchak railroad station on the Kherson-Dzhankoi line, Chaplinka has a creamery, a mixed-feed plant, a bituminous concrete plant, a poultry hatchery, and a mill. [29–53–1]

CHAPLINO, an urban-type settlement in Vasil'kovka Raion, Dnepropetrovsk Oblast, Ukrainian SSR. Chaplino is a railroad junction for lines to Dnepropetrovsk, Kransnoarmeisk, and Berdiansk. The city has enterprises serving railroad transportation. A state fruit nursery is located in Chaplino. [29–53–2]

CHAPLYGIN, SERGEI ALEKSEEVICH. Born Mar. 24 (Apr. 5), 1869, in the city of Ranenburg, Riazan' Province, now the city of Chaplygin, Lipetsk Oblast; died Oct. 8, 1942, in Novosibirsk. Soviet specialist in theoretical mechanics, one of the founders of modern aerohydrodynamics. Academician of the Academy of Sciences of the USSR (1929; corresponding member, 1924). Hero of Socialist Labor (1941). Student and colleague of N. E. Zhukovskii.

In 1890, Chaplygin graduated from the faculty of physics and mathematics at Moscow University, where he had specialized in applied mathematics. On Zhukovskii's recommendation he was allowed to remain at the university to prepare for a position as a professor. Over a period beginning in 1893, Chaplygin taught physics at a women's secondary educational institution and mechanics at the Moscow Higher Technical School, the Moscow Engineering School, the Moscow Advanced Courses for Women, and Moscow University. He helped organize the Moscow Advanced Courses for Women in 1905 and served as director until 1918; under his leadership the advanced courses developed into a large higher educational institution offering instruction in all the principal branches of knowledge. Chaplygin wrote a university textbook on analytic mechanics—*The Mechanics of a System* (parts 1–2, 1905–07)—and later produced a more concise textbook—*Introductory Course in Mechanics* (1915)—for higher technical educational institutions and for natural science faculties of universities.

Chaplygin's first works were influenced by Zhukovskii and dealt with hydromechanics. The laws of the motion of a body in a fluid had been found in analytic form in a number of studies carried out by Russian and foreign scientists. Chaplygin gave a geometric interpretation of these laws in his two articles under the title "On Certain Cases of the Motion of a Solid Body in a Fluid" (1894, 1897); the second article was his master's dissertation. In its simplicity and completeness his interpretation bears the same classic character as L. Poinsot's famous geometric interpretation of the motion of a body by inertia.

Chaplygin's subsequent scientific works were devoted mainly to two classic problems in theoretical mechanics: the problem of the motion of a body in the presence of nonintegrable constraints and the problem of the motion of a heavy body about a fixed point. In "On the Motion of a Heavy Body of Revolution in a Horizontal Plane" (1897) he gave the first presentation of the general equations for the motion of nonholonomic systems. His equations are generalizations of the Lagrange equations, from which they differ in the presence of additional terms. Other works of Chaplygin's in this field include "On a Certain Possible Generalization of the Theorem of Areas" (1897) and "On the Rolling of a Sphere Along a Horizontal Plane" (1903). In 1899 the St. Petersburg Academy of Sciences awarded Chaplygin an honorary gold medal for his studies on the theory of the motion of a body in a fluid and on the motion of bodies with nonintegrable constraints.

In the late 19th and early 20th centuries Chaplygin did his first work on jet flows. He produced a series of papers on the theory of jets in an incompressible fluid. In 1902 he presented his doc-

toral dissertation, *On Gas Streams*, at Moscow University; it gave a method of studying jet flows of a gas at any subsonic speed (*see* GAS DYNAMICS). At that time the investigation of gas flows at speeds near the speed of sound had no practical application in aviation. Three decades later, however, Chaplygin's dissertation served as a starting point for many studies by aerodynamics specialists and provided a basis for the solution of problems of subsonic flows. After undergoing refinement, the methods developed in the dissertation led to the solution of a number of problems of modern aerodynamics, including the principal problems involved in the behavior of wings at high subsonic speeds.

In 1910, Chaplygin presented a paper at a meeting of the Moscow Mathematical Society in which he advanced a postulate that permitted determination of the rate of circulation flow around a wing section. This postulate constituted the necessary supplement to Zhukovskii's theorem that confirmed the theorem as the fundamental principle explaining the lift acting on a wing.

Problems in aerodynamics became the central concern of Chaplygin's research. His paper "On the Pressure Exerted by a Plane-parallel Flow on an Impeding Body" and Zhukovskii's paper "On the Contours of Airfoils in Airplanes" appeared almost simultaneously in 1910. These two works gave the first presentation of methods for the quantitative determination of the lift on a wing section. They completed the establishment of the principles of aerodynamics and proved of seminal importance in the field's subsequent development. Chaplygin's principle regarding the descent of jet flows from the sharp edge of a wing was applied by him in his paper to the determination of flows around a number of specific profiles. The paper contains the now generally known formulas for determining the lift and moment from the characteristic functions of the flow and provided the first methods for plotting the flow around wing profiles with a sharp trailing edge and a rounded leading edge. In particular, Chaplygin introduced the well-known inverted-parabola profiles that were found in a different way by Zhukovskii and that are often called Zhukovskii, or Joukowski, profiles.

Chaplygin's important work "Theory of Cascaded Airfoils" appeared in 1914. It set forth the fundamentals of the theory of the circulation around cascades; this theory underlies the design of propellers, turbines, and other hydraulic machines. In subsequent works Chaplygin solved a number of complex problems relating to aeromechanics and aviation—for example, the determination of the lift application point, the determination of the forces in unsteady flight, the theory of high-lift wings, and several problems of wing stability in flight.

Chaplygin made important contributions to mathematics. His investigations in the approximate integration of differential equations are major achievements of mathematical thought. His ideas proved applicable not only to the solution of broad classes of differential equations but also to the approximate solution of very general classes of functional equations.

After the October Revolution of 1917, Chaplygin took an active part in the building of a socialist state. In 1918 he was associated with the Commission on Special Artillery Tests of the Main Artillery Directorate and with the Scientific Experimental Institute of Railroad Transport. In late 1918 he was enlisted by Zhukovskii to help organize the Central Aerodynamic and Hydrodynamic Institute (TsAGI), the largest institute of its kind in the world. Chaplygin was chairman of the institute's collegium from 1921 to 1930 and executive director of the institute from 1928 to 1931. From 1931 to 1941, as head of the institute's scientifc work, he supervised the organization of its largest aerodynamic and hydrodynamic laboratories. At the same time, in his capacity as a member of the Academy of Sciences of the USSR, Chaplygin helped the Academy deal with the task of involving science in the building of a socialist state.

Chaplygin received the Zhukovskii Prize in 1925; he was awarded two Orders of Lenin and two other orders.

In 1942 the Academy of Sciences of the USSR established the S. A. Chaplygin Prize "for the best original work in theoretical research in the field of mechanics." A bust of Chaplygin was dedicated in Moscow in 1961, and a monument was erected at the TsAGI in 1959. Chaplygin's name has been given to streets in Moscow and Novosibirsk, an aerodynamic laboratory at the TsAGI, a memorial museum-apartment in Moscow, and a crater on the back side of the moon.

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M. V. KELDYSH [29–53–3]

CHAPLYGIN (until 1948, Ranenburg), a city and the administrative center of Chaplygin Raion, Lipetsk Oblast, RSFSR. Chaplygin is situated on the Stanovaia Riasa River in the Don basin and is a railroad junction (Ranenburg) for lines to Bogoiavlensk, Troekurovo, and Lev Tolstoi. It has a plant producing tractor parts, a pig-iron foundry, a plant for the production of starch, a milk plant, a brickyard, and a clothing factory. There is also a sovkhoz technicum and a museum of local lore in the city. The city has renamed in honor of S. A. Chaplygin, who was born in Ranenburg. [29–55–1]

CHAPLYGIN INEQUALITY, one of the most important differential inequalities. Suppose $y'(x) = f(x, y)$ and the functions $u(x)$ and $v(x)$ satisfy the differential inequalities

$$u'(x) - f(x, u) > 0$$

$$v'(x) - f(x, v) < 0$$

where $x_0 \leq x \leq x_1$. If $u(x_0) = v(x_0) = y_0$, then the solution $y(x)$ of the differential equation $y'(x) = f(x, y)$ that passes through the point (x_0, y_0) is contained between the functions $u(x)$ and $v(x)$; that is, $u(x) > y(x) > v(x)$, where $x_0 < x \leq x_1$. This theorem, of which the simplest case is presented here, was proved by S. A. Chaplygin in 1919 and was used by him as the basis of a method for the approximate integration of differential equations. Chaplygin proved a similar theorem for the equation $y^{(n)} - f(x, y, y', \ldots y^{(n-1)} = 0$ and extended the theorem to partial differential equations. [29–56–1]

CHAPLYGIN METHOD, a method of approximate integration of differential equations. Proposed by S. A. Chaplygin in 1919, the method permits an approximate solution to be found for a differential equation to a given degree of accuracy. It involves the construction of sequences of functions $\{u_n\}$ and $\{v_n\}$ that approximate with continually increasing accuracy the desired solution y of a given differential equation and that fulfill the following relations:

$$u_n \geq u_{n+1} \geq y \geq v_{n+1} \geq v_n$$

The construction of the sequences $\{u_n\}$ and $\{v_n\}$ is based on Chaplygin's theorem of differential inequalities and is a generalization of Newton's method to the case of differential equations. The rate of convergence is the same as in Newton's method; that is, $u_n - y$ tends to zero like

$$C/2^{2^n}$$

REFERENCE

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CHAPMAN, GEORGE. Born 1559 in Hitchin; died 1634 in London. English poet and dramatist.

Chapman, a graduate of Oxford University, was a writer of the Late Renaissance. His comedies reveal traits of the poetic comedy of the 1590's, for example, *The Gentleman Usher* and *Monsieur d'Olive* (both published 1606) and of B. Jonson's comedies of manners, for example, *An Humourous Day's Mirth* (1599) and *All Fools* (published 1605). Chapman's best-known comedy, *Eastward Ho!*, which was written together with J. Marston and Jonson (published 1605), contains elements of political satire.

Chapman's tragedies represent a return to pre-Shakespearean drama, with its romantic pathos; they include *Bussy d'Ambois* (published 1607) and *The Conspiracy and Tragedy of Charles, Duke of Byron* (parts 1–2, published 1608). Chapman's heroes

stoically confront the coincidences of fate in such works as *The Revenge of Bussy d'Ambois* (published 1613) and *Caesar and Pompey* (published 1631).

Chapman also translated Homer, Hesiod, and Juvenal and completed C. Marlowe's narrative poem *Hero and Leander* (1598).

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A. Ia. LIVERGANT [29–56–2]

CHAPMAN, SYDNEY. Born Jan. 29, 1888, in Eccles, Lancashire; died June 16, 1970. British mathematician, physicist, and geophysicist. Fellow of the Royal Society of London (1919).

Chapman graduated from the University of Manchester in 1907 and from Cambridge University in 1911. He was a professor at the University of Manchester from 1919 to 1924, at the Imperial College of Science and Technology from 1924 to 1946, and at Oxford University from 1946 to 1953. He served as president of the London Mathematical Society from 1929 to 1931, of the Royal Meteorological Society from 1932 to 1934, and of the International Association of Meteorology and Atmospheric Physics from 1936 to 1948. From 1953 to 1959 he was president of the central organizing committee for the International Geophysical Year.

Chapman's principal works deal with the kinetic theory of gases, terrestrial magnetism, the investigation of the ionosphere and the upper atmosphere, atmospheric electricity, and mathematics. In 1919 he developed the dynamo theory of lunar daily variations of the geomagnetic field (the theory of drift currents). In 1930 he proposed a new photochemical theory of the formation of ozone, and in 1931 he set forth a theory of the formation of the electron-concentration layers of the ionosphere. Chapman developed a theory of the particle fluxes continuously emitted by the sun. With V. Ferraro, he used this theory in 1931 and 1932 to construct a theory of geomagnetic storms and of auroras. He studied airglow and investigated the influence of the X-radiation of auroras on the ionization of the lower ionosphere layers that leads to absorption of radio waves.

In 1957, Chapman analyzed the extent of the solar corona and investigated the influence of the corpuscular radiation of the sun on the thermal conditions of the earth's atmosphere. He made an important contribution to the development of the kinetic theory of gases. He proposed methods of solving the Boltzmann transport, or kinetic, equation. Chapman gave a theoretical demonstration, independently of the Swedish scientist D. Enskog, of thermal diffusion in gases and subsequently, with F. Dootsen, found experimental confirmation of such diffusion.

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CHAPOLOT' (also *chapoloch'*), the folk name for several herbaceous plants of the family Gramineae (green foxtail, *Calamogrostis epigeios*, and species of the genus *Hierochloe*). [29–56–3]

CHAPPE, CLAUDE. Born Dec. 25, 1763, in Brûlon, Sarthe Department; died Jan. 23, 1805, in Paris. French engineer; inventor of the semaphore telegraph.

Chappe was accorded the title of telegraph engineer in 1793. In 1794 he and his brothers built between Paris and Lille the world's first semaphore telegraph line. In the same year, Chappe was appointed director of the French telegraph lines.

REFERENCE

Chappe, I. *Histoire de la télégraphie*. Paris, 1824. [29–852–1]

CHAPULTEPEC DECLARATION, a declaration adopted on Mar. 6, 1945, as the principal statement of the Inter-American Conference on Problems of War and Peace, which was held at Chapultepec Castle, Mexico City.

The preamble to the Chapultepec declaration discusses mutual aid and inter-American solidarity. The first part of the declaration, which deals with questions of legal equality and independence, asserts that any encroachment on the integrity, territorial sovereignty, or political independence of any American nation will be regarded as an act of aggression against all the nations and will be answered by collective action, subsequent to consultation among all the nations.

The second part of the declaration contains recommendations on a procedure for applying sanctions in response to threats and acts of aggression. The third part proclaims that the principles underlying a regional consensus pertaining to the peace and security of the western hemisphere shall reflect the goals and principles of the future international organization (the UN).

The USA used the Chapultepec declaration to establish under its domination a military and political bloc of American nations.

PUBLICATION

In B. I. Gvozdareva, *Organizatsiia amerikanskikh gosudarstv*. Moscow, 1960. Pages 264–66. [29–56–4]

CHAPYGIN, ALEKSEI PAVLOVICH. Born Oct. 5 (17), 1870, in the village of Bol'shoi Ugol, in what is now Kargopol' Raion, Arkhangel'sk Oblast; died Oct. 21, 1937, in Leningrad. Soviet Russian writer.

The son of a peasant, Chapygin was self-educated. His work was first published in 1903. The novella *The White Monastery* (1913) and the collection *Along the Beastly Path* (1918) display a tragic world outlook and are permeated with antiurbanism and an intense feeling for nature; in these works the author depicted the spontaneous protest of people against the social structure of prerevolutionary Russia. Chapygin's epic works *Razin Stepan* (parts 1–3, 1926–27) and *Idle People* (parts 1–4, 1935–37) greatly influenced the development of the Soviet historical novel. The hero of these works is the people as a whole, rising to fight for freedom. These books demonstrate Chapygin's familiarity with the popular speech and customs of 17th-century Russia.

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CHARA, a river in Chita and Irkutsk oblasts and the Yakut ASSR; a left tributary of the Olekma River. The Chara measures 851 km in length and drains an area of 87,600 sq km. It originates on the southern slope of the Kodar Range, flows along the Chara Depression, and crosses the range, forming rapids. It is fed by rain, snow, glaciers, and subterranean sources. High water is from May to September. The mean flow rate is 900 cu m per sec.

The Chara freezes over in October, and the ice breaks up in May. Its main left tributary is the Zhuia, and its main right tributary is the Tokko. The river is navigable for a distance of 416 km.

The Udokan Ore Region is located in a basin near the river's upper course. The Baikal-Amur Railroad will pass along the lower course of the Chara. [29–58–1]

CHARA, an old Russian metal drinking vessel used for alcoholic beverages. *Chary* were short and round, without a base, and featured a flat, horizontal handle attached at the side. They were in common household use in the 16th and 17th centuries. [29–57–2]

CHARACTER READER, a device for the automatic identification of characters—that is, letters, numerals, or other symbols—that are printed or written on paper in the usual form by a human being. Character readers are intended mainly for automatic data input into computers or other automatic systems that process data directly from a sheet without the preliminary rerecording of the data on information carriers, for example, punched cards.

In character readers, character recognition is based on the following two procedures: the measurement of the "blackness"—that is, the absorption coefficient—of individual tiny (for example, 0.1×0.1 mm^2) squares, into which a field containing a character to be read is divided, and a subsequent comparison of the results obtained against standard characters, which are idealized and generalized. As a rule, exact agreement between a written or printed character and a standard character is not necessary, since the comparison is usually continued until the least permissible value of a quantity characterizing the similarity of the written or printed character and the standard character is reached. As a result of the comparison, a code is generated that corresponds to the number of a standard character, the name of a character, or the position of a letter in an alphabet. The generated codes are usually obtained as electrical signals at the output of the reader.

Blackness is measured by using either a scanning system similar to that employed in a television camera or a photocell matrix, in which the blackness of the many tiny squares that make up a character is measured simultaneously by means of miniature photocells, for example, photodiodes. In its design, a photocell matrix resembles the retina of the eye.

In contrast to both a television camera and a facsimile apparatus, a character reader not only converts a visual image into an electrical signal but also rejects signals that correspond to unrecognizable characters, discards insignificant elements, and extracts the most important information concerning the assignment of a character being read to a specific class of characters. The simplest character readers are designed to read stylized characters, which are given a special form. An example of such characters is the numerals of the postal codes that are used on envelopes and postcards in the USSR. More complicated character readers are used to identify the font of a standard typewriter. However, the presence in an alphabet of letters with a similar outline—for example, the Russian letters ш and щ or э and з—and the poor quality of characters printed with a typewriter make it difficult to obtain a high reliability in the automatic identification of typewriting.

The most advanced character readers are multifont readers, which are designed to read texts printed in various fonts or typewriter fonts. A multifont reader consists of the following components: an on-line storage device, in which standard characters of one or two fonts are stored; an auxiliary storage device for the storage of up to several dozen other fonts; an arithmetic unit, in which a character to be identified is compared with a standard character; and a program-control unit. In complexity, a multifont reader is comparable to a medium-capacity general-purpose computer. With time expended on such operations as the movement of a document and line searching taken into account, the reading rate of a multifont reader may be as high as several hundred characters per second.

As of 1976, experimental models of character readers for the identification of handwritten characters, mainly stylized numerals, had been developed. In such character readers, various methods of analyzing the geometric structure of a character are used rather than the method of direct comparison with a standard character.

Character readers are used in the processing of, for example, bank checks, bills, statements, bills of lading, supply orders, and statistical reports.

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CHARADE, a type of riddle. In a charade, a word is divided, usually syllabically, into two or more parts, each of which has its own meaning, for example, *vino* ("wine") + *grad* ("city" or "hail") for *vinograd* ("grapes"), or *sem'* ("seven") + *ia* ("I") for *sem'ia* ("family"). Each of the component words is described in the manner of periphrasis.

Practically unknown in folklore, charades originated when writing made word division visually recognizable. They were especially popular in salons in the 17th and 18th centuries, read as poems or acted out.

An anonymous example of a charade follows.

Edva primetnyi cherv', no dlia mekhov opasnyi
Est' pervoe moe. Znak v azbuke bezglasnyi—
Vtoroe. A poet i komik-charodei
Est' tseloe sharady sei (Mol'-er).

A worm that's barely noticeable but dangerous to furs
Is my first part. A mute symbol in the alphabet
Is the second. And a poet and comic wizard
Is the whole of this charade. (*Mol'* ["moth"] + *er* [a silent letter in Old Russian] = *Mol'er* [Molière].) [29–853–3]

CHARBONNAGES DE FRANCE, a government-owned French fuel and chemical company, one of France's largest industrial companies (in 1975 it was the 13th largest in turnover). The firm was formed in 1946 from nationalized coal companies, and it began petrochemical production in the 1960's. In 1968 the company joined its chemical enterprises under the control of its subsidiary CDF Chimie, one of the chief French chemical companies. Charbonnages de France controls virtually all coal mining and a significant portion of the coke production in France; it is a major producer of ammonia and nitrogen fertilizers, polyvinyl chloride, and several other chemical products, and also participates in petroleum production. It supplies coal to the leading power and metallurgical companies, and also uses coal in its own industrial and power enterprises. Charbonnages de France owns more than 20 chemical enterprises that produce fertilizers, basic organic chemistry products, large semifinished products, and plastics. In 1975 it registered a turnover of $2.2 billion, employed 100,000 persons, and mined 24 million tons of coal. [29–854–6]

CHARCOT, JEAN-BAPTISTE (also Jean-Baptiste-Etienne-Auguste Charcot). Born July 15, 1867, in Neuilly-sur-Seine; died Sept. 16, 1936. French polar explorer. Son of J.-M. Charcot.

From 1903 to 1905, J.-B. Charcot led an antarctic expedition on the *Français* that conducted scientific research along the western coast of the Antarctic Peninsula. From 1908 to 1910 he led an expedition on the *Pourquoi Pas?* that continued the research and charting of the Antarctic Peninsula and did similar work for Alexander I Land and Peter I Island. Charcot named the area of ocean near Peter I Island the Bellingshausen Sea. In 1911 he conducted oceanographic work in the English Channel.

From 1920 to 1927, Charcot made soundings in various parts of the Atlantic Ocean, including the North Sea, the Baltic Sea, and the Bay of Biscay. Between 1926 and 1936 he took part in several expeditions of the *Pourquoi Pas?* to the shores of Greenland. He died in a shipwreck off the coast of Iceland.

Charcot was an honorary member of the Geographical Society of the USSR and was awarded the Great Litke Gold Medal in 1914. A cape and a bay in Antarctica have been named for Charcot, as have a mountain and strait in the Kerguelen Archipelago.

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CHARCOT, JEAN-MARTIN. Born Nov. 29, 1825, in Paris; died Aug. 16, 1893, in the Hotel Morvan, Lac des Settons, Nièvre Department. French physician; one of the founders of modern neuropathology and psychotherapy. Member of the Académie de Médecine (1872) and Académie des Sciences (1883).

After graduating from the faculty of medicine of the University of Paris in 1848, Charcot worked as a physician. In 1860 he was named professor of neuropathology at the University of Paris, where he was also (from 1872) professor of pathological anatomy. Beginning in 1862, he worked for thirty years at the Hospital of the Salpêtrière, and in 1882 he was named director of its neurological clinic.

From the 1850's to the 1870's, Charcot's work dealt with various problems of clinical medicine, including chronic pneumonias, cirrhosis of the liver, and diseases of the skin. He was among the first to describe rheumatoid polyarthritis (1853), and he also described intermittent claudication (1858). Charcot discovered the existence of sharp transparent octahedral structures that were later, in 1878, found by the German physician E. von Leyden to be associated with eosinophilia in bronchial asthma, and they were called Charcot-Leyden crystals. Charcot also noted the diverse clinicomorphological manifestations of pulmonary tuberculosis. He described the tremor of the hands, distinctive paresis of the lower extremities, and increased electric conductivity of the skin in thyrotoxicosis.

After 1862, Charcot dealt mainly with nervous disorders. Working in the area of clinical anatomy, he sought to establish the connection between clinical symptoms and the localization of structural changes in the nervous system. Charcot identified a number of diseases, including amyotrophic lateral sclerosis, as independent nosological forms. He described the symptoms of various other diseases, such as syringomyelia, parkinsonism, and multiple sclerosis.

The study of inherited nervous disorders was initiated by Charcot in the 1880's. He proved the existence of male hysteria, thus refuting the earlier belief that hysteria was caused by disorders of the uterus. On the basis of his study of hypnotism, Charcot established the part played by suggestion in the onset of hysterical disturbances, many of which he described. He was the first to make extensive use of hypnosis in the treatment of hysteria. A number of Charcot's works deal with the psychology of creativity in the arts. A hydrotherapeutic method was named after Charcot (the Charcot shower).

Charcot's neurological clinic—with its museum of pathological anatomy, laboratory, and special rooms that housed drawings, sculptures, and photographs—became an international training center for medical students. Members of the scientific school founded by Charcot inciuded J. Babinski, J. Wagner von Jauregg, J. Déjerine, P. Janet, G. Marinescu, and P. Marie. Charcot founded several journals, including *Archives de neurologie* (1880). He was president and a member of various French and foreign academies, universities, and scientific societies. A peninsula in Antarctica was named after Charcot by his son, J.-B. Charcot.

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G. V. ARKHANGEL'SKII, V. I. BORODULIN, and A. V. BRUENOK [29–860–1]

CHARCOT, a peninsula in the northwestern part of Alexander I Land (69°45′ S lat., 75°15′ W long.), in Western Antarctica. Washed by the Bellingshausen Sea, the Charcot Peninsula is connected to the continental land mass by the Wilkins Ice Shelf. The peninsula, which has an area of approximately 2,700 sq km, is almost completely covered by a glacier, whose surface lies 270 m above sea level. In the northwestern part of the peninsula the surface of the glacier is broken by mountain peaks rising to an elevation of 609 m at Mount Monique. The peninsula was discovered in 1910 by the French antarctic expedition of J.-B. Charcot and was named in honor of the explorer's father. [29–861–1]

CHARDARA RESERVOIR, a reservoir formed by the dam of the Chardara Hydroengineering Complex on the Syr Darya River, in the Kazakh SSR and Uzbek SSR. Itself a part of the hydroengineering facilities of a hydroelectric power plant, the reservoir was filled between 1965 and 1968. It has an area of 900 sq km, a capacity of 5.7 cu km, and a length of 70 km. Spanning 20 km at its widest point, it has an average depth of 6.5 m. The reservoir was built to improve the supply of water to existing irrigation tracts, to eliminate flooding in the lower course of the Syr Darya, and to irrigate new lands. It has improved the navigability of the Syr Darya and has increased the power output of the Farkhad and Kairakkum hydroelectric power plants. Carp, pike perch, and pike are fished commercially on the reservoir. [29–59–1]

CHARDIN, JEAN BAPTISTE SIMÉON. Born Nov. 2, 1699, in Paris; died there Dec. 6, 1779. French painter.

Chardin was the son of a joiner. He studied under the academic painter P. J. Cazes and in the school of the Royal Academy of Painting and Sculpture. He worked under N. N. Coypel and J. B. Van Loo. In 1728 he was elected to the academy for his presentation of still lifes.

Although Chardin's early works are ornamental and superficially appealing, thorough study of nature led to a change in his style, a preference for classic simplicity and clarity. His genre paintings are pervaded by profound lyricism and love for the world of the common people. They accurately depict the physical appearance and inner world of the townspeople, for example, *The Peddler Woman* (1739, the Louvre, Paris), *The Laundress* (1774, the Hermitage, Leningrad), and *Grace Before Meat* (1774, the Hermitage).

Chardin is also known for his portraits, which include *Boy With a Top* (1738, the Louvre) and other paintings of children, his self-portraits of 1771 and 1775, and his 1775 pastel portrait of his wife, all of which are housed in the Louvre. These works are noted for their vitality, simplicity, and sincerity.

Chardin's still lifes reveal an inner regularity and rhythm of composition. The common objects of everyday use that they depict radiate warmth and seem to quiver with almost human emotions. Notable examples include *The Copper Fountain* (the Louvre), *Still Life With Brioche* (the Louvre), *The Attributes of the Arts* (1760's, A. S. Pushkin Museum of Fine Arts, Moscow).

Chardin's paintings are distinguished for their compositional integrity, due in part to the predominance of silvery grays in the color scheme. They are known for their rich use of reflexes and subtle, barely perceptible transitions from light to shade, as well as the skillful play of value gradations. Chardin's works represent the pinnacle of 18th-century realism.

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[29–855–4]

CHARDZHOU, a city and the administrative center of Chardzhou Oblast, Turkmen SSR. Landing on the left bank of the Amu Darya at the place where the river is crossed by the Krasnovodsk-Tashkent railroad line. Starting point of the Chardzhou-Kungrad-Makat railroad line. Population, 113,000 (1977; 51,000 in 1939).

Chardzhou originated in the 1880's as a Russian fortified settle-

ment in the Bukhara Khanate. In 1886 it became a city—Novyi Chardzhui—and a commercial and transportation center of Middle Asia; since 1888 it has been served by the Middle Asian Railroad. Part of the Turkestan ASSR from 1918 to 1924, the city became part of the Turkmen SSR in 1924 and acquired its present name in 1937. Chardzhou has been an oblast capital since 1939, with an interruption from 1963 to 1970.

Chardzhou has a silk combine, a factory for the spinning and weaving of wool, a cotton-ginning plant, and enterprises for the production of wadding, knitwear and other clothing, footwear, and Karakul skins. The food-processing industry is represented by a meat-packing plant, a milk plant, a winery, and a licorice factory. The city also has a superphosphate plant, a repair shop, a furniture factory, and a factory for the production of building materials.

In addition to a pedagogical institute, Chardzhou has textile, medical, and river transport technicums and medical and music schools. The city's cultural and scientific institutions include a museum of history and local lore, the Turkmen Sericulture Experiment Station, and a land-reclamation experiment station.

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[29–59–3]

CHARDZHOU OBLAST, part of the Turkmen SSR. Formed on Dec. 14, 1970 (existed earlier from Nov. 21, 1939, through Jan. 10, 1963). Located in the eastern part of the republic. Area, 93,800 sq km. Population, 565,000 (Jan. 1, 1977). Chardzhou Oblast is divided into 11 raions and has two cities and 22 urban-type settlements. The administrative center is the city of Chardzhou. The oblast was awarded the Order of Lenin on Jan. 10, 1974.

Natural features. Chardzhou Oblast lies along the middle course of the Amu Darya. The area along the left bank is occupied by part of the Karakum, which in the extreme southwest adjoins the northern periphery of the Karabil' Uplands. The northwestern part of the area along the right bank is occupied by the periphery of the Kyzylkum. The sands of the Sundukli lie in the central part of the oblast, and part of the Kugitangtau Range, with elevations to 3,139 m, occupies the southeast.

The climate is markedly continental and extremely arid. Summers are hot, and winters moderately cold; the average July temperature is 29.5°C, and the average January temperature ranges from −4° to 2°C. Annual precipitation ranges from 100 mm in the north at Dargan-Ata to 160 mm in the southeast at Kerki. The growing season lasts 203–235 days. The oblast's principal river is the Amu Darya, whose waters are used extensively for irrigation.

The soils of the desert regions are sierozems, solonchaks, and takyr-like soils. The Amu Darya valley has meadow sierozems, alluvial-meadow soils, and cultivated and irrigated soils; the mountains have light sierozems, mountain cinnamon-colored soils, and mountain meadow soils. The sparse vegetation of the desert expanses includes sand sedge, the saxaul *Haloxylon persicum, Ammodendron*, and *Calligonum*. In the Amu Darya valley there is *tugai* (gallery-forest) vegetation, including Euphrates poplar, willow, cattail, licorice, and *Elaeagnus*. There are juniper forests in the mountains.

The deserts are inhabited by such mammals as the goitered gazelle, the African wildcat (*Felis libyca*), *Felis margarita*, fox, wolf, golden jackal, and various rodents, including gerbils and susliks. The desert contains such birds as Pander's ground jay and the white-winged woodpecker, and reptiles are represented by snakes, lizards, and turtles. Mammals encountered in the Amu Darya valley include the Bukhara deer and wild boar.

Population. According to the 1970 census, Turkmens constituted 68.8 percent of the oblast's population, Russians, 12.5 percent, and Uzbeks, 11.2 percent; the oblast is also inhabited by such peoples as Tatars, Ukrainians, and Kazakhs. The average population density is six persons per sq km (Jan. 1, 1977) and ranges from less than one person per sq km in the Karakum to 100 persons per sq km in parts of the Amu Darya valley. As of Jan. 1, 1977, the urban population made up 46 percent of the total. The oblast's cities are Chardzhou and Kerki.

Economy. The economy of Chardzhou Oblast is dominated by light industry and the food-processing industry, which is devoted to the processing of agricultural products. Of particular importance are cotton ginning, silk winding, the initial processing of Karakul sheepskins, and the production of vegetable oil. The extraction of natural gas and sulfur and the production of mineral fertilizers are developing rapidly. The oblast's largest enterprises are located in Chardzhou, and there are cotton-ginning mills in Kerki, Kerkichi, Moskovsk, Saiat, and Sakar. Kerki has a meat-packing plant, a carpet factory, and a repair shop for agricultural machinery; a sulfur plant is located in Gaurdak. A large petrochemical complex is being built north of Chardzhou.

Of the total land, 1.8 percent is under cultivation, and 76.3 percent is pastureland. As of Jan. 1, 1977, the oblast had 81 kolkhozes and eight sovkhozes. Agriculture is based on irrigation farming: large tracts of land are irrigated directly from the Amu Darya and from such canals as the Karakum, Bosaga-Kerki, and Karabekaul. The principal crop grown on irrigated land is long-staple and medium-staple cotton. The total sown area in 1976 was 161,100 hectares (ha), of which 100,900 ha were planted to cotton; in that year 250,000 tons of raw cotton were harvested. The cotton yield is 29.1 quintals per ha, as compared to 21.3 quintals per ha for the republic as a whole. Perennial grasses, including medic, take up 23,300 ha and are used in crop rotation with cotton. Grains, including maize, *Sorghum cernuum*, and barley, occupy 18,600 ha; melons and gourds, including the famous Guliabi varieties, occupy 4,700 ha; and vegetables occupy 2,500 ha. There is viticulture and the cultivation of such fruits as peaches, apricots, apples, and pears.

Animal husbandry is dominated by the raising of Karakul sheep in desert regions and of cattle and swine in areas along the Amu Darya. As of Jan. 1, 1977, the livestock population included 910,000 sheep and goats, 180,000 cattle (including 65,000 cows), and 38,000 swine. Chardzhou Oblast is the principal sericultural region of the Turkmen SSR.

In 1976 the oblast had 680 km of railroads; it is crossed by the Krasnovodsk-Tashkent, Chardzhou-Kungrad-Makat, and Karshi-Dushanbe lines. In 1976 there were 2,324 km of roads, including 1,613 km of hard-surface roads. The principal motor-vehicle routes are Chardzhou-Mary, Chardzhou-Tashauz, and Chardzhou-Kerki. There is navigation on the Amu Darya and the Karakum Canal; the main landings are at Kerkichi and Chardzhou. The city of Chardzhou is linked by air with various cities, including Moscow and the major cities of Middle Asia and the Caucasus.

Education, cultural affairs, and public health. In 1914 the territory that is now Chardzhou Oblast had 2 general-education schools, with a total of 430 students, and no secondary or higher educational institutions. In the 1976–77 academic year there were 386 general-education schools of all types, with 146,800 students, and nine vocational-technical educational institutions, with more than 5,000 students; in the latter category were six secondary vocational-technical educational institutions, with 3,702 students. There were seven specialized secondary educational institutions, with 3,900 students; in addition, 6,100 students attended the Turkmen Pedagogical Institute. In 1976 more than 29,900 children were enrolled in 259 preschool institutions.

As of Jan. 1, 1977, the oblast's educational and cultural institutions and facilities included 361 public libraries, with 1,786,000 copies of books and periodicals; a museum of history and local lore in Chardzhou; 259 clubs; 322 motion-picture projection units; and 23 extracurricular institutions.

Chardzhou Oblast has two oblast-level newspapers: the Turkmen-language *Lenin yoli* (Leninist Path), founded in 1931, and the Russian-language *Chardzhouskaia pravda*, founded in 1938. Two programs of All-Union Radio are broadcast for a total of 19 hours daily; they are supplemented by republic and oblast broadcasts in Turkmen and Russian, which are transmitted for a total of 24 hours daily. With regard to television, the program *East* of Central Television is broadcast for 12.9 hours daily, the Orbita system carries broadcasts for 8 hours daily, and republic broadcasts are offered in Russian, Kazakh, and Turkmen for 24 hours daily.

As of Jan. 1, 1977, the oblast had 52 hospitals, with 5,800 beds, or 10.2 beds per 1,000 inhabitants; there were 1,500 physicians,

or one physician per 388 inhabitants. Chardzhou Oblast has a children's sanatorium.

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CHARENTE, a department in France, in the basin of the Charente River. Area, 6,000 sq km. Population, 337,000 (1975). The capital of Charente Department is the city of Angoulême.

In 1968, 30 percent of Charente's economically active population was employed in agriculture, and 24 percent in industry. Viticulture and wine-making are important activities; brandy is distilled from wine in the cities of Cognac, Jarnac, and Rouillac. Livestock is raised for dairy products and meat. The machine-building industry is represented by electrical-equipment and military plants. Charente also has wool, paper, leather, and cement industries. [29–854–3]

CHARENTE, a river in western France. The Charente River is 360 km long and drains an area of approximately 10,000 sq km. The river rises in the western part of the Massif Central, flows along the northern edge of the Garonne Lowland, and empties into the Bay of Biscay of the Atlantic Ocean, where it forms an estuary approximately 15 km long. High water occurs in winter and spring; low water occurs in summer and autumn. The river is tidal as far as the city of Saintes, where the mean flow rate is approximately 140 cu m per sec. The seaport of Rochefort is situated near the Charente's mouth. [29–854–2]

CHARENTE-MARITIME, a department in France, in the basin of the Charente River, on the Bay of Biscay. Area, 7,200 sq km (including the islands of Oléron and Ré). Population, 498,000 (1975).

The capital of Charente-Maritime is La Rochelle. In 1968, 28 percent of the department's economically active population was employed in agriculture, and 15 percent was employed in industry. Viticulture and wine-making accounted for 47 percent of the value of the agricultural output in 1974. Cattle and other livestock are raised in the department. Salt is extracted from seawater. The department has food-processing, shipbuilding, aviation, and glass industries. La Rochelle is the chief port and the most important center of industry and fishing. Oyster culture is carried on along the coast. [29–854–4]

CHARENTS, EGISHE ABGAROVICH (pen name of Egishe Abgarovich Sogomonian). Born Mar. 13 (25), 1897, in Kars; died Nov. 29, 1937, in Yerevan. Soviet Armenian poet. Member of the CPSU from 1918.

Charents, the son of a shopkeeper, studied at the Kars Realschule. In 1915 he went to the front as a volunteer and served in the Red Army during the years 1918–19. Estrangement from reality is characteristic of his early works, such as the collection *Three Songs of a Pale and Mournful Girl* (1914), the narrative poems *The Blue-eyed Homeland* (1915) and *The Dante Legend* (1916), and the lyric cycle *The Rainbow* (1917).

Charents' romantic narrative poems *Soma* (1918) and *The Furious Multitudes* (1919) were the first works of Armenian literature to deal with the October Revolution of 1917. *The Furious Multitudes* combines features of a new revolutionary epos with forms of folk poetry. Charents developed this style further in the extensive cycle *Sacrificial Fire* (1918–20). In the narrative poems *To All, All, All* (1921), *The Omnipoem* (1922), and *Charents-nameh* (1922) he revealed his mastery of the theme of revolutionary heroism, consummately integrating revolution and the fate of Armenia. The years 1915–18, a complex period in Armenia's history, are described in the satirical novel *Land of Nairi* (published separately 1926). The main theme of *Memories of the Yerevan Reformatory* (1927) is the birth of Soviet humanism and the socialist concept of man.

Zealous party spirit and an intense creative quest are characteristic of Charents' cycle of verse and narrative poems devoted to Lenin: *Lenin* (1924), *Uncle Lenin* (1924), *Ballad of Vladimir Il'ich, a Peasant, and a Pair of Boots* (1924), *Lenin and Ali* (1925), *The Communard Wall in Paris* (1926), *Funeral March* (1927), and *Cast-iron Man* (1928).

An important landmark in Charents' work was the collection *The Epic Dawn* (1930), a model of lofty political poetry in which the influence of Pushkin and Nekrasov is particularly evident. Man and nature, art and reality, poetry and work—these are the most important themes of the collection *Voyage Book* (1933).

Of special importance are Charents' translation of works by A. S. Pushkin, V. V. Mayakovsky, Goethe, E. Verhaeren, W. Whitman, and M. Gorky. Charents also translated the *Internationale* into Armenian. He wrote articles on O. Tumanian, A. Isaakian, V. Ter'ian, and M. Gorky and on modern poetry. Charents did much to cultivate Soviet Armenian literature and was one of the organizers of Noiember, a union of proletarian writers (1925). His works have been translated into many foreign languages.

In 1974 the Charents House Museum was opened in Yerevan.

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S. B. AGABABIAN [29–62–1]

CHARENTSAVAN (until 1967, Lusavan), a city in Razdan Raion, Armenian SSR; situated on the left bank of the Razdan River, a tributary of the Araks River. Railroad station on the Yerevan-Sevan line, 30 km north of Yerevan. Population, 21,000 (1974).

Charentsavan was founded as a settlement in 1948 in connection with the construction of the Giumushskaia Hydroelectric Power Plant. It was reorganized as a city in 1961. Enterprises include a machine-tool plant, a production association for tool manufacture, the Tsentrolit Plant, the Lizin Production Association, a plant producing reinforced-concrete structural members, the Bzhni Mineral-water Plant, and a clothing factory. Charentsavan has a machine-tool technicum. The city was renamed in honor of E. A. Charents. [29–63–1]

CHARGAFF, ERWIN. Born Aug. 11, 1905, in Czernowitz, Austria-Hungary (now Chernovtsy, Ukrainian SSR). Biochemist. Austrian by nationality; a resident of the USA since 1928 (US citizen since 1940). Member of the National Academy of Sciences (1965); member of the American Academy of Arts and Sciences (1961).

Chargaff received his doctorate from the University of Vienna in 1928. He conducted research at Yale University from 1928 to 1930, at the University of Berlin from 1930 to 1933, and at the Pasteur Institute in Paris in 1933 and 1934. In 1935 he joined the staff of Columbia University, where he held a professorship in biochemistry from 1952 to 1974.

Chargaff has devoted his research primarily to the biochemistry of nucleic acids and the interrelationships of the nitrogenous bases in these acids. He discovered that the deoxyribonucleic acids (DNA) in different biological species differ from one another in the molar amounts of the constituent bases they contain, and between 1950 and 1953 he discovered a rule concerning base-pairing regularities in DNA. Chargaff's rule states that there is a constant ratio of purines to pyrimidines in DNA (that is, the total amount of purine bases—adenine and guanine—is in constant ratio to that of the pyrimidine bases thymine and cytosine); ribonucleic acids, however, usually contain somewhat larger amounts of purines than pyrimidines.

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[29–58–4]

CHARGE, a French term used in some languages (in Russian, *sharzh*) to describe a satirical or humorous likeness, usually of a person, that renders the model's outer appearance while emphasizing essential traits of character. The *charge*, a special type of caricature, is broader than the English term "cartoon," as it may be executed in various media, including scultpure.

Outstanding masters of the *charge* have included L. Bernini, H. Daumier, and the Russian artists B. M. Kustodiev, V. A. Serov, and N. A. Stepanov. The genre has been developed in the USSR by V. N. Deni, B. E. Efimov, I. I. Igin, Kukryniksy, D. S. Moor, and F. P. Reshetnikov. Methods of the *charge* have often been applied to literature, mainly in lampoons, feuilletons, and epigrams. [29–856–2]

CHARGE, a mixture of materials in specific proportion, subjected to treatment in metallurgical, chemical, and other plants. The charge is designed for the manufacture of products with specified physical and chemical properties. Metallurgical charges may contain ores, ore concentrates, agglomerates, recycled slag, dust from a collection device, metals (mainly as scrap), fluxes, and sometimes fuel, for example, in the smelting of pig iron and ferrous alloys in blast furnaces. The charge is loaded into the processing unit in the form of a homogeneous mixture (as a powder, in lumps, or as briquettes) prepared outside the unit or as separate, proportioned quantities of the individual components. The charge materials are usually stored in stockyards. [29–1242–5]

CHARGING, impregnation of the surface of a lap with particles of an abrasive powder or paste. The surface may be charged before the lap is used (direct method) or during use (indirect method). [29–856–4]

CHARI (also Shari), a river of Central Africa whose course lies in the Central African Republic, in the Republic of Chad, and along the Chad-Cameroon border.

Formed primarily by the Ouham (Bahr Sara) and Gribingui rivers, the Chari empties into Lake Chad. Its length is variously given at between 1,400 and 1,500 km, as measured from the Ouham, and it drains an area of approximately 700,000 sq km. The Gribingui has a large number of tributaries on the right—among them the Bamingui, the Bahr Aouk, and the Bahr Kéita—and an inland delta in the vicinity of Sarh (Fort-Archambault). After the Ouham and the Gribingui, the Chari receives the Bahr Salamat from the right and, farther downstream, the Logone River, its largest left tributary. At Lake Chad, the Chari and the Logone form a common, branching delta.

Water levels in the rivers of the Chari basin rise during the summer rainy season and remain high for several months. Since freshets move downstream slowly, the highest water levels in the middle and lower courses of the Chari and the Logone occur in the autumn months; at Ndjamena (Fort-Lamy), they occur in November. The Chari and the Logone flood extensively, forming temporary lakes and linking with the rivers of the Niger basin. The Chari is fished commercially. Navigation is possible for more than 860 km—from the mouth of the Chari to the city of Batangafo on the Ouham. [29–857–1]

CHARIKAR, a city in eastern Afghanistan, on the Kunduz-Kabul highway. Capital of Parwan Province. Population, 100,000 (1973). Pottery is produced in the city. [29–64–1]

CHARINOV, MUGUTIN. Born May 23, 1893, in the village of Khurukra, in what is now Laka Raion, Dagestan ASSR; died 1936. Soviet Lak poet.

Charinov studied at the Baku Agricultural Institute from 1921 to 1927 and became a research worker at the Dagestan Scientific Research Institute in the early 1930's. Charinov began his literary career in 1910. he wrote lyric poetry, as well as the first Lak plays, for example, *Gabibat and Gadzhiiav* (1919) and *Shagalai* (1929), which deal with women's education. Charinov also translated the fables of I. A. Krylov and the poetry of N. A. Nekrasov and M. Iu. Lermontov.

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CHARKA. (1) A vessel for alcoholic beverages; a small *chara*, sometimes with a base or a spherical stem. Various forms of *charka* with niello, enamel, or engraved ornamentation were common in Russia in the 17th and 18th centuries.

(2) A Russian liquid measure used before the introduction of the metric system; also called *sotka*. One *charka* was equal to 1/10 of a *shtof* 1/100 of a *vedro*, and 2 *shkaliki*. One *charka* was also the equivalent of 0.12299 liter. [29–64–3]

CHARKESAR, an urban-type settlement in Pap Raion, Namangan Oblast, Uzbek SSR. Charkesar is situated 35 km northwest of the Pap railroad station on the Kokand-Uchkurgan line. Granite is quarried in the vicinity. [29–64–4]

CHARLEROI, a city in Belgium, in Hainaut Province. Population, 22,500 (1975). A transportation junction and port on the Sambre River, Charleroi is connected by ship canal with Brussels. It is the center of a major industrial and coal-mining region. Industry includes ferrous metallurgy, machine building (particularly the manufacture of electrical equipment), and the production of glass and refractories. The city also has a chemical industry. [29–861–3]

CHARLESTON, a city in the southeastern USA, in the state of South Carolina. Port on the Atlantic coast, near the mouth of the Ashley River. Important center of trade and transportation. Population, 60,000 (1975; including suburbs, 350,000). In 1974, 16,000 people were employed in industry. The city manufactures wood products, food products, tobacco, ships, and such chemical products as mineral fertilizers. [29–64–6]

CHARLESTON, a city in the eastern USA; capital of the state of West Virginia. Located on the Great Kanawha River. Population, 67,000 (1975; including suburbs, 260,000).

Charleston is a transportation junction and mining center. Hard coal, salt, and natural gas are extracted in the vicinity. In 1974, 4,500 persons were employed in mining, and 18,500 in manufacturing. The city has a chemical industry, which produces primarily synthetic rubber, plastics, and synthetic fibers. Other industries in Charleston include metalworking and the manufacture of wood products and building materials. [29–64–7]

CHARLESTON, an American ballroom dance. It first appeared in the 1920's in Charleston, S.C., and then spread to Europe. Based on Negro dances, the Charleston is accompanied by music in 4/4 time with a syncopated rhythm. It became popular again in the late 1960's and mid–1970's. [29–64–5]

CHARLIER, CARL WILHELM LUDWIG. Born Apr. 1, 1862, in Östersund; died Nov. 4, 1934, in Lund. Swedish astronomer.

Charlier's principal works are devoted to celestial mechanics and stellar astronomy. Charlier applied techniques of mathematical statistics to the study of the spatial distribution of stars in the galaxy and the true motions of stars in the solar neighborhood. Between 1908 and 1922, Charlier proposed a theory of the structure of the universe.

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CHARLOTTE, a city in the southeastern USA, in the state of North Carolina. Population, 250,000 (1975; including suburbs, 600,000). Charlotte is the center of a major agricultural region

that produces tobacco and peanuts. In 1975 industry employed 88,000 persons. Machine building, including the manufacture of electronic and aerospace equipment, is of considerable importance. The city also has metalworking, chemical, textile, tobacco, food-processing, and clothing industries. Charlotte is the seat of the University of North Carolina. [29–861–4]

CHARLOTTE AMALIE (formerly St. Thomas), a city in the West Indies, on the island of St. Thomas. Capital and chief port of the US Virgin Islands. Population, 13,000 (1975). Charlotte Amalie has fueling facilities and is a seaside resort. [29–861–5]

CHARNOCKITE (named for the founder of Calcutta, J. Charnock), a hypersthene granite typical of Precambrian assemblages that contain migmatites. Charnockite is composed of orthoclase, oligoclase, quartz, and hypersthene; it also often includes the garnets almandine and pyrope, as well as biotite, magnetite, and other minerals. Two types of charnockites are distinguished: ferrohypersthene charnockite and garnet charnockite.

The composition of charnockite varies. It is currently believed that ferrohypersthene charnockites occur in relatively shallow facies, whereas garnet charnockites are typical of more deep-seated metamorphic facies. The formation of garnet charnockites whose outcroppings are observed in the most deeply eroded Precambrian shields (Indian, Sinian, Aldan, Baltic, and Canadian), is distinguished. The origin of charnockites is linked with magmatism and metamorphism; charnockites are associated with anorthosites and other plutonic rocks, forming the charnockite-anorthosite series.

The term "charnockite" was first proposed by the British geologist T. Holland in 1900 for the intrusive rocks of the Madras area, which contain ferruginous hypersthene as the chief mineral.

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V. P. PETROV and A. A. MARAKUSHEV [29–65–1]

CHAROLAIS, a breed of beef cattle developed in the 18th century in the Charolais region of France from spotted mountain cattle. In the 19th century the Charolais was crossed with the Shorthorn. Its coloration is creamy white.

Charolais bulls weigh 1,000–1,200 kg, cows 700–800 kg, and 18-month-old calves, 450–650 kg. The dressed yield is 60–65 percent. The animals are undemanding and adaptable, and they fatten rapidly. The breed is found in many countries of Europe and North and South America. In the USSR purebred Charolais are produced for commercial crossbreeding and for improving other beef breeds.

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[29–868–2]

CHAROT, MIKHAS' (pen name of Mikhail Semenovich Kudzel'ka). Born Oct. 26 (Nov. 7), 1896, in the settlement of Rudensk, in what is now Minsk Oblast; died Dec. 14, 1938. Soviet Byelorussian poet. Member of the CPSU from 1920.

Charot, the son of poor peasants, served in the Civil War of 1918–20. He was one of the leaders of the literary organization Molodniak. Charot first published his works in 1918. The poetry collections *The Snowstorm* (1922) and *The Sunny Ways* (1929) and the narrative poems *The Barefoot Fire-Walkers* (1922), *Lenin* (1924), and *Byelorussia in Lapti* (1924) reflected the heroic deeds accomplished during the Great October Socialist Revolution and the great changes that took place in the life of the Byelorussian people in the years of Soviet power. Charot was also the author of the collection of short stories *Spring Has Come* (1924) and the folk drama *On St. John's Night* (1921).

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[29–65–2]

CHARPENTIER, GUSTAVE. Born June 25, 1860, in Dieuze, Lorraine; died Feb. 18, 1956, in Paris. French composer and musician. Member of the Institut de France (1912).

In 1887, Charpentier graduated from the Paris Conservatory, where he had studied with J. Massenet. His work developed the traditions of the French lyric opera and the verists. The opera *Louise* (1900, libretto by the composer), based on the life of a Parisian working woman, achieved great popularity. Charpentier's other works include the opera *Julien* (1913), whose music was taken from the symphonic drama *La Vie du poète* (1892); the suite *Impressions d'Italie* (1890; reworked as a ballet, 1913); and the song cycle *Les Fleurs du mal* (1895), based on the poems by C. Baudelaire. Charpentier organized festivals of folk music and in 1902 founded a people's conservatory.

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[29–870–1]

CHARSHANGA, an urban-type settlement and the administrative center of Charshanga Raion, Chardzhou Oblast, Turkmen SSR. Charshanga is situated on the right bank of the Amu Darya. The settlement has a railroad station on the Karshi-Termez line. [29–73–2]

CHARSK, a city (until 1963, the settlement of Charskii) and the administrative center of Charsk Raion, Semipalatinsk Oblast, Kazakh SSR. The city is situated on the Char River, a tributary of the Irtysh, and it has a railroad station on the Semipalatinsk-Aiaguz line. Charsk has railroad transport enterprises and a clothing accessories factory. The Charsk Sovkhoz, which specializes in dairy and grain farming, is located in the city. [29–65–3]

CHARTAK, a city (since 1976) and the administrative center of Iangikurgan Raion, Namangan Oblast, Uzbek SSR. Chartak is situated on the Chartaksai River and is traversed by the Bol'shoi Namangan Canal. The city has a railroad station on the Kokand-Uchkurgan line, 19 km northeast of Namangan. Industry is represented by a cotton-ginning plant, a clothing factory, and a mineral water plant. A balneological health resort is located 7 km from the city.

The summers at the health resort are hot, with a mean July temperature of 27°C, and the winters are mild, with a mean January temperature of −3°C. There are approximately 225 mm of precipitation a year. An important therapeutic agent is highly mineralized thermal water containing nitrogen, silicon, chloride, sodium, and calcium; this water, which also has a high iodine content, has a temperature of approximately 47°C and is used for baths. Another therapeutic agent is chloride-sulfate-sodium water, which is used for drinking. Treatment is given at the health resort for disorders of motor and support organs, gynecological and skin diseases, and disorders of the peripheral nervous system. The health resort also has a sanatorium and a bathhouse. [29–65–4]

CHARTIER, ALAIN. Born circa 1385, in Bayeux; died circa 1433, in Avignon. French poet.

Chartier was secretary to King Charles VII. As a diplomat, he visited many countries, including Italy. In ballades and rondeaux and in such narrative poems as *The Book of the Four Ladies* (1424) and *La Belle Dame sans merci* (1424), Chartier surmounted the linguistic conventions of late medieval love lyrics.

Chartier's political tracts *The Quadrilogue Invective* (1422) and *The Curial* (mid-1420's) sharply and eloquently addressed France's problems, especially the decay of the nobility and the suffering of the people, who bore the brunt of the Hundred Years' War of 1337–1453.

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[29–872–1]

CHARTISM, a movement of the workers of Great Britain in the 1830's, 1840's, and 1850's that fought to implement the People's Charter—hence the name "Chartism." Engendered by the sharpening class contradictions brought about by the completion of the industrial revolution in Great Britain, Chartism constituted, according to V. I. Lenin, "the first broad, truly mass and politically organised proletarian revolutionary movement" (*Poln. sobr. soch.*, 5th ed., vol. 38, p. 305).

The Chartist movement was the highest stage in the development of the working-class liberation struggle during the period preceding the rise of Marxism. It was a revolutionary protest by the workers against political disenfranchisement, capitalist oppression, and the monopoly of power by the landlords and the big bourgeoisie. Chartism reflected the profound discontent of the proletarian masses with the limited parliamentary reform of 1832, which had lowered the property qualification only to the extent that members of the bourgeoisie could be elected, and with the anti-working-class policy of the postreform Parliament. The movement demonstrated the revolutionizing effects of the economic crises of the 1830's and 1840's and indicated dissatisfaction with the limited aims of earlier proletarian struggles, which had been content to pursue the interests of particular trades.

Chartism, which emerged, for the most part, before scientific communism became an integral part of the proletarian movement, manifested a political incoherence characteristic of the proletarian struggle at that time, whose participants were influenced considerably by nonproletarian views and utopian socialism. Despite its immaturity, however, Chartism proved that even at this early stage the working class was capable of independent political action, and it revealed an impulse among the working class toward solidarity and organization. As Lenin stated, Chartism "in many respects was something preparatory to Marxism, the 'last word but one' before Marxism" (*ibid.*, 5th ed., vol. 40, p. 290).

Although Chartism absorbed many traditions of the democratic movement that preceded it, the Chartists brought to the struggle for the democratization of the British governmental system a proletarian opposition to capitalism. F. Engels stressed that in Chartism "the entire working class rose against the bourgeoisie, attacking first of all the latter's political power, the wall of laws with which it had surrounded itself" (K. Marx and F. Engels, *Soch.*, 2nd ed., vol. 2, pp. 451–52).

Chartism emerged as an organized movement with the establishment in 1836 of the London Working Men's Association, among whose leaders was W. Lovett. The leaders of the LWMA drafted a program that was published in May 1838 as a bill entitled *The People's Charter*; it included such demands as universal manhood suffrage and vote by ballot. Agitation for the charter became widespread, especially in central and northwestern England and in the industrial areas of Scotland and Wales, and was accompanied by mass demonstrations and meetings. The notion of exerting outside pressure on Parliament, along with the submitting of a petition, gained widespread popularity. The possibility of using revolutionary force was not ruled out: the Great Northern Alliance, founded in 1838 by F. O'Connor, advocated revolutionary methods. The LWMA's proletarian wing, which was headed by G. J. Harney and supported resolute action, split from the association, which was dominated by petit bourgeois and artisan elements, and formed the independent London Democratic Association. The *Northern Star*, published by O'Connor from its inception in 1837, became the central organ of the Chartists.

Initially, Chartism was tied to the bourgeois democratic movement. The bourgeois radicals, notably such leaders of the Birmingham Political Union as T. Attwood, sought to restrict the movement to a campaign for further parliamentary reform. The moderates and bourgeois fellow travelers, committed to the principle of "moral force," hoped to limit the struggle to peaceful propaganda. Some of the proponents of "physical force," such as O'Connor and J. O'Brien, considered revolutionary struggle a means of self-defense. The left wing believed that the workers would have to use revolutionary force in order to win; this view was maintained by Harney, who was subsequently joined by such figures as E. Jones.

Bitter disputes flared up at the Chartist National Convention, which met in London in February 1839. Attempts by the revolutionary wing to turn the convention into a center of revolutionary struggle frightened many bourgeois radicals, whose representatives quit the convention. The remaining delegates failed to work out a genuine program for mass action.

On July 12, 1839, Parliament rejected the Chartist petition, which bore 1,280,000 signatures. The convention and the movement's supporters were unprepared to carry out contingency measures, which included the organization of a general strike; nevertheless, the convention's call for a strike to begin on August 12 was answered by workers in Manchester, Bolton, Macclesfield, and numerous other localities. On November 4, Welsh miners staged the Newport uprising, which was put down by troops.

In the 1840's, the Chartist movement entered a new phase. On July 20, 1840, the National Charter Association was founded in Manchester; it reached a membership of 50,000 in 1842. The association was the first mass working-class party in history. Although it was unable to clearly define goals and tactics and suffered from a certain lack of organization, the National Charter Association waged a struggle to enable the working class to assume political power and use that power to transform society. The line was drawn between the Chartists and the bourgeois radicals. The convention that met in April 1842 reflected the desire of most Chartists to create an independent class movement. Several social demands were included in the new petition, notably the abrogation of the Poor Law of 1834, whose only provision providing relief to the poor was the workhouse. The petition also demanded a reduction in taxes, a shortened workday, and higher wages. For the first time, British workers demanded the dissolution of the union of Britain and Ireland that had been imposed in 1801.

More than 3.3 million signatures were gathered for the new petition, which was nevertheless rejected by Parliament. In response, miners, textile workers, and pottery workers in Staffordshire, Worcestershire, and Scotland went on strike in August 1842. From August 9 to August 16 the strike engulfed Lancashire and part of Cheshire and Yorkshire, assuming the character of a general strike in these areas. Uprisings broke out spontaneously in several places, and bloody clashes took place in Preston, Blackburn, and Halifax, with workers fighting police and troops.

In late 1842 the Chartist movement temporarily went into decline owing to the failure of the strike, to internal separatist tendencies, and to the immature social and political views of its members. Many Chartist leaders believed, with O'Brien, that a crucial means of solving social problems lay in land nationalization. Others saw the solution in the workers' returning to the land; to accomplish this goal, O'Connor helped found the National Land Company in 1845.

The revolutionary trend nevertheless gained strength as the Chartist leaders tended toward proletarian socialism and internationalism. Left-wing Chartists, notably Harney, established close ties with K. Marx and F. Engels. In 1845 left-wing Chartists and revolutionary exiles from Germany and other countries founded the Fraternal Democrats, an international society, in London. Harney and Jones, the most progressive Chartist leaders, joined the Communist League.

In 1847 and 1848 the Chartist movement took on a wider scope under the influence of the economic crisis and disturbances in Ireland and revolutionary events on the Continent. In response to the upsurge in the proletarian struggle, Parliament in 1847 was compelled to pass a bill establishing a ten-hour workday. O'Connor was elected to the House of Commons. Harney and Jones were unable, however, to persuade the convention that met in April 1848 to plan an armed struggle. A peaceful demonstration by the Chartists on April 10 was broken up by the government, and a third Chartist petition met with the same response as its

predecessors. An attempt by the left wing to prepare an armed uprising proved unsuccessful. Most of the Chartist leaders, including Jones, were arrested, and on Aug. 14, 1848, a Chartist uprising in Ashton-under-Lyne was put down.

After 1848 the Chartist movement declined, and the adherents of O'Brien and O'Connor split into two mutually hostile sects. In response, the left-wing Chartists, supported by Marx and Engels, sought to revive Chartism on a socialist basis. The first English translation of *The Communist Manifesto* was published in the Chartist press. A new Chartist program was adopted in 1851. In it the movement proclaimed socialist goals for the first time; they included the establishment of the political hegemony of the working class through the implementation of the demands of the People's Charter, the nationalization of land and banks, and the cooperation of labor.

The Chartists sought to take part in the strike movement and to combine economic struggle with political agitation. On their initiative the Labour Parliament convened in March 1854; it was attended by representatives from the trade unions and nonorganized workers. The Chartists failed to create, however, a mass organization. Using Great Britain's worldwide industrial and colonial monopoly, the bourgeoisie, by creating a privileged stratum, the labor aristocracy, were able to divide the working class and thereby temporarily weaken its revolutionary energy. As reformist tendencies in Great Britain's working-class movement became dominant, Chartism steadily lost its influence among the working class, and at the end of the 1850's it finally disappeared from the historical stage.

Chartism, which Lenin described as "the revolutionary period of the English labour movement" (*Poln. sobr. soch.*, 5th ed., vol. 16, p. 25), strongly influenced Great Britain's social development. The ruling classes were compelled to implement in one form or another the main democratic demands of the Chartist program. Great Britain's working-class movement, despite the malign influence of reformism, preserved the traditions of Chartism. Chartism and its lessons were of international importance.

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L. I. GOL'MAN [29–66–3]

CHARTIST LITERATURE, literature written during the Chartist movement that reflected the struggle of the British proletariat in the revolutionary-democratic stage of the working-class movement.

Chartist literature was rooted in the mass democratic literature of the late 18th and early 19th centuries and in working-class folklore; it also reflected the influence of Lord Byron and P. B. Shelley. The leading revolutionary-democratic trend in Chartist literature countered the reformism favored by the poets E. Elliot, T. Hood, and T. Cooper. Such poets as E. Jones, W. J. Linton, and G. Massey came to the fore, and poems written by workers were published, often anonymously, in Chartist newspapers and journals.

Building on the achievements of British critical realism, such prose writers as T. M. Wheeler and Jones sought to depict popular revolutionary movements. An important place in Chartist literature is occupied by journalism, by satirical sketches (D. J. Jerrold), and by literary criticism (G. J. Harney, Jones, and Massey), which attempted to create a proletarian aesthetics.

K. Marx and F. Engels valued Chartist literature highly; its traditions were adopted by writers of the socialist movement, notably W. Morris, and may be seen today in progressive British literature.

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[29–71–1]

CHARTRES, a city in northern France, situated on the Eure River. Capital of Eure-et-Loir Department. Population, 72,000 (1975). Chartres is a transportation junction and commercial center of an agricultural region. It has enterprises for the manufacture of agricultural machinery, electrical equipment, fertilizers and other chemical products, pharmaceuticals, and food products, mainly flour and beer. The city also produces decorative glassware and ready-to-wear clothing.

The center of Chartres has preserved its medieval plan. Its numerous buildings dating from the 13th to 18th centuries include the Romanesque abbey of St. Pierre (12th–13th centuries), the churches of St. Brice (11th century) and St. André (12th century), the Gothic cathedral of St. Pierre, and the Renaissance cathedral of St. Aignan (16th–17th centuries).

Chartres is famous for the cathedral of Notre Dame, originally built in the Romanesque style in the 11th century. The old cathedral was destroyed by fire in 1194; only the crypt and the base of the west tower were preserved. It was rebuilt in the High Gothic style by 1260, and additional construction was carried out between the 14th and 16th centuries. The cathedral is also known for the rich sculptural work of its Romanesque royal portal on the west (1145–1155) and the Gothic portals on the north and south. It is especially noted for its stained-glass windows (12th–13th centuries).

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[29–870–7]

CHARTRES, SCHOOL OF, a medieval school of Scholastic philosophy in Chartres. In the first half of the 12th century the school, then at its zenith, was an international center of Platonic thought colored by natural philosophy. Outstanding among the school's teachers were Bernard of Chartres, Gilbert of Porrée, and Thierry (or Theodoric) of Chartres; followers of the school included William (or Guillaume) of Conches, John of Salisbury, Bernard Silvestris, and Alan of Lille.

The philosophy of the school of Chartres was an unusual phenomenon in the context of medieval Scholasticism. In their delight with nature as a creative force, the school's adherents ap-

proached pantheism—a doctrine that was incompatible with Christian orthodoxy—and were impelled to resort to forms of literary exposition far removed from the dryness and strictness of Scholasticism. The school's ideas are most vividly expressed in two extant examples of philosophical narrative poetry—*De mundi universitate* by Bernard Silvestris and *Nature's Plaint* by Alan of Lille.

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CHARUSHIN, EVGENII IVANOVICH. Born Oct. 29 (Nov. 11), 1901, in Viatka (present-day Kirov); died Feb. 18, 1965, in Leningrad. Soviet graphic artist and writer. Honored Art Worker of the RSFSR (1945).

From 1922 to 1926, Charushin studied at the Vkhutein (Higher Art and Technical Institute) in Leningrad under A. I. Savinov and A. A. Rylov. He was influenced by V. V. Lebedev. Charushin's drawings of animals are pervaded by a warm humor and are notable for their free style reminiscent of watercolor. They have appeared as illustrations for young children's books, including Charushin's own books, such as *The Little Wolf and Others* (1931), *Nikitka and His Friends* (1938), and *About Tomka* (1957), as well as works of other authors, for example, S. Ia. Marshak's *Tots in a Cage* (published 1935).

While cultivating sensibility and judgment in the child, Charushin's drawings promote an understanding of right and wrong and awaken a love of nature. This is also true of his prose works, as well as his prints and miniature porcelain works. Charushin's books have been translated into the languages of the peoples of the USSR and several foreign languages.

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CHARUSHIN, NIKOLAI APOLLONOVICH. Born Dec. 23, 1851 (Jan. 4, 1852), in Orlov (now Khalturin); died Mar. 6, 1937, in the city of Kirov. Russian revolutionary and Narodnik (Populist).

The son of a *dvorianin* (nobleman), Charushin studied at the St. Petersburg Technological Institute in 1871 and 1872. In October 1871 he joined the Chaikovskii circle and carried out propaganda among the workers. On Jan. 5, 1874, he was arrested, and at the Trial of the 193 he was given a sentence of nine years' hard labor, which he served at the Kara Penal Colony. Charushin was required to live in Eastern Siberia from 1881 to 1895. In 1895 he took up residence in Viatka, where he was associated with the *zemstvo* (organ of local self-government). From 1905 to 1917 he headed the newspaper *Viatskaia zhizn'*. Charushin adhered to the positions of the Popular Socialists and later to those of the Constitutional Democrats. He abandoned political activity in 1918. In 1922, Charushin joined the Society of Former Political Prisoners and Exiles.

WORKS
O dalekom proshlom, 2nd ed. Moscow, 1973. [29–73–1]

CHARVAK, an urban-type settlement in Bostanlyk Raion, Tashkent Oblast, Uzbek SSR. Charvak is situated on the Chirchik River, a tributary of the Syr Darya. The terminus of a railroad branch line from Tashkent, Charvak was established in 1964 during the construction of the Charvak Hydroelectric Power Plant. [29–58–2]

CHARVAKA, a materialist doctrine in ancient and medieval India—a late variant of, and sometimes identified with, the Lokayata. No written work by followers of this school, or Charvakas, has been preserved.

The Charvakas rejected the orthodox Indian religious-philosophical systems whose authority was derived from the Vedas and Vedic principles; they not only denied the existence of an absolute god and of the soul (the *brahman* and *atman*) but also rejected the concepts of *dharma* and *karma* as the basis of morality. The Charvakas held that only what is directly perceived is true; this world is all that exists, and matter is the only reality. Concentrating on the development of ethical concepts, the Charvakas regarded the notion of good and evil as an illusion created by the human imagination. In their view, only the pain and pleasure of sensory existence are real. They rejected the ascetic restrictions imposed by the rules of the Indian religious-philosophical systems, asserting that the achievement of pleasure is the one goal of human existence. They held that one should strive toward the goal even though the pleasure may be coupled with suffering.

The Charvaka's consistent materialism and hedonism make it a unique phenomenon in the history of Indian thought, even with respect to unorthodox Indian philosophical systems.

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CHARYN (also Sharyn; in the upper course, Sholkodagsu; in the middle course, Kegen), a river in Alma-Ata Oblast, Kazakh SSR; a left tributary of the Ili. The Charyn measures 427 km in length and drains a basin of 7,720 sq km. It originates on the southern slopes of the Ketmen' Range and divides into several arms in the lower course. It is fed by snow and groundwater. The mean flow rate 84 km from the mouth is 35.4 cu m per sec. The river freezes over between November and February, and the ice breaks up in March or early April. The Charyn is used for irrigation. [29–73–3]

CHARYSH, a river in Altai Krai, RSFSR; a left tributary of the Ob'. The Charysh measures 547 km in length and drains a basin 22,200 sq km in area. It originates on the slopes of the Korgon Range, flowing through hilly and later flat terrain. It is fed primarily by snow. The mean flow rate 82 km from the mouth is 192 cu m per sec. The river freezes over in the lower course in late October or November and in the upper course in December; the ice breaks up in late March or April. The main tributaries are the Inia, Belaia, and Loktevka on the left and the Maralikha on the right. The Charysh is navigable 83 km from the mouth. It is used for irrigation. [29–73–4]

CHASE, STUART. Born Mar. 8, 1888, in Somersworth, N.H. American economist.

Chase attended the Massachusetts Institute of Technology (1907–08) and Harvard University (1910). He served as a consultant to various US government agencies from the 1920's to the 1940's. In 1925 he published *The Tragedy of Waste*, in which he cited an abundance of evidence regarding the plundering of productive forces under capitalism. Chase defends the erroneous theory of the possibility of reforming and improving capitalism. In *Technocracy* (1933), Chase maintained that the main role in this regard must be played by the technical intelligentsia. Chase was forced to acknowledge the underutilization of production capacities in the USA and the existence of a constant army of unemployed. However, he considers these phenomena to stem not from capitalist production relations but from human psychology and dominant ideas and concepts. Chase expressed these idealist views in *The Tyranny of Words* (1938). He was an active proponent of the bourgeois reformist theory of a mixed economy (*see* MIXED ECONOMY, THEORY OF) in *Goals for America* (1942).

Chase considers government economic regulation to be the principal means of curing capitalism's ills. In Chase's opinion, the

capitalist economy becomes mixed as a result of the combination of private enterprise with government regulation. In actuality, Chase's "mixed economy" is nothing but an apology for state-monopoly capitalism. Declaring that the reduction of unemployment requires the expansion of personal consumption and of military production, Chase essentially justifies the militarization of the economy. Chase's advocacy of broad public works programs (for example, construction of airports and important highways) serves the same goals. [29–125–4]

CHASE MANHATTAN BANK, N. A., a commercial US bank and the principal center of the Rockefeller financial group. The bank was created in its present form in 1955 by the merger of the Bank of the Manhattan Company (founded 1799) and the Chase National Bank (founded 1877). The bank's board of directors and approximately 50 of its divisions are located in New York City. The bank has close ties with major petrochemical concerns (Standard Oil Company, Allied Chemical Corporation), electronics firms, machine-building companies (American Telephone and Telegraph Company, Honeywell Inc.), and insurance corporations. In the 1970's the bank stepped up its program of foreign expansion in Latin America, Asia, and Europe through its specialized subsidiary Chase International Investment Corporation.

As of 1976, the Chase Manhattan Bank had approximately 70 divisions, subsidiaries, and associated (amalgamated) banks in various countries, 15 representative facilities in foreign countries, including Moscow, and approximately 40 financial companies specializing in long-term investment and equipment leasing. The bank's total balance at the close of 1976 was $44.7 billion. Loans totaled $30.2 billion; securities, $3.4 billion; deposits and current accounts, $37.6 billion; and capital and reserves, $2.0 billion.

E. D. ZOLOTARENKO [29–126–1]

CHASHA, a round vessel with a wide mouth and narrow bottom, used for wine and other beverages. The Russian term *chasha* is usually applied to vessels without feet and whose body sits directly on a base. [29–111–1]

CHASHNIK (also *chashnichii*), from the 14th to 18th centuries, a rank and position at the court of the grand prince of Moscow and later the tsar.

The *chashnik* was originally the head of the special court institution that was in charge of drinking establishments and wild-hive beekeeping. The *chashnik* also supervised the economy, administration, and judicial system of crown hamlets and villages inhabited by wild-hive beekeepers and managed the crown's wild-hive forests. The *chashnik* was among the closest advisers of the prince.

In the 16th and 17th centuries the administrative functions of the *chashnik* passed to the Sytnyi Dvor, which prepared beverages for the tsar's household, and the duties of the *chashnik* were reduced to serving the tsar at banquets and the holiday feasts. The rank of *chasnik* was abolished in the early 18th century. [29–111–5]

CHASHNIKI, a city since 1966 and the administrative center of Chashniki Raion, Vitebsk Oblast, Byelorussian SSR. Chashniki is situated on the Ulla River, a tributary of the Zapadnaia Dvina. Railroad station on the Orsha-Lepel' line. The city has an alcohol plant, a flax-processing plant, and a paper factory.

In the final stage of the Patriotic War of 1812, battles were fought near Chashniki between the Russian I Separate Corps under General P. Kh. Vitgenshtein and the French II and IX Corps of marshals L. de Gouvion-Saint-Cyr and C. Victor-Perrin. On orders from Napoleon I to reinforce the northwestern axis, Victor-Perrin set out for the Ulla River, joining Gouvion-Saint-Cyr's corps on October 18 (30). On October 19 (31), Vitgenshtein attacked Gouvion-Saint-Cyr, driving him across the Ulla. Upon learning that units from Victor-Perrin's corps had also fought in the battle, Vitgenshtein decided not to continue the offensive and stopped near Chashniki, awaiting the approach of the forces of Field Marshal M. I. Kutuzov and Admiral P. V. Chichagov. After the French retreated to Senno, Napoleon ordered them to drive Vitgenshtein beyond the Zapadnaia Dvina River. Victor-Perrin's and Gouvion-Saint-Cyr's troops took the offensive on November 2 (14) and initially forced the Russian vanguard back toward Chashniki. In bitter fighting, the village of Smol'nia changed hands several times. After losing as many as 3,000 men, the French retreated along the road to Beshenkovichi. [29–112–1]

CHASLES, MICHEL. Born Nov. 15, 1793, in Epernon; died Dec. 18, 1880, in Paris. French mathematician and historian of mathematics. Member of the Académie des Sciences (1851; corresponding member, 1839).

Chasles became a professor at the Ecole Polytechnique in Paris in 1841 and at the University of Paris in 1846. His most important works deal with geometry. He contributed to the development of projective geometry with, for example, his textbook *Treatise on Higher Geometry* (1852). Chasles's works on the history of mathematics, particularly his *Historical Survey of the Origin and Development of Geometric Methods* (1837; Russian translation, vols. 1–2, 1883), helped establish the relations between individual studies and clarified the historical relationship of scientific ideas in the field.

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CHASOV IAR, a city (since 1938) in Donetsk Oblast, Ukrainian SSR; under the jurisdiction of the Artemovsk city soviet. Railroad station. Population, 23,000 (1974). Chasov Iar is an important center for the production of refractory clay. The city is the site of the Gidrozhelezobeton plant, a pilot plant, and a refractory-products plant that is part of the Ukrogneupornerud industrial association. Chasov Iar has a museum of local lore. [29–73–6]

CHASSELASE, a group of early-ripening table grape varieties native to Egypt and France. The bunches are medium-sized, weighing 120–180 g; they are cylindrical or conical in form and of average or loose compactness. The fruit is round. Its coloration is light green to golden yellow in white chasselase, dark pink in pink chasselase, or light amber in muscadine chasselase. The productivity is 6–20 tons per hectare. The grapes are usually eaten fresh or processed into juice or wine. They are distributed in almost all grape-growing regions, including those of rhe USSR. [29–873–4]

CHASSEY, a Neolithic archaeological culture (fourth and third millennia B.C.) in the southern part of central France. Named after the finds near the village of Chassey in the department of Saône-et-Loire, the Chassey culture was contemporaneous with the Lagozza culture of northwestern Italy and the Cortaillod culture of eastern France and Switzerland. It is characterized by implements made of small flint plates and by polished axes made of hard rocks. The pottery had simple shapes (plates, bowls, spherical vessels), mostly with rounded bottoms and with no decorations. Copper objects are rare. Initially the settlements were in caves and under the open sky. In the later stages, settlements built on high ground or on promontories and fortified with earthen banks and ditches appeared. Burials were in caves, dolmens, or cists.

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CHASSIS. (1) In reference to a motor vehicle or a tractor, a chassis is the aggregate of assemblies comprising the power train, the undercarriage (or running gear), and the control mechanisms. In a motor vehicle with a load-carrying (frameless, or unitized) body, the bottom of the body is considered part of the chassis, and the above-mentioned assemblies are fastened to it. In a vehicle with a frame, the chassis is the structure that, when completed, can move on its own wheels or tracks. The frame-type chassis is used mainly in tractors and trucks; its configuration depends on whether wheels or tracks are used. For wheeled vehicles, the design of the chassis is determined by the vehicle's total number of axles and the number of driving axles. The chassis of some vehicles are equipped for off-road travel.

(2) The chassis of a device such as a radio, computer assembly, or rectifier is the panel on which the individual parts are mounted. The chassis is usually made of sheet material, such as aluminum, brass, Micarta, or textolite. S. IA. MAKAROV [29–873–6]

CHASTII, NIKOLAI ANDREEVICH. Born Mar. 25 (Apr. 7), 1905, in the city of Valki, in what is now Kharkov Oblast; died Nov. 18, 1962, in Kiev. Soviet Ukrainian singer (bass). People's Artist of the Ukrainian SSR (1941).

In 1929, Chastii graduated from the Kharkov Institute of Music and Drama, where he studied under N. L. Chemezov. He was a soloist at the Kharkov Theater of Opera and Ballet from 1927 to 1934, at the Georgian Theater of Opera and Ballet from 1941 to 1944, and at the Ukrainian Theater of Opera and Ballet from 1934 to 1941 and from 1944 to 1958. Chastii excelled in the title role in Glinka's *Ivan Susanin* and as Tsangala in Paliashvili's *Daisi*, Karas' in Gulak-Artemovskii's *The Zaporozhian Cossack Beyond the Danube*, the Elected Official in Lysenko's *Natalka from Poltava*, Mephistopheles in Gounod's *Faust*, and Kecal in Smetana's *The Bartered Bride*. He also gave concerts and recitals of folk songs and works of Russian and Soviet composrs.

Chastii was awarded the State Prize of the USSR in 1950. [29–79–2]

CHASTIKOVAIA RYBA (also *chastik*; literally, "fine-mesh fishes"), the commercial name for a group of fishes of moderate size, used mainly in southern fishing regions of the USSR on the Caspian, Aral, Azov, and Black seas. The term originated because of the use of fine-mesh nets for catching certain species of fish, in contrast to large-mesh nets used for catching fish of the sturgeon family, for example.

Chastikovye ryby are distinguished by size. The larger species include sheatfish, carp, pike, and pike perch, and the smaller ones include sabre carp, crucian carp, and others, excluding sprats, anchovies, and related species. [29–79–3]

CHASTNYI POVERENNYI (private attorney), in tsarist Russia, the second of the two categories of lawyers created by the Judicial Reform of 1864, the first category being that of *prisiazhnyi poverennyi* (sworn attorney).

The position of *chastnyi poverennyi* was introduced in order to force out of the courts the private intercessors known as *khodatai po chuzhim delam*, who were slipping beyond the government's control. The *chastnye poverennye* could practice only in courts from which they had received formal permission. Unless they had received a higher legal education, they were subject to an examination. They were also checked for "reliability and morality." The *chastnye poverennye* had the right to conduct no more than three civil cases a year, but the number of criminal cases they could conduct was unlimited. [29–83–1]

CHASTUSHKA (a ditty), a literary and musical genre of Russian folklore; a short song usually having four lines and performed at a rapid tempo.

The *chastushka*, which became established as an independent genre in the last third of the 19th century, is historically related to traditional songs, especially those with a quick tempo. It achieved its greatest popularity in the first half of the 20th century. Composed primarily by rural youth, *chastushki* are performed in a series to a single melody; they may be accompanied by an accordian or balalaika or sung a cappella. *Chastushki* are sung at parties and usually communicate an emotional buoyancy. They generally deal with love or everyday concerns, but even before the October Revolution there were topical *chastushki*, usually with satiric overtones. In the Soviet period the proportion of such songs increased, and the range of subjects expanded. A response to events of the day, the *chastushka* is generally improvised.

Chastushki, which are addressed to a particular person or to the audience as a whole, are characterized by their simple idiom, their concern with everyday reality, and their expressiveness. Written in a trochaic meter, they generally follow the pattern abcb, although sometimes paired rhymes or alternate rhymes are used. The melody, usually for one voice but sometimes in two-part harmony, either is sung or is partly sung and partly spoken. In recent decades the output of *chastushki* has declined somewhat.

Literary *chastushki*, influenced by folk *chastushki*, have been composed by such writers as D. Bednyi, V. V. Mayakovsky, and A. A. Prokofiev. *Chastushki* are often created by amateur arts groups. Although they originated in Russian folklore, *chastushki* subsequently spread to the Ukraine, Byelorussia, and other republics of the USSR.

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S. G. LAZUTIN [29–92–4]

CHATEAUBRIAND, FRANÇOIS RENÉ (Vicomte de Chateaubriand). Born Sept. 4, 1768, at Saint-Malo; died July 4, 1848, in Paris. French writer and political figure.

Chateaubriand studied at Dôle and Rennes. He entered military service in 1786; at court he was close to a group of writers in the opposition. In 1792 he joined the royalist forces against the republic. He then emigrated to England, where he lived from 1793 to 1800. Called into the diplomatic service by Napoleon Bonaparte, Chateaubriand was sent to Rome in 1803; he resigned his post in 1804, when imperial rule was proclaimed in France. During the Restoration he served as ambassador to Berlin and then to London. He withdrew from political activity after 1830.

Chateaubriand's literary heritage constitutes the foundation of "conservative" romanticism. Some early indications of the author's disillusionment with the concept of "natural man" can be found in his sketches *Journey to America* (published 1827). His *Essay on Revolutions* (1797) marks Chateaubriand's further retreat from the materialist and atheist traditions of the Enlightenment; man's yearning for the absolute fullness of being turns into the triumph of elemental destructive forces. To this fatal cycle of irrational human aspirations Chateaubriand juxtaposes the romantic ideal of creative individuality, which acquires harmony and spiritual equilibrium by communicating with nature.

In the short novel *Atala, or the Love of Two Savages* (1801), Chateaubriand argues against the "state of nature" of J.-J. Rousseau. In another work, *The Genius of Christianity* (1802), Chateaubriand proposes religious fervor as a foil to the egotistical acts of the individual. Apologizing for Christianity, the author argues that religious feeling, rather than cold rationalism, nourished the great writers of the past, inspiring every true work of art. The tale *René, or the Results of Passion* (1802) introduced the image of the romantic suffering hero in French literature. As represented by Chateaubriand, the traditional opposition between duty and destructive passion is erased by the acknowledged uselessness of any kind of action under bourgeois social conditions. *The Martyrs* (1809), a "Christian epic" conceived as a literary illustration of the basic theoretical propositions of *The Genius of Christianity*, sings the praises of the first Christians. *The Adventures of the Last of the Abencérages* and *The Natchez* (both published 1826) affirm the superiority of the Christian ethic and are filled with exotic images, myths, and miracles.

Chateaubriand's artistic and philosophical quest was summarized in his *Memoirs From Beyond the Grave* (1848–50). He also wrote many articles on historical, literary, and political subjects. In Russia, Chateaubriand was held in high esteem by K. N. Batiushkov and A. S. Pushkin, and V. G. Belinskii began a critical reassessment of his work.

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A. P. BONDAREV [29–879–1]

CHÂTEAUROUX, a city in central France. Capital of Indre Department. Population, 64,000 (1975). Châteauroux is a transportation junction. Its industries produce agricultural machinery, automobile parts, and tobacco products. Châteauroux also has wool, food-processing, and furniture industries. [29–880–2]

CHATHAM, a city in Great Britain, in the county of Kent; situated on the Medway River, which empties into the Thames estuary. Population, 144,500 (1976). Together with the city of Rochester, Chatham forms the adminstrative district of Medway. Chatham is the site of a major naval base. [29–106–4]

CHATHAM, a group of volcanic islands in the Pacific Ocean, east of New Zealand. The Chatham Islands—which include Pitt Island and Chatham Island—belong to New Zealand. The group has a total area of 963 sq km and a combined population of 500 (1968). The maximum elevation is 291 m. The islands have an oceanic climate, and there are vast swamps, meadows, and heaths. The economy is based on sheep raising. The Chatham Islands were discovered in 1791 by the British navigator W. R. Broughton. [29–106–3]

CHATHAM, a strait in the Alexander Archipelago, in the northeastern part of the Pacific Ocean. Chatham Strait separates Baranof Island and Chichagof Island from Kuiu Island and Admiralty Island. The strait has a length of 203 km, a width of 7 to 25 km, and depths ranging from 530 to 691 m. The coasts are steep and occasionally precipitous, with elevations of as much as 1,000 m above sea level. The velocity of the tidal currents reaches 2 km per hr. Chatham Strait was discovered in 1741 by the Russian navigator A. I. Chirikov. [29–106–2]

CHATKAL (also Karakul'dzha), a river in the Kirghiz and Uzbek SSR's. Before the construction of the Charvak Reservoir, the Chatkal was the left fork of the Chirchik River (Syr Darya basin). The Chatkal is 223 km long and drains an area of 7,110 sq km. It rises on the southwestern slopes of the Talasskii Alatau and flows through a broad valley with steep slopes; below the place where the Ters empties into it, the Chatkal flows through a deep gorge. The river is fed mainly by snow. It has a mean flow rate of 122 cu m per sec near the mouth; the maximum flow rate is 920 cu m per sec. [29–106–5]

CHATKAL MOUNTAIN AND FOREST PRESERVE, a nature preserve located in the western spurs of the Chatkal Range, 70 km from Tashkent. The preserve has two sectors, Bashkyzylsai and Maidantal, with a total area of 35,256 hectares (1976). It was established in 1947 to protect the natural complexes of the western Tien-Shan, which range from the steppes and the zone of tree and shrub vegetation (juniper stands with apple, hawthorne, pear, mountain ash, cherry, and other tree species) to alpine meadows. The preserve has gallery forests in which the predominant species are birch (in the Maidantal sector) and willow and poplar (in the Bashkyzylsai sector). Pistachio trees grow on the mountain slopes individually and in small stands.

Mammals commonly encountered include the Asiatic ibex (*Capra sibirica*), roe deer, wild boar, *Marmota sibirica*, a relict suslik, porcupine, Eurasian brown bear, wolf, fox, badger, stone marten, ermine, and weasel. Snow leopards are occasionally encountered. Common birds include the Himalayan snowcock, snow partridge, griffon vulture, black vulture (*Aegypius monachus*), bearded vulture, Egyptian vulture, and blue whistling-thrush.

Ancient cliff drawings depicting people and deer and other animals have been found along the banks of the Tereksai River.

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[29–106–7]

CHATKAL RANGE, a mountain range in the western Tien-Shan, in the Kirghiz and Uzbek SSR's; borders the northwestern part of the Fergana Valley. The Chatkal Range is approximately 200 km long, with an average elevation of 3,500 m and a maximum elevation of 4,503 m. The mountains are composed of shales, limestones, and granites. The northern slopes are short and steep; on the south the mountains are more gently sloping and have thickets of English walnut, Schrenk's spruce, fir, and juniper. Meadows are found at the higher elevations. [29–107–1]

CHATKAL VALLEY, a valley along the upper course of the Chatkal River in the western Tien-Shan in the Kirghiz SSR. The valley is situated between the Chatkal Range on the southeast and the Pskem and Sandalash ranges on the northwest; it is bounded by the Talasskii Alatau on the north. Elevations range from 2,500 at the "upstream" end of the valley to 1,000 m farther downstream. Mountain pastures, fields, and forests of English walnut and juniper are found on the floor and slopes of the valley. [29–106–6]

CHATTANOOGA, a city in the southeast USA, in the state of Tennessee. Population, 145,000 (1975; with suburbs, 390,000). Chattanooga is a port on the Tennessee River and a transportation junction. Industry employed 61,000 people in 1974. Chattanooga has enterprises of the chemical, wood-products, metalworking, machine-building, and textile industries; ferrous alloys are produced. A university is located in the city. [29–107–2]

CHATTERJI, BANKIM CHANDRA (also Chatterjee, Cattopadhyay). Born June 26, 1838, in Katalpara, near Calcutta; died Apr. 8, 1894, in Calcutta. Indian Bengali-language writer.

Chatterji, a romanticist, was the author of the first historical novels in Bengali. His poem "Hail to Thee, Mother" ("Bande Mataram") was the hymn of the national liberation movement from 1905 to 1947. His novels *Candrasekhar* (1873), *Ananda Math* (1882), and *Raj Singh* (1893; Russian translation, 1960) enthusiastically supported the struggle for independence. The social position of Indian women, deprived of rights, is the main theme of the novels *Bishka Brikka* (also known as *The Poison Tree*, 1872; Russian translation, 1962) and *Krishnakanter Uil* (1875).

Chatterji also wrote the collections of satirical short stories *Popular Amusements* (1874) and *Kamalakanter Daptar* (1875), as well as articles on literary history, sociology, science, philosophy, and religion. As an educator, publicist, and editor of the journals *Banga Darshan* and *Prochar*, Chatterji played an important role in the cultural life of Bengal.

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[29–688–3]

CHATTERJI, SUNITI KUMAR. Born Nov. 26, 1890, in Sibpur, near Calcutta; died May 29, 1977, in Calcutta. Indian philologist, Orientalist, and public figure.

Chatterji graduated from the Calcutta District College in 1913 and from 1919 to 1922 studied Indo-European, Indian, Iranian, Slavic, Austro-Asiatic, and classical linguistics at the University of Paris, the Collège de France, and the School of Oriental Studies at the University of London. He became a professor at the

University of Calcutta in 1922 and National Professor of India in Humanities in 1964. He was named vice-president of the National Academy of Letters in New Delhi in 1968 and became president the following year.

Chatterji published some 900 works in Bengali, Hindi, Sanskrit, and English. His research dealt with the history of Bengali phonetics and morphology, the development of the Indo-Aryan languages (particularly the Prakrits), and the influence of the substratum (Dravidian and Austro-Asiatic languages) on the lexicon of the Middle and Modern Indic (Indo-Aryan) languages. His principal work, *The Origin and Development of the Bengali Language* (1926), initiated the development of Indian linguistics on a modern scientific basis. In his linguistic studies Chatterji used historical, cultural, anthropological, and philosophic data. He wrote a book about his trip with R. Tagore to Malaya, Indonesia, and Thailand, and he is the author of works in Bengali on literary subjects.

Chatterji served on many committees that dealt with educational, cultural, and linguistic problems. From 1952 to 1965 he was chairman of the upper house of the legislative body of West Bengal. He was an honorary member of many academies, institutes, and scientific societies in Europe, Asia, and America. In 1969, Chatterji became president of the International Phonetic Association in London and of the West Bengal division of the Indian-Soviet Cultural Society.

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A. S. BARKHUDAROV [29–107–3]

CHATTERTON, THOMAS. Born Nov. 20, 1752, in Bristol; died Aug. 24, 1770, in London. English poet.

Chatterton was the author of literary forgeries that expressed a reaction against the rationalism of Enlightenment literature and an interest in the age of chivalry characteristic of preromanticism. Writing in pseudomedieval English under the name Thomas Rowley (an imaginary 15th-century monk), Chatterton composed ballads ("An Excelente Balade of Charitie"), epic poems ("The Tournament," "The Parliament of Sprites," and "Battle of Hastings"), eclogues, satires, apocryphal biographies, and treatises ("The Ryse of Peyncteynge in Englande"). The poetic works are marked by a longing for tradition, mystery, and solemnity. Chatterton was also the author of dramas (the tragic interlude *Ælla* and the burlesque *The Revenge*, staged in 1770), poems, and other works in the comtemporary style, as well as political essays.

In April 1770, Chatterton moved to London, where extreme poverty and the discovery by Walpole of his forgeries drove the young poet to suicide. Almost all of Chatterton's work was published posthumously. His tragic fate attracted the interest of many writers, including Wordsworth, Keats, Rossetti, and de Vigny.

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A. B. GORIANIN [29–107–4]

CHATURANGA, an ancient table game; one of the oldest forerunners of chess. *Chaturanga* originated in India in about the fifth century. According to Indian and Arabic sources, it was a four-handed game in which each player had a set of pieces of four types: elephants, horses, chariots, and foot soldiers. The object of the game was to take the opponents' pieces. The moves were made alternately, and the number of moves was determined by throwing a die. The exact rules of *chaturanga* are not known. The game became popular in Iran and Middle Asia and then in the Arab Caliphate. It eventually evolved as the game called in Arabic *shatranj* and in Persian *chatrang*, a two-handed game with rules similar in part to those of modern chess and without the use of the die. [29–108–1]

CHATYRDAG (also Shater-gora), a plateau-like massif in the Glavnyi (southern) Ridge of the Crimean Mountains, northwest of the city of Alushta. Chatyrdag, which rises to a maximum elevation of 1,527 m, is composed of limestones and has karst landscapes. The slopes are covered with forests of beech, hornbeam, and pine. [29–108–2]

CHATYRKEL', a closed lake in the central Tien-Shan, Kirghiz SSR. Chatyrkel' is situated in a depression at an elevation of 3,530 m, between the Atbashi Range in the north and the Torugarttau in the south. It has an area of approximately 175 sq km and a maximum depth of 3.8 m. Chatyrkel' is a fresh-water lake, with brackish water in the eastern part. It is ice-covered from November to April. It is fed mainly by snow. [29–108–3]

CHAUCER, GEOFFREY. Born circa 1340 in London; died there Oct. 25, 1400. English poet.

Chaucer fought in the Hundred Years' War (1337–1453), and in the 1370's he carried out various diplomatic missions in France and Italy. He held a number of administrative posts and was made a member of Parliament in 1386. He was buried in Westminster Abbey.

In the words of J. Dryden, Chaucer was the "father of English poetry"; from the very beginning, contrary to the traditions of his formative environment, he wrote only in English (the London dialect). The first period of Chaucer's creative work—approximately until 1379—is usually called his French period because of the strong influence on him of the courtly literature of France, as exemplified in his translation of the *Roman de la Rose* and in his narrative poem *Book of the Duchess* (1369).

Chaucer's second period began after his travels to Italy and lasted approximately from 1380 to 1386; it was during this Italian period that all his major works prior to the *Canterbury Tales* were written—namely, the narrative poems *Parliament of Fowls, House of Fame*, and *Troilus and Criseyde*. The *Legend of Good Women* was Chaucer's first collection of tales and the first long narrative poem in English written in decasyllabic verse form—later used in the *Canterbury Tales* as well. The few examples of Chaucer's prose are inferior in expressiveness to his poetry.

The English style of Chaucer's third period appears in its final form in the *Canterbury Tales*. This work, begun in the late 1380's, was never completed. It consists of a *General Prologue*, followed by more than 20 tales—told by pilgrims as a way of shortening their journey to the tomb of St. Thomas à Becket—and an equal number of linking interludes. Most of the social groups living in England at the time are represented in the *Tales*. The general tone of the book is one of good-natured humor that is tolerant of human weaknesses; only the parasitic monks are consistently depicted in the satiric vein. The marvelous quality of Chaucer's humanism is vividly revealed in the *Tales'* optimistic affirmation of life, loving interest in man, sense of social justice, feeling for the common people, and democratic spirit.

Chaucer's influence is most clearly evident in the realistic depiction of everyday life as it evolved in English literature. His influence was also very great in the development of the literary language and national poetry of England. The *Canterbury Tales* were first published by W. Caxton, the first English printer, in 1478(?). The first edition of selected works by Chaucer appeared in 1532. In 1866, W. Morris began working on a "medieval-style" edition of Chaucer's works. The first and most complete Russian translation of the *Canterbury Tales* was done by I. A. Kashkin and O. B. Rumer.

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O. A. KIRPICHNIKOVA [29–686–5]

CHAUDA HORIZON (after Cape Chauda on the Kerch' Peninsula), the lower Pleistocene of the Black Sea region. Established by the Russian geologist N. I. Andrusov (1889), the Chauda horizon is represented by sands, coquinas, conglomerates, and clays (layers up to 15–20 m thick) containing *Didacna tschaudae, D. pseudocrassa*, and the like, which were deposited in an isolated brackish basin. It is found on the Kerch' and Taman' peninsulas, along the Caucasian coast of the Black Sea (a terrace 100–110 m high) and the shores of the Sea of Marmara, and in the Dardanelles. The Chauda horizon corresponds to the Baku horizon of the Caspian region. The Chauda basin occupied the basins of the Black Sea and the Sea of Azov, which received the outflow from the Baku Sea through the Manych Valley. It discharged into the Sea of Marmara and the Aegean Sea with no back-flow.
[29–108–5]

CHAUMETTE, PIERRE-GASPARD (during the revolution, Anaxagoras Chaumette). Born May 24, 1763, in Nevers; died Apr. 13, 1794, in Paris. Figure in the French Revolution; left Jacobin.

Chaumette joined the political club known as the Cordeliers in 1790. He took part in the preparations for the popular uprising of Aug. 10, 1792. After the insurgents' victory, he became first a member of the Paris Commune and then, in December 1792, its procurator. He sought to introduce a tax on the rich, end unemployment, and increase the wages of workers. He opposed the Girondins.

Chaumette advocated the arrest of the Enragés; nevertheless, to strengthen the democratic revolutionary dictatorship, he appropriated some of their slogans and led a demonstration of the Parisian lower classes on Sept. 4 and 5, 1793. He insisted on the implementation of egalitarian measures, including an agrarian program that in many respects anticipated that of the Ventose Decrees. He favored state control of the production and sale of agricultural commodities. He also demanded the nationalization of all enterprises that had ceased to function because of the big bourgeoisie's sabotaging of the Maximum.

Chaumette helped initiate the policy of dechristianization, but he renounced the policy after M. Robespierre condemned it in November 1793. During the period of intense struggle within the Jacobin bloc, Chaumette denounced the actions of the Hébertists. Nevertheless, shortly after the Hébertists were arrested, he too was arrested. Accused of attempting to transform the Commune into a legislative organ opposed to the Convention, Chaumette was guillotined.

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[29–1344–2]

CHAUN BAY, a bay (*guba*) of the eastern part of the East Siberian Sea, to which it is connected by the Malyi Chaun and Srednii straits. The bay is 150 km long, 100 km wide, and approximately 25 m deep. The western coast is low-lying; the eastern coast is more elevated. The entrance into the bay from the sea is blocked by two islands: Aion and Chenkul'. Chaun Bay receives many small rivers. In the summer the Aion Ice Massif forms in the bay's entrance from old ice that is carried from high latitudes by currents. The port of Pevek is situated on Chaun Bay. [29–109–2]

CHAUSH, the Russian term for any one of several early-ripening varieties of table grapes native to Asia Minor. There are white, pink, and black varieties. The medium-sized bunches, which weigh 100–250 g, are cylindrical-conical and vary from dense to loose in compactness. The large oval or slightly ovate grapes are greenish white, pink, or black. They have a pleasant taste reminiscent of muscat grapes. The yield may reach 16 tons per hectare. The grapes are eaten fresh and are easily transported. They are grown in Bulgaria, Rumania, Turkey, Greece, and Algeria. White varieties are grown in the USSR, mainly in the southern Ukraine, the Lower Volga Region, and Kirghizia (Chu and Talas valleys). [29–109–5]

CHAUSSON, ERNEST. Born Jan. 20, 1855, in Paris; died June 10, 1899, in Limay. French composer.

In 1883, Chausson graduated from the Paris Conservatory, where he had studied with J. Massenet and C. Franck. In 1889 he became a secretary of the Société Nationale de Musique. Chausson was influenced by the French lyric opera and by R. Wagner. In its expressiveness, grace, and refined harmony, his work shows an affinity with the impressionist composers. Chausson's most famous composition is his *Poème* (1896), a work for violin and orchestra; other works include several operas, of which only *Le Roi Arthus* was staged (1903; Théâtre de la Monnaie, Brussels). Chausson composed a symphony (1890), music for Shakespeare's *The Tempest* (1888), choral works, works for the piano, and works for voice and orchestra, notably *Poème de l'amour et de la mer* (1882–92).

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[29–1357–5]

CHAUSY, a city and the administrative center of Chausy Raion, Mogilev Oblast, Byelorussian SSR. Chausy is situated 38 km southeast of Mogilev and 4 km from the Chausy railroad station on the Mogilev-Krichev line. Industry is represented by a building-materials combine, a plant for the production of reinforced concrete articles, a flax-processing plant, a creamery, and a vegetable-drying plant. [29–109–3]

CHAUTEMPS, CAMILLE. Born Feb. 1, 1885, in Paris; died July 1, 1963, in Washington, D.C. French political and state figure. A leader of the Radical Socialist Party.

Between 1924 and 1940, Chautemps frequently held ministerial posts, including that of minister of internal affairs in 1924–25, 1925–26, 1930, and 1932–34. He served as premier four times: in 1930, 1933–34, 1937–38, and 1938. He supported the creation of the Popular Front; however, as head of the Popular Front government he prevented the implementation of the front's program and contributed to the organization's collapse.

As vice-premier from April 1938 to July 1940, Chautemps favored collaboration with the fascist aggressors. In November 1940, Pétain sent him on a diplomatic mission to the USA, where he chose to remain and retire from political activity. Because of his work for the Pétain government, Chautemps was sentenced in absentia in 1947 to five years' imprisonment; in addition, his property was confiscated, and he was stripped of his rights as a citizen. [29–1361–3]

CHAUVAI, an urban-type settlement in Frunze Raion, Osh Oblast, Kirghiz SSR. Chauvai is situated on the northern slopes of the Alai Range, 32 km south of the Kyzyl-Kiia railroad station. The settlement has a mine of the Khaidarken Mercury Combine.
[29–108–4]

CHAUVINISM, an extreme form of nationalism, involving the advocacy of national exclusivity. Chauvinists place the interests

of their own nation above the interests of all others, promote national arrogance, and exacerbate national hatreds and animosities.

The term "chauvinism" first appeared in France. It derives from the name of an aggressive and bellicose recruit in the comedy *The Tricolor Cockade* (1831), by the brothers J.-H. and C.-T. Cogniard. The recruit, Nicolas Chauvin, was apparently based on a real Nicolas Chauvin, a veteran of the Napoleonic Wars who was known for his worship of Napoleon and his belief that the emperor had made France great.

The word "chauvinism" was eventually applied to many types of exaggerated nationalism. "Jingoism" came into use in Great Britain in the 1870's as a synonym. Terms such as "social chauvinism" and "great power chauvinism" have been devised to identify particular types of chauvinism.

Chauvinism flourishes in imperialist countries. Its most extreme manifestation is the antihuman ideology and policies of fascist states. The struggle against chauvinist ideologies and their proponents has always been one of the most important tasks confronting Marxist-Leninist parties.

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CHAUVIRÉ, YVETTE. Born Apr. 22, 1917, in Paris. French ballerina.

From 1927 to 1931, Chauviré studied at the Paris Opéra school, and from 1941 she was a leading soloist with the Paris Opéra Ballet. She also appeared with Les Ballets des Champs-Elysées, La Scala Opera Ballet, and the Festival Ballet. She was an outstanding representative of the French school of classical dance. Her dancing, highly refined and dramatic, was characterized by high mastery, a keen sense of style, and meticulous attention to detail. Chauviré became particularly known for her interpretations of contemporary works, such as one of the mirages in the allegorical ballet *Les Mirages* by Sauguet, and for her performances in other ballets of the choreographer S. Lifar, including d'Indy's *Istar* and Leleu's *Nautéos*. In the classical repertoire, her best role was the title role in Adam's *Giselle*.

In the 1960's, Chauviré was director of the Paris Opéra school. She made her last stage appearance in 1972, at the Paris Opéra. A prize named for her was established in France in 1972. Chauviré performed in the USSR many times.

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CHAVANNES, ÉDOUARD. Born Oct. 5, 1865, in Lyon; died Jan. 20, 1918, in Paris. French sinologue. Member of the French Académie des Inscriptions et Belles-Lettres (1903); the academy's president from 1915.

Chavannes's most important works deal with the history, archaeology, and culture of China. An annotated translation of 50 of the 130 chapters of Ssu-ma Ch'ien's *Historical Records* was Chavannes's most outstanding achievement. He made an important contribution to the deciphering and translation of inscriptions and documents in China and Central Asia that dated from the first millenium of the Common Era. Chavannes became a corresponding member of the Imperial St. Petersburg Academy of Sciences in 1913. [29–794–4]

CHAZOV, EVGENII IVANOVICH. Born Oct. 6, 1929, in the city of Gorky. Soviet doctor of internal medicine. Academician of the Academy of Sciences of the USSR (1979) and Academician (1971) and member of the presidium (since 1972) of the Academy of Medical Sciences of the USSR. Honored Scientist of the RSFSR (1974). Hero of Socialist Labor (1978). Member of the Communist Party of the USSR since 1962.

After graduation from the Kiev Medical Institute in 1953, Chazov worked at the First Moscow Medical Institute and the Institute of Internal Medicine of the Academy of Medical Sciences of the USSR (directed by A. L. Miasnikov). He was appointed professor and director of the latter institute in 1965. Three years later Chazov became deputy minister of health of the USSR and head of the emergency cardiology division of the A. L. Miasnikov Institute of Cardiology. In 1976 he helped establish and became general director of the All-Union Cardiology Research Center of the Academy of Medical Sciences of the USSR.

Chazov's work has focused mainly on thrombosis, myocardial infarction, myocardial metabolism, and circulatory insufficiency. Since 1973, Chazov has been editor of the journal *Terapevticheskii arkhiv*, and since 1975 he has served as president of the All-Union Society of Cardiologists. Chazov is an honorary member of the American Heart Association, the Swedish Society of Medical Sciences, and the Academy of Sciences of the German Democratic Republic. He was awarded the State Prize of the USSR in 1969 for developing new methods of treating myocardial infarction. Chazov was a delegate to the Twenty-fifth Congress of the Communist Party of the Soviet Union. He has also been a deputy to the Supreme Soviet of the USSR since 1974. Chazov has been awarded two Orders of Lenin and various medals.

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CHEBAN, TAMARA SAVEL'EVNA. Born Oct. 9 (22), 1914, in the village of Berezlozhi, in what is now Orgeev Raion, Moldavian SSR. Soviet Moldavian singer (soprano); leading figure in public life and in the world of music. People's Artist of the USSR (1960). Member of the CPSU since 1953.

Cheban graduated from the Kishinev Conservatory in 1946. She was a soloist with Moldavian Radio from 1944 to 1951. She sang with the Fluerash Folk Orchestra and performed with the orchestra on foreign tours. Cheban began teaching voice classes at the Institute of Arts in Kishinev in 1973, becoming a docent in 1976. Since 1973 she has been honorary chairman of the Music and Choir Society of the Moldavian SSR. She is an outstanding performer of Moldavian folk songs and songs by Moldavian composers.

Cheban was a deputy to the third through fifth convocations of the Supreme Soviet of the USSR. She has been awarded the State Prize of the USSR (1950), the Order of Lenin, and two other orders. [29–113–4]

CHEBARKUL', a city under oblast jurisdiction and the administrative center of Chebarkul' Raion, Cheliabinsk Oblast, RSFSR; situated on the shore of Lake Chebarkul'. The city has a railroad station, 78 km southwest of Cheliabinsk. Industry includes metallurgy, machine repair, fish processing, and the production of clothing. Cherbarkul' also has a confectionery factory and a poultry farm; and there are sanatoriums and houses of rest near the city. [29–114–2]

CHEBARKUL', a lake in Cheliabinsk Oblast, RSFSR. Lake Chebarkul' occupies an area of 19.8 sq km. It is located on the eastern slopes of the Southern Urals, at an elevation of 320 m. The lake is fed by various sources, with snow predominating. The water level does not vary by more than 1.25 m; it reaches its

height in June. The lake freezes over in the first half of November, and the ice breaks up in May. The Koelga River of the Ob' basin flows out of Chebarkul'. The shores of the lake are picturesque and are the site of a number of sanatoriums and houses of rest. The city of Chebarkul' is also situated on the lake. [29–114–1]

CHEBOKSAROV, NIKOLAI NIKOLAEVICH. Born Apr. 23 (May 6), 1907, in Harbin; died Feb. 1, 1980, in Moscow. Soviet ethnographer and anthropologist. Doctor of historical sciences (1947).

Cheboksarov was a professor at Moscow State University from 1951 to 1956. He became a staff member of the Institute of Ethnography of the Academy of Sciences of the USSR in 1943 and director of the institute's section on Australia, Oceania, and non-Soviet Asia in 1957.

Cheboksarov's most important works deal with ethnic history, with East Asian anthropology and ethnography, and with general problems of anthropology and ethnography. He edited and helped write the general works *Studies in General Ethnography* and *The Peoples of the World*.

Cheboksarov received the N. N. Miklukho-Maklai Prize in 1947 and 1966; he was awarded the Badge of Honor and various medals.

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CHEBOKSARY (in Chuvash, Shupashkar), the capital of the Chuvash ASSR. Situated on the right bank of the Volga. A river port and highway junction, Cheboksary is the terminus of a 103-km branch line of the Moscow-Kazan railroad line; it has an airport. Population, 292,000 (1977; 5,000 in 1897, 9,000 in 1926, 31,000 in 1939, 104,000 in 1959, 216,000 in 1970). Cheboksary is divided into three urban districts.

First mentioned in 1469, Cheboksary became a fortress of the Muscovite state in 1555. In 1611 and 1612 the residents of the city fought in the people's volunteer corps of Minin and Pozharskii. In the late 17th and the 18th century the city was an important commercial center of the Volga Region. Cheboksary became a district capital of Kazan Province in 1781. Soviet power was established in the city on Oct. 30 (Nov. 12), 1917. Cheboksary became the administrative center of Chuvash Autonomous Oblast in 1920 and the capital of the Chuvash ASSR in 1925.

In the Soviet period Cheboksary has become a major industrial and cultural center of the Volga Region. The principal industries are machine building and textiles. In addition to a motor-vehicle assembly plant and a casting and metalworking plant, the city has factories producing tractor parts, machinery, electrical equipment, electrical measuring devices, cable, metal goods, and spare parts for the electric power industry.

The textile industry is represented by a cotton combine, a hosiery and knitwear factory, a ribbon-weaving factory, and the Rassvet Clothing Production Association. Also located in the city are the Prompribor and Chuvashmebel' production associations, a meat-packing combine, and a milk plant. The building-materials industry includes a wood-products factory and plants producing reinforced-concrete structural members, modular units of ceramic stone, *keramzit* (an artificial porous filler), and bonded structures. The city has a district heat and power plant. Under construction in 1978 were a plant for the production of industrial tractors, District Heat and Power Plant No. 2, and the Cheboksary Hydroelectric Power Plant on the Volga.

The Cheboksarka, Kaibulka, Trusikha, and Sugutka rivers divide Cheboksary into six sectors, which fan out toward the Volga, so that the city resembles an amphitheater. The city's street network is laid out on a radial-ring pattern. In the Soviet period Cheboksary has been rebuilt and modernized, and an embankment has been constructed along the Volga. The city's construction is proceeding according to a general plan (1969, architects M. E. Kolosovskii and others). Housing construction has been undertaken on a large scale, and large public buildings have been erected, such as the House of Soviets (1940, architect M. M. Bazilevich), the buildings of the city executive committee (1958, architect F. S. Sergeev) and the building of the city committee of the CPSU (1959, architect F. S. Sergeev); all three buildings are located on the city's central plaza, Lenin Square. In the center of the square is a monument to V. I. Lenin (bronze and granite, 1960, sculptors G. I. Iastrebenetskii and others, architect G. A. Izrailevich); the monument's pedestal is combined with reviewing stands. Other modern structures include the pedagogical institute (1956, architect A. M. Krylov), the agricultural institute (1957, architect E. E. Kalashnikova), and the building of the philharmonic society (1959, architect F. S. Sergeev). Architectural monuments include the Troitskii Monastery (17th century), the Vvedenskii Cathedral (1657), and the houses that formerly belonged to the Zeleishchikov family (17th century) and the Solovtsov family (mid-18th century).

Cheboksary has monuments to V. I. Chapaev (reinforced concrete and cement, 1960, sculptor P. A. Balandin), the Chuvash poet K. V. Ivanov (1952, sculptor I. F. Kudriavtsev, architect V. I. Stupin), and the Chuvash educator I. Ia. Iakovlev (1971, sculptor D. I. Naroditskii, architect G. E. Saevich). Of particular interest is the memorial *Iu. A. Gagarin, Space Pioneer* (1976, sculptor G. O. Postnikov, architect B. M. Shimarev).

Cheboksary's educational institutions include the Chuvash University, pedagogical and agricultural institutes, and a department of the Moscow Cooperative Trade Institute. In addition to an evening machine-building technicum and a cooperative trade technicum, the city has technicums of electrical engineering, construction, textiles, power engineering, economic planning, and electrical communications. There are medical, music, and art schools. The city has an all-Union scientific research institute, a design institute, a technological institute for the construction of relay systems, and a scientific research institute of language, literature, history, and economics.

Cheboksary has an art museum and a museum of local lore with two branches, one devoted to literature and the other to V. I. Chapaev, who was born in the village of Budaiki, now within the city limits of Cheboksary. The city's five theaters are the Chuvash Academic Drama Theater, the Chuvash Music Theater, the Russian Drama Theater, a young people's theater, and a puppet theater. Cheboksary has a philharmonic society.

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CHEBOKSARY HYDROELECTRIC POWER PLANT, a power plant of the Volga Hydroelectric System, located near the city of Novocheboksarsk, Chuvash ASSR. The rated power of 1,400 megawatts (MW) is supplied by 18 hydroelectric units with adjustable-blade turbines, each developing 78 MW. The average annual power output is 3.31 billion kilowatt-hours, and the maximum head is 18.9 m. Construction was begun in 1968; the first unit went into operation in 1981.

The hydroengineering complex includes an integrated power house 548 m long; a concrete spillway dam of lightweight design with a spillway face 120 m long; earthen channel and floodplain dams with a total length of 3,355 m; and a single-chamber, double-lane lock with an outer staging area of 1.1 sq km in the upper pond and with a lower approach channel. The face of the support structures is 4,480 m long. The hydroengineering complex forms a reservoir with an area of 2,182 sq km, lying in the Chuvash ASSR, the Mari ASSR, and Gorky Oblast. Power from the plant will be transmitted to the Integrated Electric Power Grid of the USSR over 220-kilovolt and 500-kilovolt lines. [29–114–4]

CHEBOTAREV, ALEKSANDR STEPANOVICH. Born Nov. 15 (27), 1881, in Belebei, in what is now the Bashkir ASSR; died Nov. 5, 1969, in Moscow. Soviet geodesist. Honored Worker in Science and Technology of the RSFSR (1947).

Chebotarev graduated from the Moscow Engineering Institute

of Geodesy, Aerial Photography, and Cartography (formerly the Land Surveying Institute) in 1903. He became a professor there in 1921 and was the head of a subdepartment from 1922 to 1962. Chebotarev helped found the Central Scientific Research Institute of Geodesy, Aerial Photography, and Cartography. He developed a theory for equating traverse networks and leveling grids and applied methods of mathematical statistics and matrix calculus to the analysis of geodetic measurements. Chebotarev's school of geodesy and mathematical analysis of measurements has received wide recognition both in the USSR and abroad. Chebotarev was awarded the Order of Lenin.

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CHEBOTAREV, NIKOLAI GRIGOR'EVICH. Born June 3 (15), 1894, in Kamenets-Podol'skii, in what is now Khmel'nitskii Oblast; died July 2, 1947, in Moscow. Soviet mathematician. Corresponding member of the Academy of Sciences of the USSR (1929).

Chebotarev graduated from the University of Kiev in 1916 and became a professor at the University of Kazan in 1928. His principal studies were devoted to modern algebra. In 1924 he solved Frobenius' problem and thereby obtained the most far-reaching generalization of Dirichlet's theorem regarding prime numbers in an arithmetic progression. In 1930 he set forth the first general theorem in resolvent theory. Chebotarev received the State Prize of the USSR in 1948 and was awarded the Order of Lenin, two other orders, and various medals.

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CHEBSARA, an urban-type settlement in Sheksna Raion, Vologda Oblast, RSFSR. Chebsara has a railroad station on the Vologda-Leningrad line, as well as a brickyard and a branch of the Sheksna Woodworking Plant. [29–117–3]

CHEBYSHEV, PAFNUTII L'VOVICH. Born May 14 (26), 1821, in the village of Okatovo, Kaluga Province, now Kaluga Oblast; died Nov. 26 (Dec. 8), 1894, in St. Petersburg. Russian mathematician and specialist in mechanics. Academician of the St. Petersburg Academy of Sciences (1859; adjunct, 1853; corresponding member [academician extraordinary], 1856).

After receiving his initial education at home, Chebyshev entered Moscow University at the age of 16. He graduated from the university in 1841 and defended his master's dissertation there in 1846. In 1847 he moved to St. Petersburg and, after defending a dissertation, began teaching algebra and number theory at the University of St. Petersburg. In 1849, Chebyshev defended his doctoral dissertation, which was awarded the Demidov Prize of the St. Petersburg Academy of Sciences in the same year. He became a professor at the University of St. Petersburg in 1850. Chebyshev was long associated with the artillery division of the military academic committee and the academic committee of the Ministry of Public Education. In 1882 he gave up his teaching position at the University of St. Petersburg to devote himself fully to scientific work.

Chebyshev was the founder of the St. Petersburg mathematical school, the most prominent members of which were A. N. Korkin, E. I. Zolotarev, A. A. Markov, G. F. Voronoi, A. M. Liapunov, V. A. Steklov, and D. A. Grave.

Chebyshev contributed to a variety of fields. He was able to obtain important scientific results through elementary means, and he exhibited an unflagging interest in practical problems. The many branches of mathematics and related areas of knowledge in which he worked included probability theory, number theory, integral calculus, the approximation of functions by polynomials, and the theory of mechanisms. In each field mentioned, Chebyshev created a number of fundamental, general methods and set forth ideas establishing the principal directions of its subsequent development. Chebyshev's genius as a scientist consisted largely in his tendency to link problems of mathematics to fundamental problems of the natural sciences and engineering. Many of his discoveries were inspired by the needs of applied sciences. He himself noted this fact several times. He wrote that in the creation of new methods of investigation "the sciences find themselves a reliable guide in practice" and that "the sciences are advancing under the influence of practice as it discovers new objects of study for them" (*Poln. sobr. soch.*, vol. 5, 1951, p. 150).

In probability theory Chebyshev introduced random variables into study on a systematic basis and devised a new procedure for proving limit theorems—the method of moments (1845, 1846, 1867, 1887). He provided a proof of striking simplicity and elegance for the law of large numbers in an extremely general form. He investigated the conditions under which the distribution of sums of independent random variables converges to a normal distribution. By supplementing Chebyshev's methods, A. A. Markov subsequently provided a satisfactory proof of such convergence. Chebyshev also suggested, without rigorous proof, the possibility of refinements in this limit theorem in the form of asymptotic expansions of the distribution function of a sum of independent terms in powers of $n^{-1/2}$, where n is the number of terms. Chebyshev's works on probability theory constitute an important stage in the field's development. They provided the basis for the Russian school of probability theory, which initially consisted of Chebyshev's own students.

In number theory Chebyshev was responsible for the first substantial advances since Euclid in the study of the distribution of prime numbers (1849, 1852). He proved that the function $\pi(x)$—the number of primes that do not exceed x—satisfies the inequalities

$$a\frac{x}{\ln x} < \pi(x) < b\frac{x}{\ln x}$$

where $a < 1$ and $b > 1$ are constants that he calculated ($a = 0.921$, $b = 1.06$). An investigation of the distribution of primes in the sequence of integers led him to the investigation of quadratic forms with positive determinants. A paper by him that was devoted to approximating numbers by rational numbers (1866) played an important part in the development of the theory of Diophantine approximations. Chebyshev was the creator of new fields of study in number theory and of new methods of investigation.

Chebyshev's works in mathematical analysis are the most numerous. In particular, the dissertation he submitted for the right to teach at the University of St. Petersburg deals with this field: in it he investigated the integrability of some irrational expressions in terms of algebraic functions and logarithms. He also devoted a number of other papers to the integration of algebraic functions; in one of them (1853) he derived the well-known theorem on the conditions of integrability of a binomial differential in terms of elementary functions. Chebyshev's works on the construction of a general theory of orthogonal polynomials played a seminal role in the development of this area of mathematical analysis. His starting point in the creation of the theory was parabolic interpolation by the least squares method. Chebyshev's studies on the problem of moments and on quadrature formulas draw on the same range of ideas. Wishing to shorten calculations, he proposed in 1873 the examination of quadrature formulas with equal coefficients, or weights (*see* APPROXIMATE INTEGRATION). His research on quadrature formulas was closely connected with the problems he faced in the artillery division of the military academic committee.

Chebyshev was the founder of the constructive theory of functions, the principal component of which is the theory of best approximation of functions (*see* APPROXIMATION AND INTERPOLATION OF FUNCTIONS and CHEBYSHEV POLYNOMIALS). His simplest statement of the problem (1854) is as follows: given a continuous func-

tion $f(x)$, find among all polynomials of degree n the polynomial $P(x)$ such that in a given interval $[a, b]$ the expression

$$\max_{a \le x \le b} |f(x) - P(x)|$$

is a minimum. In addition to the described best uniform approximation, Chebyshev studied approximation in the quadratic mean, and in addition to approximation by algebraic polynomials he investigated approximation by means of trigonometric polynomials and rational functions.

The theory of machines and mechanisms interested Chebyshev throughout his life. He devoted many papers to linkages, particularly Watt's parallel motion (for example, 1861, 1869, 1871, 1879), and he designed and built several devices. Of particular interest are his plantigrade machine, which simulated the motion of a walking animal, and his automatic calculating machine. While studying Watt's linkage and seeking to improve it, Chebyshev formulated the problem of the best approximation of functions.

Chebyshev's works of an applied nature include an original study (1856) in which he posed the problem of finding for a given country the conformal cartographic projection under which the maximum difference in scale at different points of the map is a minimum. He voiced without proof the opinion that in such a projection the scale at the border must be constant. This conjecture was subsequently proved by Grave.

Chebyshev's position in the development of mathematics rests not only on his research but on the assistance he provided to young mathematicians, to whom he suggested problems for study. For example, it was on Chebyshev's advice that A. M. Liapunov began his series of studies on the figures of equilibrium of a rotating fluid whose particles are attracted according to the law of universal gravitation.

During his lifetime Chebyshev's works won broad recognition both in Russia and abroad. He was elected a member of the Berlin Academy of Sciences in 1871, of the Bologna Academy of Sciences in 1873, of the Académie des Sciences in 1874 (correspondent, 1860), of the Royal Society of London in 1877, and of the Swedish Academy of Sciences in 1893. In addition, he was named an honorary member of many Russian and foreign scientific societies, academies, and universities.

An award for outstanding research in mathemetics was established in honor of Chebyshev by the Academy of Sciences of the USSR in 1944.

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B. V. GNEDENKO [29–117–4]

CHEBYSHEV FORMULA, a formula for the approximate computation of a definite integral:

$$\int_{-1}^{1} f(x)\,dx \approx \frac{2}{n} \sum_{i=1}^{n} f(x_i)$$

The formula is accurate for polynomials of degree not greater than $n - 1$, where n is the number of nodes. The values of the x_i have been computed for some n. In the case of $n = 9$, for example, $x_1 = -x_9 = 0.911589$, $x_2 = -x_8 = 0.601019$, $x_3 = -x_7 = 0.528762$, $x_4 = -x_6 = 0.167906$, and $x_5 = 0$. For $n = 8$ and $n > 9$, the x_i have complex values; the Chebyshev formula can therefore be used only for $n = 1, 2, 3, 4, 5, 6, 7$, and 9. The formula was derived by P. L. Chebyshev in 1873. [29–121–2]

CHEBYSHEV INEQUALITY. (1) A basic inequality for monotonic sequences or functions. In the case of the finite sequences $a_1 \le a_2 \le \ldots \le a_n$ and $b_1 \le b_2 \le \ldots \le b_n$ it has the form

$$\sum_{k=1}^{n} a_k \sum_{k=1}^{n} b_k \le n \sum_{k=1}^{n} a_k b_k$$

In integral form we have

$$\int_a^b f(x)\,dx \int_a^b g(x)\,dx \le (b - a) \int_a^b f(x)g(x)\,dx$$

Here, $f(x) \ge 0$ and $g(x) \ge 0$; in addition, the functions are either both increasing or both decreasing. The inequality was derived by P. L. Chebyshev in 1882.

(2) An inequality that provides an estimate of the probability that the deviation of a random variable from its mathematical expectation exceeds some given limit. Let ξ be a random variable, $\mathsf{E}\xi = a$ its mathematical expectation, and $\mathsf{D}\xi = \sigma^2$ its variance. The Chebyshev inequality asserts that the probability of the inequality

$$|\xi - a| \ge k\sigma$$

does not exceed the quantity $1/k^2$. If ξ is the sum of independent random variables and some additional restrictions are made, then the estimate $1/k^2$ can be replaced by the estimate $2 \exp(-k^2/4)$, which decreases with increasing k much more rapidly.

The inequality is named for P. L. Chebyshev, who used it in 1867 to establish extremely broad conditions for the application of the law of large numbers to sums of independent random variables. (*See* LARGE NUMBERS, LAW OF; LIMIT THEOREMS.) [29–120–2]

CHEBYSHEV PARALLEL MOTION, a linkage, proposed by P. L. Chebyshev in 1868, such that some point on it describes a nearly straight line.

A straight-line mechanism, the Chebyshev parallel motion is a four-bar linkage $ABCD$ (Figure 1) in which the lengths of the links satisfy the relation $3d - a = 2b$. An increase in AB results in an increase in the length of the approximately rectilinear segment of the path traced by point M; at the same time, however, the deviation from a true straight line also increases.

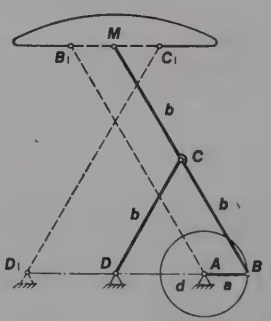

Figure 1. Chebyshev parallel motion

When in middle position, the Chebyshev parallel motion shown by solid lines in Figure 1 is reminiscent of the Greek letter lambda (λ); for this reason, it is referred to as lambda shaped. Chebyshev also proposed the variant $AB_1C_1D_1$, which is shown in Figure 1 by broken lines. In this crossed-bar mechanism, the path of M coincides with the path of the same point in the lambda-shaped mechanism, and the lengths of the links satisfy the following relations: $AB_1 = C_1D_1 = 2b$, $B_1C_1 = 2a$, $B_1M = a$, and $AD_1 = 2d$. In another variant of the Chebyshev parallel motion, the angle between the lines CB and CM is not 180°.

The Chebyshev parallel motion is employed in devices for obtaining rectilinear motion of a point without the use of guides.

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N. I. LEVITSKII [29–121–1]

CHEBYSHEV POLYNOMIALS. Chebyshev polynomials of the first kind are a special system of polynomials of successively in-

creasing degree. For $n = 0, 1, 2, \ldots$ they are defined by the formula

$$T_n(x) = \cos(n \arccos x) = \sum_{k=0}^{[n/2]} (-1)^k \frac{n}{n-k} C_{n-k}^k 2^{n-2k-1} x^{n-2k}$$

In particular, $T_0 = 1$, $T_1 = x$, $T_2 = 2x^2 - 1$, $T_3 = 4x^3 - 3x$, and $T_4 = 8x^4 - 8x^2 + 1$.

The polynomials $T_n(x)$ are orthogonal with respect to the weight function $(1 - x^2)^{-1/2}$ on the interval $[-1, +1]$ (*see* ORTHOGONAL POLYNOMIALS). They satisfy the differential equation

$$(1 - x^2)y'' - xy + n^2y = 0$$

and the recursion formula

$$T_{n+1}(x) = 2xT_n(x) - T_{n-1}(x)$$

Chebyshev polynomials of the first kind are a special case of the Jacobi polynomials $P_n^{(\alpha,\beta)}(x)$:

$$T_n(x) = \frac{2^{2n}(n!)^2}{(2n)!} P_n^{(-1/2, -1/2)}(x)$$

Chebyshev polynomials of the second kind $U_n(x)$ are a system of polynomials that are orthogonal with respect to the weight function $(1 - x^2)^{1/2}$ on the interval $[-1, +1]$. The relation between Chebyshev polynomials of the second kind and Chebyshev polynomials of the first kind is given by, for example, the recursion formula

$$(1 - x^2)U_{n-1}(x) = xT_n(x) - T_{n+1}(x)$$

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Szegö, G. *Ortogonal'nye mnogochleny*. Moscow, 1962. (Translated from English.) [29–120–1]

CHECHEL'NIK, an urban-type settlement and the administrative center of Chechel'nik Raion, Vinnitsa Oblast, Ukrainian SSR. Chechel'nik is situated on the Savranka River, a tributary of the Iuzhnyi Bug. It is the rail terminus of a spur from the Rudnitsa-Gaivoron line. Chechel'nik has a sugar combine, a distilling plant, a mixed-feed plant, a brickyard, and an industrial combine. [29–506–3]

CHECHEN (self-designation, *Nakhcho*), a people living in the Northern Caucasus, predominantly in the central and eastern parts of the Chechen-Ingush ASSR (Chechen make up about 50 percent of the population) and in Khasav"iurt Raion of the Dagestan ASSR. The total number of Chechen in the USSR is 755,800 (1979 census). The Chechen speak the Chechen language. Believers are Sunni Muslims.

The Chechen, like the related Ingush, are the indigenous population of the Northern Caucasus. They are mentioned in seventh-century Armenian sources, which refer to them as the Nakhchamat'ian. Originally, the Chechen lived in the mountains in individual territorial groups. In the 15th and 16th centuries they descended to the plains and into the valleys of the Terek River and its tributaries the Sunzha and Argun. Before the October Revolution of 1917, the Chechen were divided into two groups according to their place of habitation—Greater and Lesser Chechnia. Those living on the plain were primarily engaged in land cultivation, while those living in the mountains engaged in stock raising. The production of hand-crafted goods, such as felt coats, leather goods, and pottery, is also developed.

During the years of Soviet power, the culture of the Chechen has undergone a radical transformation: illiteracy has been eliminated, a writing system has been created, a national intelligentsia has emerged, and literature and other forms of art have been widely developed.

(For information about the history, economy, and culture of the Chechen, *see also* CHECHEN-INGUSH AUTONOMOUS SOVIET SOCIALIST REPUBLIC.)

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CHECHEN', an island in the northwestern part of the Caspian Sea, north of the Agrakhan Peninsula. The island measures 12 km in length and as much as 5 km in width. Sand spits overgrown with reeds extend from the shore into the sea. [29–522–2]

CHECHEN, the language of the Chechen. According to the 1970 census, there are approximately 613,000 speakers of Chechen, mainly in the central and eastern raions of the Chechen-Ingush ASSR and in the Khasav"iurt Raion of the Dagestan ASSR.

Chechen belongs to the Nakh group of the Caucasian (Ibero-Caucasian) languages. Its dialects are Ploskostnoi, Akka, Cheberloi, Melkha, Itumkala, Galanchog, and Kista. Chechen has a rich vowel system that includes dipthongs and long and mutated vowels; there are abrupt (glottalized) and pharyngeal consonants. The six nominal classes have one type of declension, and cardinal and local cases are distinguished. The verb has the categories of class, number, tense, mood, and aspect. Aspect is marked by internal inflection, as in *lalla* ("to drive away" [perfective]) and *liella* ("to drive" [imperfective]). The counting system is vigesimal. The syntax of the simple sentence is distinguished by its great variety of constructions. A writing system based on Arabic script was developed after the October Revolution; it was superseded by a Latin script in 1927. Since 1938, Chechen has used a Cyrillic alphabet.

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CHECHEN-INGUSH AUTONOMOUS SOVIET SOCIALIST REPUBLIC (Chechen-Ingushetia), part of the RSFSR. Established as an autonomous oblast on Jan. 15, 1934; designated an autonomous Soviet socialist republic on Dec. 5, 1936. Situated in the eastern part of the northern slopes of the Greater Caucasus and the adjoining Chechen Plain and the Terek-Kuma Lowland. Area, 19,300 sq km. Population, 1.159 million (as of Jan. 1, 1977). The republic is divided into 14 raions and has five cities and four urban-type settlements. The capital is the city of Groznyi.

Constitution and government. The Chechen-Ingush ASSR is a socialist workers' and peasants' state and an autonomous Soviet socialist republic. Its present constitution was adopted on May 26, 1978, by the Extraordinary Eighth Session of the Supreme Soviet of the Chechen-Ingush ASSR. The highest body of state power is the unicameral Supreme Soviet of the Chechen-Ingush ASSR, composed of 175 deputies elected from precincts of equal population size, and its presidium. The Supreme Soviet of the republic forms the government—the Council of Ministers of the Chechen-Ingush ASSR. The Chechen-Ingush ASSR is represented in the Soviet of Nationalities of the Supreme Soviet of the USSR by 11 deputies. Local bodies of state power—the city, raion, settlement, and village soviets of people's deputies—are elected by the population for 2½-year terms.

The Supreme Soviet of the Chechen-Ingush ASSR elects the Supreme Court of the republic for a term of five years. The Supreme Court comprises two judicial collegiums—one for criminal cases and one for civil affairs—and the Presidium. The procurator of the Chechen-Ingush ASSR is appointed by the procurator-general of the USSR for a term of five years.

Natural features. Stretching along the southern border of the republic is the Bokovoi Range, with Mount Tebulosmta, which at 4,493 m is the highest peak in the republic, and Mount Diklosmta, which rises to 4,285 m. To the north are several parallel cuestas—the Skalistyi and Pastbishchnyi ranges and the Chernye Mountains. Further north lies the Chechen Plain. The northernmost part of the republic is occupied by the Terek-Kuma Lowland, with sandy ridges and hills. Located in the west is the

Terek-Sunzha Upland, which consists of the Terek and Sunzha ranges, separated from one another by the Alkhanchurt Valley.

The climate in the north is continental. In the Terek-Kuma Lowland the average temperature is −3°C in January and 25°C in July, and the annual precipitation is 300–400 mm; the growing period is 190 days. On the Chechen Plain the average temperature is −4°C in January and 22°–24°C in July, and the annual precipitation is 400–600 mm. In the mountains, the average January temperature varies from −5°C at the lower elevations to −12°C and lower at the higher elevations, while the average July temperatures vary from 21°C to 5°C; the annual precipitation here is 600–1,200 mm.

Almost all the rivers belong to the Terek River basin. The largest ones—the Terek, Sunzha, Argun, and Assa—originate from the glaciers in the high mountains. High water occurs in the spring and early summer as a result of the thawing of seasonal snow and glaciers. The rivers that originate in the low mountains are marked by summer flash floods. The rivers are extensively used for irrigation.

The Terek-Kuma Lowland has chestnut and light chestnut soils, and the Terek-Sunzha Upland, carbonate chernozems. The Chechen Plain is dominated by meadow soils, with leached chernozems in the more elevated areas. The river valleys have alluvial and meadow-bog soils, and the mountains have mountain-forest and mountain-meadow soils.

Wormwoods and saltworts are common in the Terek-Kuma Lowland; the wetter sections are occupied by dry steppes of fescue and feather grass, with associations of shrubs, including hawthorn and plants of the genus *Elaeagnus*, occurring in sandy depressions. The Chechen Plain is covered with steppe and forest-steppe vegetation. The mountains are covered with broad-leaved forests up to elevations of 1,800–2,200 m, above which they give way to subalpine and alpine meadows.

Forests cover 361,000 hectares (ha), or 18.7 percent, of the republic's territory. The most common trees are beech (48.8 percent of the forest-covered area), birch (10.9 percent), hornbeam (9.9 percent), and oak (9.6 percent).

Rodents and reptiles abound in the steppe and forest steppe, as well as such birds as bustards, wild ducks, and geese; pheasants are found in the river valleys. The mountains are inhabited by the stone and pine marten, brown bear, boar, mountain goat, roe deer, European wildcat, wolf, chamois, and badger. The alpine meadows are the habitat of the Egyptian black vulture (*Aegypius monachus*), snow pheasant, Caucasian blackcock (*Lyrurus mlokosiewiczi*), and chukar partridge. There are eight game reserves in the republic.

N. V. PRIBYTKOV

Population. The Chechen-Ingush ASSR is inhabited by Chechen (611,400; figures here and below from the 1979 census), Ingush (134,700), Russians (366,000), and nationalities of Dagestan, including Kumyks, Nogai, Avars, Laks, and Darghins (22,000), as well as by Armenians (14,600), Ukrainians (12,000), Tatars, and other nationalities.

Between 1926 and 1977, the population increased by a factor of 2.2. The average population density is 60 persons per sq km (as of Jan. 1, 1977). The foothill plain is the most densely populated region, while the steppe and high mountains are the least populated. Between 1926 and Jan. 1, 1977, the urban population increased from 19 percent to 44 percent. All the cities except Groznyi (population, 387,000; as of Jan. 1, 1977) were founded during the Soviet period, including Gudermes, Malgobek, Nazran', and Argun.

Historical survey. The area now occupied by Chechen-Ingushetia was settled as early as the Paleolithic period. Most of the remains dating from the Bronze Age (second millennium B.C.) are burials, found in the mountains and on the plain. The economy of the population was based on transhumance and land cultivation; the primitive communal system prevailed. The remains of the late Bronze and early Iron ages (end of the second millennium to the first half of the first millennium B.C.) attest to a high level of social and economic development of the tribes, to advanced metallurgy, first of copper, then of iron, and to contacts with Scythia, Transcaucasia, and Southwest Asia.

In the early Middle Ages most of the plain and certain parts of the foothill region of Chechen-Ingushetia were part of the early feudal state federation of Alania. The mountains were inhabited by the direct ancestors of the Chechen and the Ingush, among whom the primitive communal system was rapidly declining. Chechen-Ingushetia was subjected to devastating Mongol-Tatar raids in the 13th century and was invaded by Tamerlane in the late 14th century. Vestiges of the primitive communal system survived for a long time because of the low level of development of the productive forces. Chechen-Ingushetia was inhabited by individual clans and by groups (mainly in the plain) that united several frequently feuding clans. The blood feud existed until the early 20th century.

Christianity spread to Chechen-Ingushetia from Georgia after the tenth century. Islam penetrated from Dagestan in the late 16th century and by the first half of the 19th century was the dominant religion. Feudal relations arose in Chechen-Ingushetia in the 16th century. In the early 18th century, the Nakhcho tribe came to be known under the ethnic name of Chechen, after the *aul* (mountain village) of Chechen, and in the second half of the 19th century, the Galgai tribe came to be known as the Ingush, after the *aul* of Angush, or Ingush.

In 1722, during the Persian Campaign, Peter I spent some time in Chechnia. This period saw the beginning of cultural and economic ties between Russia and the Chechen and the Ingush, especially those living on the plain. However, the colonial policy of tsarism fostered the growth of the national liberation struggle, particularly the popular movement in the northern Caucasus in 1785, under the leadership of the Chechen Ushurma. In 1810, the Ingush voluntarily became Russian subjects, and thus their lands were spared colonization. The tsarist government encouraged the resettlement of the Ingush to the plain, with the result that the majority did not participate in the war against Russia. Military colonization of the Northern Caucasus intensified, in the course of which fortresses were built, the Chechen and other mountain peoples were driven into the mountains, and the fertile lands were settled by the cossacks; all of this provoked a movement of the mountaineers under the leadership of the imams Gazi-Magomed, Gamzat-Bek, and Shamil (*see* CAUCASIAN WAR OF 1817–64).

After Shamil's capitulation in 1859, all of Chechnia was definitively incorporated into Russia. This promoted the economic and cultural development of the Chechen and Ingush peoples and undermined the patriarchal clan system and the natural economy in the mountain villages. A commercial and industrial bourgeoisie, owning the oil fields, industrial plants, and trade enterprises, emerged in the late 19th century. The Vladikavkaz Railroad was built across Chechen-Ingushetia in the early 1890's. The Groznyi oil industry developed rapidly after the first oil well was drilled in 1893. The growing working class was composed of new arrivals, mostly Russians. By 1905 there were more than 10,000 workers in Groznyi, and by 1917, as many as 20,000. Commercial farming and animal husbandry developed. In 1913 alone, 6.816 million poods (111,646,080 kg) of grain were transported out of Chechen-Ingushetia.

Social Democratic circles arose in Groznyi in the early 1900's, and a Bolshevik organization was formed in 1903, in whose founding I. T. Fioletov played a leading role. The proletariat of Groznyi participated in the Revolution of 1905–07. The spring and summer of 1905 saw a wave of peasant unrest, primarily in Vedeno District.

After the February Revolution, a civilian committee was organized in Groznyi on Mar. 4 (17), 1917, as a body of the bourgeois Provisional Government. The Groznyi soviet of workers', soldiers', and cossacks' deputies was formed on March 5 (18). The Chechen Congress, held in Groznyi on March 14 (27), elected the bourgeois nationalist Chechen National Soviet, composed of sheikhs, merchants, and officers, as well as the Ingush National Soviet. By the autumn of 1917, the Bolsheviks, headed by N. A. Anisimov, had gained the majority in the Groznyi soviet, and the Groznyi garrison came out in support of the October Revolution. Soviet rule was proclaimed in the city on October 26 (November 8).

The establishment of Soviet power in Chechen-Ingushetia was accompanied by a bitter class struggle. In mid-November, two officers and several horsemen of the Chechen Cavalry Regiment of the Caucasian Native Cavalry Division (known as the Wild Division) were murdered at the Groznyi railroad station. The cossack

and mountaineer counterrevolution, headed by the ataman of the Terek Cossack Host, M. A. Karaulov, and by the Chechen oil industrialist A.-M. A. Chermoev, took advantage of the incident to issue an ultimatum on November 23 (December 6) demanding that the Groznyi soviet disarm the workers and revolutionary soldiers. On November 24 (December 7), counterrevolutionary units captured Groznyi, but on Dec. 31, 1917, (Jan. 13, 1918), they were driven out with the help of revolutionary troops that had arrived from Mozdok; power passed to the military revolutionary committee.

The first congress of the peoples of Terek Oblast, at which S. M. Kirov played a leading role, was held in Mozdok on Jan. 25–31 (Feb. 7–13), 1918. The congress formed the Terek People's Soviet and forestalled a war between the various nationalities of the oblast, which the cossack elite was planning to unleash. On March 17, the second congress of the peoples of Terek Oblast, held in Piatigorsk on Mar. 1–18, 1918, recognized Soviet power and formed the Terek Soviet Republic as part of the RSFSR. After the congress, the working people of Chechnia convened a congress of the Chechen people in the settlement of Goity and elected the Goity People's Soviet, with T. E. El'darkhanov as chairman. The Ingush National Soviet was reorganized, and G. Akhriev became its chairman. The Goity People's Soviet and the Ingush National Soviet declared their support of Soviet power.

In the summer of 1918, the cossack counterrevolutionaries of Terek Oblast, under the leadership of G. F. Bicherakhov, organized an anti-Soviet revolt. Bicherakhov's forces were defeated in battles fought at Groznyi between Aug. 11 and Nov. 12, 1918. The defense of the city was led by N. F. Gikalo, A. Sheripov, and A. Z. D'iakov. G. K. Ordzhonikidze was extraordinary commissar of Southern Russia in the Northern Caucasus.

General A. I. Denikin's White Guard troops captured Chechen-Ingushetia in February 1919; Soviet troops left Groznyi on the night of February 2. Partisan detachments were formed in the mountains of Chechen-Ingushetia, which continued the struggle against the counterrevolution. On the night of Dec. 22, 1919, an uprising of workers and political prisoners broke out in Groznyi but was crushed by Denikin's forces.

As the Red Army approached the Northern Caucasus, the Caucasian Krai Committee of the RCP(B) in January 1920 adopted a decision to organize the Terek Oblast Group of Rebel Troops under the command of Gikalo. The 11th Army and the rebel troops launched an offensive on Groznyi in March, and the city was liberated on March 17. By the end of March 1920, Soviet power was established in all of Chechen-Ingushetia.

On Nov. 17, 1920, the congress of the peoples of Terek Oblast held in Vladikavkaz (now the city of Ordzhonikidze) proclaimed the formation of the Gortsy ASSR (a decree of Jan. 20, 1921, of the All-Russian Central Executive Committee), which included Chechnia and Ingushetia under the names of Chechen and Nazran' okrugs. On Nov. 30, 1922, Chechen Okrug was separated from the Gortsy ASSR and organized as an autonomous oblast of the RSFSR. A July 7, 1924, decree of the All-Russian Central Executive Committee abolished the Gortsy ASSR and established the Ingush Autonomous Oblast on part of its territory.

Soviet power freed the working people of Chechen-Ingushetia from national oppression and eliminated national inequality in all spheres of social, political, economic, and cultural life. Between 1921 and 1926 the economy in Chechen-Ingushetia was restored with the help of the Russian people and other fraternal peoples. In 1924 the proletariat of Groznyi was awarded the Order of the Red Banner for the heroic struggle against the counterrevolution and for the restoration of the oil industry.

During the prewar five-year plans, the industry and the oil fields of Groznyi were completely reconstructed, and new huge oil refineries and chemical and machine-building plants were built, as well as canneries and other enterprises of the food-processing industry. Collectivization proceeded successfully. In 1933 collectivized peasant farms accounted for 40.5 percent of all farms in Ingushetia and 32.4 percent in Chechenia. In 1939 there were 472 kolkhozes, which encompassed 73,744 farms, or 96 percent of all farms. The successes in agriculture were achieved amid a struggle with kulaks and mullahs, who made use of vestiges of the clan system and religious prejudice in their struggle against collectivization.

A culture national in form and socialist in content was created in the republic under Soviet power. In 1920 the literacy rate was only 0.8 percent among the Chechen and 3 percent among the Ingush. Chechen and Ingush writing systems were developed in the period 1923–25. In 1940 the literacy rate was 85 percent among the Chechen and 92 percent among the Ingush. A national intelligentsia emerged. Much work was done to eradicate the vestiges of the patriarchal clan system. Steps were undertaken to involve the Chechen and the Ingush in industrial production.

In view of the achievements in economic and cultural development, the Chechen and Ingush autonomous oblasts were merged on Jan. 15, 1934, into the Chechen-Ingush Autonomous Oblast, which was transformed on Dec. 5, 1936, into the Chechen-Ingush ASSR.

During the Great Patriotic War (1941–45), the working people of the Chechen-Ingush ASSR aided the front. The oil industry worked hard to supply the front with gasoline and lubricants. Agricultural output was maintained at the 1940 level, and food was supplied to the army. Fascist German troops invaded the western part of the republic in the fall of 1942, but they were soon stopped at the distant approaches to Groznyi. The republic was liberated in January 1943. During the war, the Chechen and the Ingush fought on the fronts and participated in the partisan struggle against the fascist invaders. Several thousand people were awarded orders and medals, and the title of Hero of the Soviet Union was conferred on 36 people. The Chechen-Ingush ASSR was abolished in 1944. A Jan. 9, 1957, decree of the Presidium of the Supreme Soviet of the USSR restored the national autonomy of the Chechen and Ingush peoples.

In the 1960's and 1970's, the Chechen-Ingush ASSR attained new successes, with the constant selfless aid of the peoples of the entire Soviet Union. By 1977, there were 32 Heroes of Socialist Labor in the republic, and a total of 13,060 working people had been awarded orders and medals of the USSR. For achievements in the development of the economy, the Chechen-Ingush ASSR was awarded the Order of Lenin in 1965 and the Order of the October Revolution and the Order of Friendship of Peoples in 1972.

V. B. VINOGRADOV and N. P. GRITSENKO

Economy. Socialist construction transformed Chechen-Ingushetia into a republic with a highly developed industry and diversified agriculture. The economy is based on oil extraction, oil refining, and petrochemical production, as well as on power production, machine building, and metalworking. The building-materials and food-processing industries are also greatly developed.

INDUSTRY. In the period 1940–76 the industrial output increased by a factor of 9. Table 1 gives the output of the most important types of industrial products.

The republic has four heat and power plants, which are linked up with the power system of the Northern Caucasus. Oil and gas deposits are concentrated around the cities of Groznyi, Malgobek, and Gudermes. Almost all the oil and gas extracted in the republic is refined at the oil and gas refineries in Groznyi. The oil-refining and petrochemical industries produce motor fuels, lubricants, petroleum bitumens, paraffin, synthetic ethyl alcohol, phenol, acetone, and polyethylene.

Machine-building and metalworking enterprises produce equipment for the oil industry, sludge pumps, cement-making machines, tractor trailers, electrographic machines, various industrial instruments, bottling assembly-line equipment, and electrical and medical instruments. The largest enterprises are the Krasnyi Molot, Transmash, and Elektropribor plants, a repair and machinery plant, an electromechanical plant, and the experimental plant of the Neftegazpromavtomatika Special Planning and Design Office in Groznyi, the Elektroinstrument Plant in Nazran', the Medinstrument Plant in Gudermes, and the Pishchemash Plant in Argun. The building-materials industry is represented by a cement plant in Chiri-Iurt and by plants for the production of bricks, limestone, and reinforced-concrete structural members and by a large-panel housing-construction plant in Argun.

The leading branches of the food-processing industry are meat packing and the production of milk, sugar, wine, beer, flour, bread, confectionery and macaroni products, and canned goods; the bottling of mineral water is also important. There are canner-

Table 1. Output of major types of industrial products

	1940	1950	1960	1976
Electricity (million kW-hr)	398	458	1,736	3,142
Petroleum equipment (thousand tons)	1.5	3.4	9.1	16.9
Pumps (units)	531	367	575	747
Tractor trailers (thousand units)	—	—	1,875	13,858
Electrical instruments (thousand units)	—	—	—	222
Export of commercial timber (thousand cu m)	79	94	229	59
Precast reinforced-concrete structural members and products (thousand cu m)	—	—	89	262
Construction bricks (million units)	34.7	53.9	148.3	201
Construction limestone (thousand tons)	12.9	9.3	19.8	30.2
Knit underwear (thousand items)	42	101	513	4,191
Leather footwear (thousand pairs)	364	250	1,084	988
Vegetable oil (thousand tons)	2.3	5.6	3.7	7.1
Canned goods (million standard cans)	20.9	17.7	54.5	140
Granulated sugar (thousand tons)	—	—	—	4.9

ies in Groznyi, the Assinovskaia Stanitsa, and the village of Samashki and a sugar refinery in Argun.

The lumber and wood-products industry is represented by ten logging enterprises, the Terek furniture production association, and the Ermolov wood-products combine. The largest enterprises of light industry are the Nazran' Knitwear Factory, the Groznyi Garment Production Association, and the Groznyi Footwear Factory.

AGRICULTURE. In 1976 agricultural lands totaled 1,166,100 ha, of which arable land occupied 426,300 ha (including 98,200 ha under irrigation), perennial plantings 38,100 ha, hayfields 71,600 ha, and pastures 630,100 ha. As of Jan. 1, 1977, the republic had 45 kolkhozes and 100 sovkhozes. In 1976 agriculture accounted for 8,135 tractors (1,519 in 1940), 1,178 grain-harvesting combines (485 in 1940), and 4,707 trucks (2,122 in 1960). Table 2 shows the distribution of sown area.

Agriculture specializes in the production of fruits, grapes, and vegetables. Between 1945 and 1976 the area occupied by orchards, berry plantings, and vineyards increased from 3,900 ha to

Table 2. Sown acres
(hectares)

	1913	1940	1976
Grain crops	262,500	292,800	239,300
Winter wheat	89,000	79,300	117,600
Winter barley	15,700	21,700	56,000
Corn for grain	56,000	126,200	32,400
Rice	100	200	6,600
Industrial crops	7,600	38,300	26,500
Sunflowers	4,400	16,500	15,300
Sugar beets	—	—	9,100
Tobacco	—	—	1,700
Total	288,800	402,200	467,800

44,600 ha, of which 23,500 ha were occupied by vineyards. In 1976 the gross harvest totaled 519,800 tons of grain (190,000 in 1940), 177,000 tons of vegetables (43,900 in 1940), 207,000 tons of sugar beets, 80,100 tons of fruit, and 112,300 tons of grapes.

The raising of fine-wooled sheep, animals for meat and dairy purposes, and poultry is developing. At the beginning of 1977, the republic had 301,500 head of cattle (249,700 in 1941), including 118,100 cows (106,200), as well as 148,300 hogs (45,100) and 744,800 sheep and goats (470,400). Efforts are under way to mechanize animal husbandry. From 1940 to 1976 the meat output increased from 10,200 tons to 30,500 tons (in dressed weight), the milk output from 78,000 tons to 206,900 tons, egg production from 52.9 million eggs to 110 million eggs, and wool production from 451,000 tons to 3.592 million tons.

In 1976 the state purchases were as follows: 174,200 tons of grain (72,500 tons in 1940), 131,000 tons of vegetables (18,300), 192,000 tons of sugar beets, 8,100 tons of sunflower seeds (5,700), 70,400 tons of fruit (1,100), 110,600 tons of grapes (400), 2,700 tons of tobacco, 32,100 tons of livestock and poultry (8,300), 78,700 tons of milk (6,100), 65.7 million eggs (15.2 million), and 4.306 million tons of wool (369,000).

TRANSPORTATION. The operational length of railroads was 362 km in 1976, compared to 150 km in 1913. The republic is traversed by the Rostov-on-Don–Beslan-Baku trunk line and by the Prokhladnaia-Mozdok-Astrakhan' line. Gudermes is a major railroad junction. In 1976 there were 3,181 km of highways, of which 2,574 km were hard-surfaced. The Moscow-Baku Highway passes through the republic. Groznyi is linked by air with Moscow, Sochi, Rostov-on-Don, and other cities.

The pipeline network is well developed.

The Chechen-Ingush ASSR supplies other parts of the USSR with products of the oil-refining, chemical, and machine-building industries; it receives coal, metals, and some building materials, oil, and gas from other regions.

STANDARD OF LIVING. The standard of living of the republic's population is steadily rising owing to the successful fulfillment of the programs of economic and cultural development. The state and cooperative retail trade turnover, including the food service industry, increased by a factor of 1.4 in the period 1971–76, reaching 600 million rubles. New housing built in the same period by the state, kolkhozes, and private individuals amounted to 2.005 million sq m. E. V. BRYKSIN

PUBLIC HEALTH. In 1913 there were ten fee-charging hospitals, with 236 beds, and 21 private physicians in what is now the Chechen-Ingush ASSR; there were no medically trained personnel from among the indigenous population. As of Jan. 1, 1977, there were 83 hospitals, with 11,200 beds (9.7 beds per 1,000 population), 556 feldsher and obstetrics centers, gynecological consultation centers, and children's polyclinics and other dispensaries and polyclinics, and 19 public health epidemiological stations. There were 2,700 physicians (one doctor per 430 population) and 7,800 secondary medical personnel.

Resorts and health facilities include the balneological resort of Sernovodsk, the climatic resort of Armkhi, nine sanatoriums, and one house of rest.

TOURISM. The main tourist itineraries, which include seven all-Union itineraries, lead from the Caucasian Mineral Waters Region to the Caspian Sea and from the city of Groznyi through the Glavnyi Range of the Caucasus to Georgia. There are tourist centers in the city of Groznyi and in the village of Benoi.

Education and culture. In the 1914–15 academic year, there were 153 general-education schools, with 12,800 pupils and students, in what is now the republic; there were no specialized secondary or higher educational institutions. In the 1977–78 academic year, there were 574 general-education schools of all types, with 288,100 pupils and students, 29 vocational-technical schools, with 15,000 students, and 12 specialized secondary schools, with 14,800 students; there were also two higher educational institutions—the Chechen-Ingush University and the Petroleum Institute—both in Groznyi, with 12,000 students. In 1976 the republic numbered 326 preschool institutions, caring for 31,000 children.

As of Jan. 1, 1977, there were three theaters, a philharmonic society, and 475 public libraries in the republic, with more than 6.2 million books and journals. The republic has two museums—

the Chechen-Ingush Museum of Local Lore and the Museum of Fine Arts, both in Groznyi—as well as 403 clubs, 358 motion-picture projection units, and 41 extracurricular institutions. (*See below:* Music and Theater.)

Scientific institutions. All scientific research institutions have been founded during the Soviet period. The oldest research institutes are the Groznyi Scientific Research Institute (GrozNII; founded 1928) and the Institute of History, Sociology, and Philology (1926). The Northern Caucasus Scientific Research and Design Institute of the Petroleum Industry was founded in 1965, the Chechen-Ingush State Agricultural Experimental Station in 1944, and the Scientific Research Station for Vegetable and Fruit Growing in 1973. Scientific work is conducted at the Chechen-Ingush University and the Groznyi Petroleum Institute. In 1976 there were more than 2,000 scholars and scientists in the republic.

Press, radio, and television. In 1979 the republic's publishing houses released 105 titles of books and pamphlets in a printing of 622,000 copies. Republic newspapers include the Chechen-language *Leninan nek"* (The Leninist Path; since 1923), the Ingush-language *Serdalo* (The Light; 1923), and the Russian-language *Groznenskii rabochii* (Groznyi Worker; 1917) and *Komsomol'skoe plemia* (The Komsomol Tribe; 1928). Almanacs include the Ingush-language *Loaman Iuire* (The Mountain Morning; 1958) and the Chechen-language *Orga* (Argun; 1958). Radio broadcasts of the First Program of the All-Union Radio, as well as broadcasts of Maiak, are relayed for 32 hours a day; republic programs are broadcast for 11 hours a day. Two television programs are broadcast for 15.9 hours a day, of which 12.9 hours are programs relayed from Central Television and three hours are local broadcasts in Chechen, Ingush, and Russian.

Literature. Both Chechen literature and Ingush literature, close in historical development and written in kindred languages, developed after the October Revolution of 1917 as written Soviet literature based on folklore, on the one hand, and on classical Russian and Soviet literature, on the other.

The founder of Chechen literature is S. Baduev (1904–43), author of the first published Chechen work of fiction, the novella *Hunger* (1925); of the first Chechen novel, *Petimat* (1930), which was devoted to the fate of a woman mountaineer; and of the plays *The Law of the Fathers* (1929) and *The Red Fortress* (1930). Sh. Aiskhanov (1907–37) wrote plays, including *The Struggle* (1932), and short stories, and M. Muzaev (born 1913) wrote the play *A Seed Sprouts in Our Epoch* (1934) and the narrative poem *The Forest Clearing* (1933). The early 1930's saw the first poems of M. Mamakaev (1910–73) and the literary sketches and plays of Kh. Oshaev (1898–1977), creator of the first Chechen alphabet, based on the Latin alphabet. The historical novel *Two Generations* (1930) by S. Arsanov (1889–1968) was devoted to the prerevolutionary period in Chechnia.

Chechen works of the 1940's include the patriotic plays *Anger* (1940) and *To the Native Aul* (1941) by A. Mamakaev (1918–58), Muzaev's poetry collection *In the Flash of Lightning* (1940), and the narrative poem *The Sun Will Triumph* (1944) by M. Sulaev (born 1920). Literature developed rapidly in the 1950's. *Friendship*, a collection of works by Chechen writers, was published in Alma-Ata. Arsanov published the historical novel about the revolution *When Friendship Becomes Known* (in Russian), a landmark work of Chechen prose. Other works of the period include the poetry collections *The Valley of the Terek* (1958) by A. Mamakaev, *The Roads of the Motherland* (1960) by M. Mamakaev, *A Handful of Earth* (1960) by Muzaev, and *Difficult Love* (1963) by R. Akhmatova (born 1928). Chechen poets of the 1960's and 1970's remained true to traditional civic, patriotic, internationalist, and lyrical themes, striving for profound philosophical solutions, epic scale, and perfection of language and artistic form.

Chechen prose of the 1960's and 1970's was marked by the development of the literary sketch and novella. Novels on contemporary themes were published with increasing frequency. The theme of the beauty of constructive labor and the theme of the individual versus society are developed in the novels *In the Valley of the Argun* (1965) and *The Power of Imagination* (1971) by Muzaev, the novels *The Root of Happiness* (books 1–2, 1964–70) and *The Creators* (1970) by M. Isaeva (1898–1977), and the novella *On the Banks of the Assa* (1975) by Z. Abdulaev (born 1296). The problems of moral upbringing and the development of communist morality are the themes of several novels, including *Tavsultan Leaves the Mountains* (1966) by Sulaev, *After the Shot* (1969) by M. Musaev (born 1915), and *Who Are You?* (books 1–2, 1969–71) by U. Gaisultanov (born 1920). An artistic reevaluation of the past marks the novels *Miurid of the Revolution* (1962) and *Zelimkhan* (1968) by M. Mamakaev, *In the Name of Freedom* (1968) and *Long Nights* (1973) by A. Aidamirov (born 1933), and the tetralogy *Flaming Years* (books 1–4, 1959–64) by Oshuev.

Chechen writers of children's works include Gaisultanov, author of the collection of novellas and short stories *Let the Sun Smile for Everyone* (1968), Kh. Edilov (born 1922), author of the fairy-tale narrative poem *The Iron Wolf* (1966), and Musaev, author of the novella *Anzor* (1966).

Since the late 1950's, Chechen dramaturgy has dealt with a wide range of topics. The Civil War of 1918–20 is the topic of *Aslanbek Sheripov* (1958) by Oshaev and *The Girl From the Mountains* (1960) by A. Khamidov (1920–69); life in a kolkhoz village is depicted in Muzaev's *The Bright Path* (1961) and Musaev's *In One Aul* (1962); the Great Patriotic War is the theme of Musaev's *The Waves of the Terek* (1961) and Khamidov's *The Immortals* (1969); and moral and ethical problems and problems of everyday life are treated in Muzaev's *Trust in Man* (1961) and Khamidov's *Sovdat and Daud* (1958) and his satirical comedy *The Fall of Bozh-Ali* (1967).

The first published Ingush literary work was the play *Abduction of a Girl* (1923) by Z. Mal'sagov (1894–1935). The newspaper *Serdalo* published Ingush poetry and prose, including excerpts from the novella *Early Spring* by T. Bekov (1873–1938) and the narrative poem *Kalym and Tamara* by S. Oziev (born 1904). Among the writers who emerged in the 1930's were the poets Kh. Mutaliev (1910–64), Dzh. Iandiev (born 1916), and A. Oziev (1902–37), the prose writer A. Goigov (1896–1948), author of literary sketches and novellas about the revolution, and the dramatist and prose writer I. Bazorkin (born 1911). During the Great Patriotic War (1941–45), Iandiev, M. Khashagul'gov (1904–77), and Kh. Osmiev (born 1919) published patriotic and antifascist poems. The war is depicted in Bazorkin's plays *Captain Ibragimov* (1941) and *The Birth of Hate* (1942).

Ingush literature developed rapidly in the 1950's. Mutaliev, Iandiev, and S. Oziev published poetry collections. Prose writers confidently mastered the genre of the novella, represented by *The First Days* (1960) by Mutaliev, *In the Name of the Republic* (1962) and *Nine Days in the Life of a Hero* (1964) by B. Ziazikov (1908–65), and *At the Fork* (1965) by A. Vedzizhev (born 1919). The problems of moral upbringing and the development of communist morality in the struggle against the vestiges of the past are treated in the first Ingush novel, *The Golden Pillars* (1966) by S. Chakhkiev (born 1938). The novel *Wolves' Nights* (1970) by Chakhkiev and the novels *Beka's Sons* (1967) by A. Bokov (born 1924) and *The Difficult Crossing* (1974) by M. Pliev (born 1929) are devoted to the revolution. Bazorkin's historical epic *From the Darkness of the Ages* (1968) traces more than 100 years of the life of the people.

Ingush writers of children's works include Vedzizhev (novella *Gapur—the Hero's Namesake*, 1968) and Chakhkiev (novella *Enver*, 1966).

Ingush dramaturgy, which emerged in the 1920's with the plays of Z. Mal'sagov and Mutaliev, made great strides in the late 1950's and the subsequent decades. Among the important plays are *The Roads of Love* (1966) by Bazorkin, *When Sons Perish* (1968) by Chakhkiev and G. Rusakov, and *I Shall Not Be Alone* (1973) by Akh. Mal'sagov (born 1922).

LITERARY SCHOLARSHIP AND LITERARY CRITICISM. Chechen and Ingush literary scholarship and literary criticism, which have developed closely with one another, have found expression, in particular, in the publication of the joint *Outline of the History of Chechen-Ingush Literature* (1963). Abu Mal'sagov (born 1939), a scholar of Ingush literature, and Kh. Turkaev (born 1938), a scholar of Chechen literature, started their careers in the early 1970's. *Chechen-Ingush Soviet Drama From 1920 to 1940* by Iu. Aidaev (born 1938) was published in 1973 and *Ingush Literature* by I. Dakhkil'gov (born 1936) in 1975. The center of research for literary scholarship and literary criticism is the Chechen-Ingush Institute of History, Sociology, and Philology.

Works of Chechen and Ingush writers have been translated into Russian and the national languages of the USSR. Chechen and Ingush translations of classical Russian and foreign works have been published in the republic, as have translations of the works of many writers of the peoples of the USSR. The creative work of writers is organized by the writers' organization of the Chechen-Ingush ASSR, based in the city of Groznyi.

M. A. SULAEV

Architecture and art. The oldest artistic remains in what is now Chechen-Ingushetia date from the third to first millennia B.C. They include remains of the Kura-Araks Aeneolithic, the Maikop culture, the Northern Caucasus culture, the Kaiakent-Khorochoi culture, and the Koban culture (*see* KURA-ARAKS AENEOLITHIC; MAIKOP CULTURE; NORTHERN CAUCASUS CULTURE; KAIAKENT-KHOROCHOI CULTURE; and KOBAN CULTURE).

The Scythian and Sarmatian period (seventh century B.C. to fourth century A.D.) is represented by works in the animal style (*see* ANIMAL STYLE), the Alani period (eighth to 13th centuries) by catacomb burials (near the villages of Alkun and Duba-Iurt), and the Mongol-Tatar period (13th to early 15th centuries) by the Borga-Kash mausoleum near the village of Plievo (1405).

Christian religious architecture from the 11th to 13th centuries (the Tkhaba-Erdy Church near the village of Khairakh), which combines Georgian and local architectural elements, is characterized by simple geometric forms and austere and elegant decor. In the mountain regions of Chechen-Ingushetia, crudely dressed stones were used in the Middle Ages to build defensive walls (near the village of Verkhnii Alkun), two- or three-tiered residential towers, with flat roofs and arched openings, and four- or five-tiered fortification towers, with embrasures, machicoulis, and pyramidal-stepped roofs, which sometimes formed majestic complexes, as in the villages of Kezenoi, Targim, Khoi, Egikal, and Erzi (all 14th to 18th centuries). Mountain hamlets, forming picturesque terrace-like compositions on the slopes, stood side by side with numerous aboveground, semisubterranean, and underground crypts (rectangular, square, or round, with gabled, pyramidal-stepped, or conical smooth roofs), as well as tomb stelae (for instance, the City of the Dead of Tsoi-Pede, near the village of Malkhista, 11th to 18th centuries). Almost all the villages had sanctuaries identical to the gabled aboveground crypts.

From the 18th to early 20th centuries, the traditional dwellings in Chechen-Ingushetia were, in the mountains, one- or two-story multiroom stone and wood dwellings, with flat roofs and separate exits to an open terrace, and, on the plain, rectangular houses of adobe (later of brick), faced with tiles and surrounded by galleries.

The decorative applied folk art of Chechen-Ingushetia includes stone and wood carving, artistic metalworking (embossing, engraving, and niello), jewelry-making, the production of wood, clay, and copper utensils, felt cloaks, and felt carpets, embroidery with gold and silver thread (astrological, zoomorphic, and floral designs), and leather tanning. P. Z. Zakharov, a Chechen easel painter and portraitist, began painting in the second quarter of the 19th century.

The reconstruction and development of Groznyi were begun after the October Socialist Revolution; it proceeded intensively in the 1950's under the direction of the architects Z. S. Berkovich, Ia. S. Berkovich, B. N. Fedotov, and L. I. Khait. Large-scale construction of housing and cultural and service facilities is currently under way in the cities of Gudermes and Malgobek. Spacious modern residential and farm buildings are being erected in the villages. The Groznyi section of the Architects' Union of the USSR was founded in 1939, and the Chechen-Ingush section, in 1967.

During the years of Soviet power, the art of Chechen-Ingushetia has been marked by the development of historical, genre, portrait, and landscape painting, as represented by the works of the painters E. N. Gaidukova, A. G. Grigor'iants, Kh. Iu. Dadaev, D. G. Idrisov, N. G. Latyshev, V. V. Livn, P. V. Mironov, O. M. Mishin, V. K. Mordovin, F. N. Sachko, Sh. A. Shamurzaev, and G. Iu. Ianakov and the graphic artists Kh. A. Akhmedov, O. R. Chubarov, and L. I. Tsaritsynskii. Sculptors include V. P. Astapov, I. D. Bekichev, V. D. Maliukov, R. I. Mamilov, and A. N. Safronov (the last is also a painter and graphic artist). Book illustration, as represented by E. M. Tokarev and A. A. Tuladze, and stage design have also developed. The Union of Soviet Artists of the Chechen-Ingush ASSR was founded in 1939 and was renamed the Artists' Union of the Chechen-Ingush ASSR In 1968.

Decorative applied folk art is being enriched with new themes.

V. B. BESOLOV

Music. Chechen and Ingush folk music have much in common. Both are characterized by the diatonic scale, by a juxtaposition of the harmonies of neighboring steps, by harmonies of fourths and fifths, and by harmonies of seconds and fifths. Many choral and instrumental works are characterized by two- or three-part harmonies. Chromaticism is absent, and there are no augmented seconds in melodies. The rhythm is well-defined, often with frequent changes of measure and alternation of triplets with an even rhythmic division, especially in dance melodies; the *lezghinka* is the most popular dance.

Folk melodies encompass a variety of genres. They include heroic and epic songs, called *illi* or *illesh*, which are often in the form of a recitative and are performed by men. Male choral singing also includes the *nazma*, usually for two or three voices. Among lyrical women's and girls' songs are the *esharsh* and *khalkharan iish*, of which there are many local variants. Instrumental music includes the *laduga iish*.

The principal musical instruments are the *dechk-pondur*, a plucked stringed instrument; the *atukh-pondur*, a bow stringed instrument; various wind instruments, such as the *shedag* (a pipe), *zurna*, and *maa* (made of horn); percussion instruments, such as the *vota* (a drum with two heads) and *zhirgia* (a tambourine); and the *tsuzam*, an instrument made of goose feathers producing a squeaky sound. The oriental accordion has become very popular. In the early 20th century, Abdul Muslim Magometovich Magomaev sought to popularize folk music; he composed several works based on Chechen melodies.

New interest in the notation of folk music was aroused after the October Revolution of 1917. A. Sheripov's collection *Selected Chechen Songs* was published in 1918. In the 1920's the music of the Chechen and the Ingush was studied by A. A. Davidenko and E. A. Kolesnikov. Much work to popularize folk music was done by the composers V. Sh. Dagaev, A. E. Khamkhoev, S. L. Magomedov, and S. Ts. Tsugaev, as well as by A. I. Aleksandrov. Leading folk musicians included the accordion players U. Dimaev and E. Ganukaeva and the *ashugs* (folk singers and storytellers) B. Suleimanov, I. Bataev, and I. Tsitskiev. The composer and conductor G. Kh. Mepurnov, one of the founders of professional music in the republic, made a great contribution to the collection of Chechen folk music. Mepurnov made use of folk melodies in his *Poem About Sheripov* and *Fantasy on Chechen-Ingush Themes* and in music to several productions of the Kh. Nuradilov Chechen-Ingush Dramatic Theater. He also helped found a music school (1936) and an orchestra of reconstructed folk instruments (1935).

U. A. Beksultanov, whose works are quite popular, wrote the symphony *For Soviet Rule* (1967), the symphonic poems *The Tale of the Mountains* (1963) and *Gomar* (1966), a concerto for piano and orchestra (1973), and *Vainakh Sketches* (1974). Vocal and instrumental chamber music is represented by the works of S. U. Dimaev, and variety music, by the works of A. M. Shakhbulatov. Chechen-Ingush folk music forms the basis of several works by Davidenko, N. S. Rechmenskii, M. V. Koval', S. N. Riauzov, Iu. S. Biriukov, O. B. Fel'tsman, and L. I. Kuliev.

Performers include Honored Artists of the RSFSR M. A. Aidamirova, V. Sh. Dagaev, and A. E. Khamkhoev and People's Artist of the USSR M. E. Esambaev, a performer of folk dances.

Among the musical institutions in the republic are (1977) a philharmonic society (1938) and its symphony orchestra (1939), the Vainakh Dance Ensemble (1939), the House of Folk Art (1938), a music school (1936, Groznyi), the Republic Cultural-Educational School (1961), and 31 children's music schools.

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Theater. The theatrical art of the Chechen and the Ingush is rooted in antiquity, attested to by the songs and legends of wandering musicians and singers glorifying the exploits of national folk heroes and by the ancient customs accompanying various festivities and wedding and funeral rituals. Both amateur theatrical arts and the professional theater developed after the October

Revolution of 1917. In the early 1920's progressive members of the national intelligentsia of the cities of Groznyi and Vladikavkaz (now the city of Ordzhonikidze) formed small amateur groups, which staged plays of the Russian and other fraternal peoples in Russian. The national dramaturgy was created mainly by members of amateur circles. Chechen plays included I. El'darkhanov's *The Young Wife of an Old Man*, D. Sharipov's *Ali-Bek-Khadzhi of Zandak*, M. Iandarov's *The Makazhoev Imam*, and S. Baduev's *Not Every Day Is a Bairam for the Mullah* and *The Political Department*. Ingush plays included Z. Mal'sagov's *The Abduction of a Girl* and *Vengeance*, A. Kh. Goigov's *The Funeral Repast*, O. Mal'sagov's *Selikhat* and *Class Struggle in the Aul*, and Kh. Mutaliev's *Eye for an Eye, Tooth for a Tooth* and *The Soldiers of Culture*. These successful plays were topical and of great educational value. At the Northern Caucasus Olympiad of the Arts of the Autonomous Oblasts in 1931, the Ingush drama circle won first place, and the Chechen circle, second place.

The origin of the professional theater dates to the founding in 1931 of the Chechen Theatrical Studio in Groznyi, which combined training with actual stage performances in cities and rural areas. In 1933 the theatrical studio was reorganized into the Chechen Dramatic Theater. An Ingush theatrical studio opened the same year in the city of Ordzhonikidze. The following year, the studio joined the troupe of the Chechen Dramatic Theater, which assumed the name Chechen-Ingush Dramatic Theater. The training of professional performers was greatly assisted by the Rustaveli Georgian Theater, the State Institute of Theatrical Arts, and the Leningrad Institute of Theater, Music, and Cinematography, where the Chechen and Ingush studios worked at one time or another.

The core of the Chechen-Ingush Dramatic Theater comprised graduates of the studios and performers associated with the theater from its inception. They included Honored Artist of the RSFSR Ia. M. Zubairaev, People's Artist of the Chechen-Ingush ASSR and Honored Artist of the RSFSR T. Sh. Alieva, People's Artists of the Chechen-Ingush ASSR A. M. Isaeva, Kh. S. Khakisheva, A. Kh. Khamidov, and V. A. Tataev, Honored Artists of the Chechen-Ingush ASSR Kh. Iu. Mustapaeva, A. D. Tashukhadzhieva, Z. M. Bagalova, I. D. Khadzhieva, Z. Minkailova, M. A. Davletmirzaev, A. A. Deniev, and N. Tsitskiev, Honored Artist of the Severnaia Ossetia ASSR D. Amaev, and the actor M. Dudaev. The first professional stage directors included G. M. Batukaev, M. M. Soltsaev, and R. Sh. Khakishev. In 1942 the theater was named for Kh. Nuradilov (Hero of the Soviet Union).

The most popular national plays are S. Baduev's *The Red Fortress, Petimat, The Law of the Fathers, The Golden Lake, The Shepherd's Family*, and *Tsaeba's Marriage*, M. Gadaev and G. Batukaev's *Adi Surkho*, I. Bazorkin's *Captain Ibragimov* and *Tamara*, A. Khamidov's *The Fall of Bozh-Ali*, Kh. Oshaev's *Aslanbek Sheripov*, M. Soltsaev's *Beshto*, N. Muzaev's *Aset*, B. Saidov's *Zeinap*, and S. Chakhkiev and G. Rusakov's *When Sons Perish*. In addition to staging national plays, the theater produces classical Russian, Soviet, and foreign plays and plays of dramatists of other republics. The rise and development of the Chechen-Ingush theater owe a great deal to the stage directors A. Tuganov, M. Alili, A. Chkhartashvili, G. Batukaev, V. E. Vainshtein, P. Kharlip, M. Minaev, and L. Gorkaia, the composers G. Kh. Mepurnov and A. Aleksandrov, and the stage designers M. Saginian, I. Gamrekeli, M. Magomaev, and E. Berngard.

The theaters of the republic include (as of 1977) the Kh. Nuradilov Chechen-Ingush Dramatic Theater, the Lermontov Russian Dramatic Theater (founded 1938), and the Chechen-Ingush Puppet Theater (1936), which has Russian, Chechen, and Ingush troupes. There are about 30 people's amateur theaters and about 4,500 smaller amateur groups. V. A. TATAEV

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CHECHEN-INGUSH UNIVERSITY (full name, L. N. Tolstoy Chechen-Ingush University), a university in Groznyi, founded in 1972 on the basis of a pedagogical institute established in 1938. The university has (1977) nine departments: physics, mathematics, biology and chemistry, geography, history, philology, Romance and German philology, economics, and physical education. It also has evening, correspondence, and preparatory divisions, as well as a graduate program and 34 subdepartments. The library houses a collection of 467,000 volumes. During the 1977–78 academic year, the university had 5,790 students of 30 nationalities; the teaching staff numbered 325, including 13 doctors of sciences and professors and 125 candidates of sciences and docents. The university publishes *Uchenye zapiski*. In the period 1973–77, the university awarded degrees to 4,370 specialists. [29–521–1]

CHECHEN PLAIN (also Groznyi Plain), a sloping plain on the right bank of the Sunzha River, at the foot of the Greater Caucasus in the Chechen-Ingush ASSR. It is 120 km long and reaches 40 km in width. Elevations range from 70 to 400 m. The plain is composed of coarse gravel covered with loess-like loams. Meadow and chernozem soils predominate; most of the plain is tilled. [29–521–2]

CHECHERSK, a city (since 1971) and administrative center of Chechersk Raion, Gomel' Oblast, Byelorussian SSR. Chechersk is situated on the Sozh River, a tributary of the Dnieper, 37 km from the Buda-Koshelevskaia railroad station and 65 km north of Gomel'. Checherk's industrial enterprises include a butter factory, a winery, a vegetable cannery, and a factory for the production of *objets d'art*. [29–522–3]

CHECHULIN, DMITRII NIKOLAEVICH. Born Aug. 9 (22), 1901, in Shostka, in present-day Sumy Oblast, Ukrainian SSR.

Soviet architect. People's Architect of the USSR (1971); Hero of Socialist Labor (1976). Member of the CPSU since 1945.

Chechulin graduated from the architecture school of the Moscow VKhutein (Higher Art and Technical Institute) in 1929. He studied with A. V. Shchusev. As chief architect of the city of Moscow from 1945 to 1949, Chechulin made major contributions to the reconstruction of the city. His designs for the Komsomol'skaia (first line, 1935), Kievskaia (second line, 1937–38), and Dynamo (ground-level vestibule, 1938) subway stations were awarded the State Prize of the USSR in 1941. Chechulin also designed the Tchaikovsky Concert Hall (1940, with K. K. Orlov), the new Moscow Council building (1945, with others), a high-rise apartment house on Kotel'nicheskaia Esplanade (1948–52, with A. K. Rostkovskii; State Prize of the USSR, 1953), the Hotel Rossiia and the Central Concert Hall (1967–74, with P. P. Shteller and others), the Library of Foreign Literature (1967, with V. A. Sitnov and others), and the Hall of Councils of the RSFSR (begun in 1968, with P. P. Shteller and others).

Chechulin was a deputy to the second convocation of the Supreme Soviet of the USSR. He was awarded the Order of Lenin, four other orders, and various medals. [29–522–5]

CHECHULIN, NIKOLAI DMITRIEVICH. Born Nov. 3 (15), 1863, in Cherepovets; died Feb. 14, 1927, in the village of Borisoglebsk, Cherepovets District, Novgorod Province. Soviet Russian historian. Corresponding member of the Russian Academy of Sciences (1921).

In 1885, Chechulin graduated from the faculty of history and philology of the University of St. Petersburg. Between 1896 and 1915 he was on the staff of the Imperial Public Library; in 1906 he became head of the library's fine arts department.

Chechulin's most important works deal with the domestic and foreign policy, social thought, and culture of 18th-century Russia. On the basis of 16th-century *pistsovye knigi* (systematic compendiums of documents pertaining to economic matters), he wrote in 1889 "The Cities of the Muscovite State in the 16th Century"; in 1894 he published *Pistsovye Knigi of the Muscovite State*. A collection of Old Russian manuscripts assembled by Chechulin is now housed in the Saltykov-Shchedrin State Public Library in Leningrad.

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CHECK, a monetary document of a standard form wherein the person writing the check orders the issuing agency to pay the indicated sum to the bearer; a type of security.

In the USSR, checks are written on blank forms, as prescribed by the State Bank of the USSR, in accordance with the statute on checks ratified on Nov. 6, 1929, by the Central Executive Committee and the Council of People's Commissars of the USSR (*Collected Laws of the USSR*, 1929, no. 73, art. 697). Every check must bear such information as the date and place of issue, the name of the payer, and the account from which payment is to be made. Checks are valid for a period of ten days, not counting the day of issue. In the USSR, only a credit agency (usually a bank) may cash a check, which must always be fully covered by the amount available in the account (either in cash or in the form of a credit account). A bank's acceptance of a check means that the bank agrees to pay the amount of the check within the stated time limit.

Checks circulating in the economy of the USSR may be payable in cash, or they may be used for noncash transactions between organizations in settling accounts for goods received, services rendered, or work performed. This second category is made up of several types of checks—namely, bank-accepted checks, which are used by the budgetary organizations to settle local, or intracity, accounts for goods and services; checks without bank acceptance, which are used to settle local accounts for goods and services and, in addition, are used by financial bodies for reimbursement of budget revenues; and checks from either limited or unlimited checkbooks, which are used to settle both local and nonlocal accounts for goods and services (particularly the accounts of transport and communication enterprises). Checks are also used in relations involving citizens; for example, payments for municipal services may be made out of depositors' current accounts in the form of noncash transactions.

The use of checks in the system of international payments is governed by various regulations—specifically, those formulated by the Geneva convention of 1931 on uniform laws for checks; the English Bills of Exchange Act of 1882, which is applied throughout the Commonwealth and in various other countries, such as the USA, Israel, and the Philippines; and the provisions of the Uniform Commercial Code of 1962, which is in effect in the United States and in a number of Latin American countries. The USSR is not a signatory to international checking agreements. [29–127–2]

CHECK, in land reclamation, a carefully flattened section of field bounded by earth dams, intended for growing rice by the flooding method (*see* SURFACE WATERING). A check is 1–4 hectares in area; a large check is 12–16 hectares in area. [29–128–1]

CHECKBOOK, an assembled booklet of checks, which may be used in exchange for money or in settlement of an account. In the USSR, checkbooks are made by banks and issued by the credit institutions in which the check writer (whether an organization or an individual citizen) has an account. The checkbook bears the name of its owner, the number of the bank account on which the checks are drawn, and the numbers of the checks. In addition, limited checkbooks (which are made out for a specified sum of money, covered by the payer's funds on deposit) and unlimited checkbooks (for unlimited amounts, covered by bank loans in special loan accounts) indicate the effective period of the checkbook, allocation of payments, and—where applicable—the established limit.

In the case of checks used for the settlement of accounts, the checkbook may be valid for a limited period that is fixed by bank regulations (up to one year); a limit may also be imposed on the amount available for writing checks from a given checkbook. Unless a checkbook is issued for the settlement of accounts with certain designated organizations, the checks may be used to settle accounts with any supplier or transport organization. [29–132–2]

CHECKERS, a board game for two players. The checkerboard is usually square in shape and is divided into numerous dark and light squares; the men are usually round. Like chess, the game simulates the actions of combatants following specified rules of competition.

The earliest evidence of checkers is found in remains of ancient Egypt. The game was known to the people who populated the territory of what is now the USSR as early as the third century. Various forms of the game are distinguished by the number of squares on the board, the number of men, and different rules. The best-known forms are Russian draughts (*shashki*), English draughts or checkers, German draughts (*Damenspiel*), and Spanish checkers, all of which are played with 12 pieces on a board of 64 squares; the French game called Polish draughts (*dames à la polonaise*), played with 20 pieces on a board of 100 squares; and Canadian draughts or checkers, played with 30 pieces on a board of 144 squares.

National checkers championships were first held in the 19th century. The first Russian championship, held in 1896, was won by S. A. Vorontsov, who died undefeated. A. I. Shoshin, V. I. Shoshin, N. A. Kukuev, and others later won the championship numerous times. Polish draughts spread from France to many countries and later became the modern game of international checkers.

According to the rules of play, the men are moved diagonally

forward on the dark squares in either direction, one square at a time. The opponent's pieces can be captured by jumping forward and backward onto unoccupied squares. A man that reaches the last row of squares on the board becomes a king (in some languages, a queen) and has the right to move any number of squares. The object of the game is to capture the opponent's pieces or to create a situation in which they cannot be moved.

Three rules in international 100-square checkers create greater opportunities for performing intricate positional maneuvers and combinations: (1) the player must take the larger number of pieces where there are several possible jumps; (2) a piece that reaches the last row of the board by jumping is not kinged until the next move; and (3) when a piece reaches the last row and is forced to take more of the opponent's pieces, it is not kinged.

World championships in 100-square checkers have been held since 1894. The first world champions were the Frenchmen I. Weiss (1894–1912), S. Bizot (1925–26), M. Fabre (1926–28, 1931–33), M. Reichenbach (1933–45), and P. Ghestème (1945–47) and the Dutchmen G. Haugland (1912–25) and B. Springer (1928–31). The World Checkers Federation (FMJD) was founded in 1947 and comprised 22 national organizations in 1977. The Soviet Union joined in 1956. The official FMJD competition for men is conducted in four stages over a course of four years. In the first year the Great Olympic Tournament is held; the national champions and the world champion participate, and the winner is declared world champion. In the second year there is a match for the world championship between the former world champion (if the world champion who participated in the first-year tournament lost the title) and the tournament winner. In the third year a tournament of challengers is held. In the fourth year a match is held for the world championship between the champion and the winner of the tournament of challengers.

World champions have included P. Rozenburg (1948–55), T. Sijbrands (1972–76), and H. Wiersma (1976), all of the Netherlands; M. Delorier of Canada (1956–58); and I. I. Kuperman (1958–68, 1975–76), V. I. Shchegolev (1960–61, 1964–65), and A. G. Andreiko (1968–72), all from the Soviet Union.

European Championships for men, originally called the European Cup, have been held since 1965. Champions have included Kuperman (1965), Sijbrands (four times, 1967–71), Andreiko (1974), and R. S. Leschinskii (1977). World youth championships, held since 1972, have been won by the Soviet masters N. N. Mishchanskii (1972) and E. M. Skliarov (1976). Tournaments for the women's world championship have been held since 1974, and E. K. Mikhailovskaia of the USSR has won four times.

In 1947 two honorary titles were instituted: international grandmaster (Jan. 1, 1977), which has been awarded to 12 persons, including the Soviet players Kuperman, Shchegolev, and A. A. Gantvarg, and international checkers arbiter, awarded to 17 persons, five of them Soviet. Representatives of the USSR have been elected vice-president of the FMJD: S. G. Tambiev (1955–64), G. Ia. Torchinskii (1964–72), and L. A. Chubarov (since 1972).

Championships have been held in the USSR since 1924 in Russian *shashki* and since 1954 in international 100-square checkers. The USSR Checkers Federation was founded in 1924 and has been an independent all-Union federation since 1960. The title Grandmaster of the USSR was instituted in 1961, and there were 14 persons with the title in 1977. Outstanding champions in Russian *shashki* include V. A. Sokov, Z. I. Tsirik, V. Medkov, V. R. Gabrielian, and A. M. Plakkhin. Andreiko, Kuperman, and Shchegolev have all won more than one competition in international 100-square checkers. The top women checkers players are I. V. Spasskaia, E. K. Mikhailovskaia, and E. V. Sorkina in *shashki* and L. G. Travina in international checkers.

In 1977 the USSR Checkers Federation had approximately 3 million members, including about 900 masters of sport and more than 1.7 million players with official sports ratings. Each year all-Union youth championships are held in *shashki* and 100-square checkers, as well as team competitions among republics and sports societies for the USSR cup and the Wonder Checkers and Great Checkers tournaments and other games for Pioneers and schoolchildren.

Checkers composition is an independent area of checkers.

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L. A. CHUBAROV [29–921–2]

CHEDER, a pelotherapeutic health resort in the Tuva ASSR. Cheder is situated in the Tuva Basin, on Lake Cheder, 45 km from Kyzyl. Summers are moderately cool, with an average July temperature of approximately 14°C, and winters are cold, the January temperature ranging from −27° to −32°C. Patients are treated with the mud and brine of the lake for diseases of the musculoskeletal system, gynecological disorders, and diseases of the peripheral nervous system. Cheder has a sanatorium and a pelotherapeutic treatment facility. [29–124–2]

CH'EERHCH'EN HO (also Cherchen Darya), a river in West China. The Ch'eerhch'en Ho rises in the Arka Tagh of the Przheval'skii Ridge; after emerging from the Kunlun Mountains, it flows along the southeastern edge of the Takla Makan Desert. The river empties into Kara Buran Kol and, during the high water in July and August, into the swamps southwest of Lop Nor. Measured from its source to Kara Buran Kol, the river has a length of 725 km. The mean flow rate is approximately 20 cu m per sec at the place where the river emerges from the mountains. The Ch'eerhch'en Ho brings water to the Ch'eerhch'en oasis. The lower course of the river is waterless most of the year. [29–333–4]

CHEFOO CONVENTION OF 1876, an agreement imposed on China by Great Britain, which used the murder of a British official in Yünnan as a pretext for making its demands. The agreement was signed Sept. 13, 1876, in Chefoo (Yent'ai). The Chefoo Convention granted Great Britain a number of privileges; in particular, it opened the ports of Ich'ang, Wuhu, Wenchou, and Pakhoi (Peihai) to English trade.

PUBLICATION
Grimm, E. D. *Sbornik dogovorov i drugikh dokumentov po istorii mezhdunarodnykh otnoshenii na Dal'nem Vostoke (1842–1925)*. Moscow, 1927. [29–661–1]

CHEGDOMYN, an urban-type settlement and the administrative center of Verkhniaia Bureia Raion, Khabarovsk Krai, RSFSR. Situated on the left bank of the Chegdomyn River of the Amur basin, the settlement is the terminus of a railroad branch line that runs from the Izvestkovaia station. Chegdomyn has a sausage factory, a brickyard, and two logging and timber distribution establishments; the Urgalles Production Association is also located in the settlement. Hard coal is mined in the area. [29–123–1]

CHEJU, a city and port in South Korea, on the island of Cheju-do in the Korea Strait. Capital of Cheju-do, which has the status of a province. Airport. Population, more than 100,000 (1970). Economic activities include cottage industry, the catching of marine fish and shellfish, and food processing, including the processing of seafood. [29–124–3]

CHEJU-DO, a South Korean island in the northern part of the East China Sea. Separated from the Korean Peninsula by the Cheju Strait and from the Japanese islands by the Korea Strait, the island occupies an area of 1,850 sq km.

The coast of Cheju-do consists mainly of cliffs that drop precipitously to the sea. The island is composed of volcanic rocks. The volcano Halla-san, which erupted in the tenth century, is located in the central part of Cheju-do; it has an elevation of 1,950 m. The island has a subtropical monsoon climate, with as much as 2,000 mm of precipitation a year. Evergreen and deciduous forests give way to coniferous forests at elevations higher than 1,600 m. Where forests have been felled, there are now meadows. Rice, barley, and the foxtail millet *Setaria italica maxima* are cultivated. Other economic activities include the catching of fish and mollusks. The city of Cheju is the capital of Cheju-do. [29–124–4]

CHEKALIN, ALEKSANDR PAVLOVICH. Born Mar. 25, 1925, in the village of Peskovatskoe, in what is now Suvorov Raion, Tula Oblast; died Nov. 6, 1941, in the city of Likhvin (now Chekalin). Partisan in the Great Patriotic War of 1941–45. Hero of the Soviet Union (awarded posthumously Feb. 4, 1942). Member of the Komsomol from 1939.

Chekalin was enrolled in a secondary school in Likhvin in 1938. He volunteered for a paramilitary fighting detachment in July 1941 and later joined the partisan detachment Peredovoi as a scout. Denounced by a traitor, he was seized by the fascists, tortured, and hanged. A monument was erected on Chekalin's grave in 1958.

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Smirnov, V. I. *Sasha Chekalin: Povest'*. Moscow, 1972. [29–128–3]

CHEKALIN (until 1944, Likhvin), a city in Suvorov Raion, Tula Oblast, RSFSR. Chekalin is situated on the left bank of the Oka River, 7 km from the Chekalin and Cherepet' railroad stations on the Tula-Kozel'sk line. It has a milk plant, a logging and timber distribution establishment, and an industrial combine. The city was renamed in honor of A. P. Chekalin. [29–128–4]

ČEKANAUSKAS, VITAUTAS AL'GIRDO (Vytautas Algirdas Čekanauskas). Born May 13, 1930, in Šiauliai. Soviet architect. People's Architect of the USSR (1975).

Chekanauskas graduated from the Art Institute of the Lithuanian SSR in Vilnius in 1955. He has designed an art exhibition pavilion in Vilnius (1967) and collaborated on plans for the residential district of Lazdynai, also in Vilnius (1967–early 1970's; Lenin Prize, 1974). [29–128–7]

CHEKANOVSKII, ALEKSANDR LAVRENT'EVICH. Born Feb. 12 (24), 1833, in the city of Kremenets, in what is now Ternopol' Oblast, Ukrainian SSR; died Oct. 18 (30), 1876, in St. Petersburg. Explorer of Central Siberia.

A Pole by nationality, Chekanovskii was exiled to Siberia for his participation in the Polish Uprising of 1863–64. Commissioned by the Siberian division of the Russian Geographic Society, Chekanovskii conducted geological investigations of the southern part of Irkutsk Province from 1869 to 1871. He provided the first reliable data on the geology of the region of the Nizhniaia Tunguska River in 1873 and of the lower course of the Lena and, particularly, the Olenek in 1874 and 1875. Chekanovskii discovered deposits of hard coal and granite along the Nizhniaia Tunguska.

In 1876, Chekanovskii was permitted to go to St. Petersburg, where he began an analysis of the data he had gathered on the geography, geology, and paleontology of the places he had visited. His botanical and zoological collections have been described in the works of a number of scientists. The ridge Chekanovskii discovered between the Lena and Olenek rivers was named after him, and many fossil plants—especially of the Jurassic—have been named in his honor.

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Dnevnik ekspeditsii po rekam Nizhnei Tunguske, Oleneku i Lene v 1873–1875 godakh. St. Petersburg, 1896.

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CHEKANOVSKII, an urban-type settlement in Irkutsk Oblast, RSFSR. Chekanovskii is under the jurisdiction of the Bratsk city soviet and is situated on the Vikhorevka River, a tributary of the Angara. It has a railroad station (Anzebi) on the Taishet-Lena line, 12 km southwest of Bratsk. A brickyard, a logging and timber distribution establishment, and a wood-products combine are located in Chekanovskii. [29–131–1]

CHEKANOVSKII RIDGE, a mountain ridge bordering the Lena delta on the southwest, in the Yakut ASSR. Chekanovskii Ridge is 320 km long and consists of Mesozoic sandstones, aleurolites, and argillaceous schists. It has an elevation of 450–500 m, with a maximum height of 529 m. Tundra with lichens and shrubs predominates. [29–131–2]

CHEKHARIN, EVGENII MIKHAILOVICH. Born Nov. 22, 1924, in the village of Gubino, Kozel'sk Raion, Kaluga Oblast. Soviet jurist; corresponding member of the Academy of Sciences of the USSR (1976). Member of the CPSU since 1950.

From 1954 to 1959, Chekharin taught at Moscow State University. He has had a responsible party position since 1959. From 1972 to 1978 he was rector of the Higher Party School of the Central Committee of the CPSU.

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CHEKHONIN, SERGEI VASIL'EVICH. Born 1878 in the village of Lykoshino, in what is now Kalinin Oblast; died Feb. 23, 1936, in Lörrach, in what is now the Federal Republic of Germany. Russian graphic artist and painter.

Chekhonin studied in St. Petersburg at the Drawing School of the Society for the Promotion of the Arts from 1896 to 1897 and under I. E. Repin at M. K. Tenisheva's school from 1897 to 1900. He was a member of the World of Art. Chekhonin worked mainly on book and magazine graphics and in painting on ceramics and enamel. He also created miniature sculptures and ceramics and worked as an interior and stage designer. During the Russian Revolution of 1905–07, Chekhonin edited a satirical political journal and drew political caricatures. One of the first artists to design ceramics on agitational themes, he served as artistic director of the State Ceramics Factory in Leningrad from 1918 to 1923 and from 1925 to 1927. He also took part in competitions to design the Soviet state emblems.

Chekhonin developed a distinctive and calligraphically refined brushwork manner employing garlands, bouquets, and other decorative motifs of the Russian Empire style. In the Soviet period he often combined these motifs with revolutionary slogans and emblems. In the 1920's, certain artistic devices in Chekhonin's graphics revealed the influence of futurism. In 1928, Chekhonin moved to France.

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CHEKHOV, ANTON PAVLOVICH. Born Jan. 17 (29), 1860, in Taganrog; died July 2 (15), 1904, in Badenweiler, Germany; buried in Moscow. Russian writer.

Chekhov's father, a merchant of the third guild, owned a grocery store. As a boy, Chekhov helped his father in the store; he entered the Taganrog *Gymnasium* in 1868. In 1876 the father went bankrupt and left for Moscow, followed by his family. Left to himself, Chekhov continued his studies, earning his living by tutoring. In 1879 he finished school and moved to Moscow. He studied medicine at the University of Moscow, graduated in 1884 with the title of district physician, and for some time practiced medicine.

Chekhov began writing in the late 1870's. He contributed to various humor magazines, such as *Oskolki*, using different pen names—for example, Antosha, A Man Without a Spleen, Brother of My Brother, and, most frequently, Antosha Chekhonte. A collection entitled *At Leisure* (later called *The Prank*) was prepared for publication in 1882 but never appeared in print, apparently because of censorship. Chekhov's first book of short stories, *Tales of Melpomene*, was published in 1884; it was followed in 1886 by *Motley Tales*.

In March 1886, D. V. Grigorovich wrote Chekhov a letter

praising his "real talent" and urging him to "give up working under a deadline" and save "[your] impressions for a well-considered work" (see *Slovo*, collection no. 2, Moscow, 1914, pp. 199–200). This letter was one of the factors that hastened Chekhov's shift from "trifling" to "well-considered work." The transition from the purely humorous to the "realm of the serious" occurred between 1885 and 1887. "The Steppe" and "The Name-Day Party" appeared in 1888, followed in 1889 by "An Attack of Nerves" and "A Dreary Story." This period also saw the publication of several collections of Chekhov's short stories—namely, *In the Twilight* (1887; awarded half of the Pushkin Prize in 1888), *Innocent Speeches* (1887), *Tales* (1888), and *Gloomy People* (1890).

Chekhov's journey to the island of Sakhalin in 1890 made a deep impression on him, which left its mark in his journalistic essay of 1893–94, *The Island of Sakhalin* (published as a book in 1895), in the short stories "In Exile" (1892) and "The Murder" (1895), and in the novella "Ward No. 6" (1892), which summed up the entire experience. Imbued with a spirit of protest against the horrors of prison life, "Ward No. 6" represented the high point of Chekhov's critical realism of the late 1880's and early 1890's. This is how V. I. Lenin described his impression of the work: "When I finished this story last night I was genuinely terrified, I couldn't stay in my room, I got up and went out. I felt as though I were locked up in ward no. 6 myself" (cited in *Reminiscences of V. I. Lenin by His Family*, 1955, p. 36).

In the second half of the 1880's Chekhov wrote extensively for the theater. His plays included *Ivanov* (1887–89), the one-act comedy *The Wedding* (1889; published 1890), *The Wood Demon* (1889; published 1890, later revised and reissued as *Uncle Vanya*), and the one-act farces *The Bear, The Proposal*, and *The Anniversary*.

In the 1890's and early 1900's Chekhov made a number of trips abroad. In 1892 he bought the estate of Melikhovo in the Serpukhov District, 13 versts from the Lopasnia Station (now Chekhov). He administered medical aid to the local peasants, built schools for the peasants' children, visited some of the famine-stricken provinces in 1892, worked as district physician during the cholera epidemic of 1892–93, and helped in the national census of 1897.

In approximately 1893, Chekhov's work moved in a new direction. In 1894 he wrote the story "The Student," in which he asserts that "truth and beauty . . . have continued uninterruptedly to the present day and, it appears, have always been the most important thing in human life and on the earth in general" (*Poln. sobr. soch. i pisem*, vol. 8, 1947, p. 348). The crowning work of this period is the play *The Seagull* (1896). As staged at the Aleksandrinskii Theater, however, the play failed, and the lyricism that colored Chekhov's works gave way to a different kind of writing. In his novella of 1897, "Peasants," and in the short stories written in the same year, Chekhov sought to reveal the unembellished truth and even the harshness of life and to show its terrible underside.

In the 1898 trilogy "The Man in a Shell," "Gooseberries," and "About Love," in the stories and novellas of the late 1890's and early 1900's, and in his last story, "The Betrothed" (1903), Chekhov depicted spiritual stagnation and a hero striving toward a better life.

Chekhov's skill as a dramatist came into full flower in the 1890's and early 1900's. In 1896, after *The Seagull*, he wrote the play *Uncle Vanya* (published 1897), followed in 1900–01 by *Three Sisters* (awarded the Griboedov Prize) and in 1903–04 by *The Cherry Orchard*. The four plays were all produced at the Moscow Art Theater, which opened in 1898; the triumphant premiere of *The Seagull* took place on December 17 of that year.

In 1898, after the death of his father and because of his own deteriorating condition (due to tuberculosis), Chekhov moved from Melikhovo to Yalta, where he built a house. There he met with L. N. Tolstoy, M. Gorky, I. A. Bunin, A. I. Kuprin, and I. I. Levitan. Chekhov's position during the Dreyfus trial, his break with A. S. Suvorin's reactionary newspaper *Novoe Vremia*, and his sympathetic attitude toward student disturbances were indicative of his rapid ideological development and heightened interest in public life. Chekhov was elected an honorary academician in 1900, but together with V. G. Korolenko he renounced the title in 1902 in protest against Nicholas II's refusal to grant the same title to Gorky.

Chekhov's work mirrors a broad cross section of postreform and prerevolutionary Russian life. Even his early comic pieces cannot be reduced to pure humor. In all the kaleidoscopic variety of his early stories, the author increasingly reveals his basic themes—man and his rank, poetry and prose, life's facade and its reverse side. Many of Chekhov's early stories show the triumph of the mercantile spirit. Antosha Chekhonte's characters belong entirely to the banal and philistine world that has given them birth; these are "the fat and the thin," the "chameleons," "windbags," "philistines," "bridegrooms and papas," and "barroom philosophers" who never dream of opposing their environment.

The creative turning point that Chekhov experienced in the mid-1880's resulted in the appearance of new protagonists who do oppose their environment and who suffer precisely because of their humanity, such as the characters in "An Upheaval," "Aniuta," and "Misery." The basic direction of Chekhov's mature work of the late 1880's and early 1900's is clearly apparent; the author strives to analyze what N. G. Chernyshevskii called the influence "of social relations and everyday conflicts on character" (*Poln. sobr. soch.*, vol. 3, 1947, pp. 422–23). Chekhov's unique field of inquiry is the soul of modern man. Hence his main theme—man's indifference, or his "somnolent stupor," as represented by the peculiar ordeal of a hero who either rouses himself from spiritual slumber or else gives up and submits to it.

The two basic groups on which Chekhov's mature work was focused were the intelligentsia and the common people. Likewise, the theme of indifference is developed in two different ways: the hero is either an educated man who is spiritually content and has locked himself up inside a "shell," or a man of the people—downtrodden, worn out by life, and made dull and indifferent. For Chekhov, the "shell" is the symbol of a life built on lies and violence, on the gluttonous satiety of some, and on the hunger and suffering of others. "The Student," in which the hero Ivan Velikopol'skii finds the way to the heart of two peasant girls, Vasilisa and Luker'ia, was the prototype of the two types of works that Chekhov wrote between 1890 and 1900. The hero of "The Student" is followed by the characters in the novellas "Three Years" (1895), "The House With the Attic," or "An Artist's Story" (1896), and "My Life" (1896), the short trilogy consisting of "The Man In a Shell," "Gooseberries," and "About Love," and the stories "Ionych" (1898), "The Lady With the Dog" (1899), and "The Betrothed." Vasilisa and Luker'ia, on the other hand, are followed by the peasants in the novella "Peasants" and in the story "The New Country House" (1899), the rural police assistant in the story "On Official Business" (1899), and the heroes of the novella "In the Ravine" (1900).

The gulf between the intelligentsia and the common people is a theme that pervades Chekhov's work and is closely linked to the theme of the "shell." During these years Chekhov wrote distinctive cycles of works on this theme—"artistic investigations" of life. In addition to the "intelligentsia" and "peasant" cycles, he wrote stories depicting the world of the merchant and the shopkeeper's storehouse, as well as the inhumanly harsh life of the factories. "Three Years" (1894), "A Woman's Kingdom" (1894), and "A Doctor's Visit" (1898) belong to this group of stories.

In his late works, including the short story "A Visit to Friends" (1898) and the play *The Cherry Orchard*, Chekhov develops the theme of the impoverishment and ruin of the "nests of the gentlefolk." Thus the theme of human indifference is resolved not only in moral and psychological terms but also on the scale of different social situations.

The Chekhovian image of "the man in a shell" grows into a symbol of callousness and conventionalism, simultaneously intimidating and fearful. V. I. Lenin often referred to this satirical symbolic image.

The essence of Chekhov's thoughts on faith in man and on the truthfulness of artistic portrayal is conveyed by an entry in the writer's notebooks: "Man will become better when you have shown him what he is" (*Poln. sobr. soch. i pisem*, vol. 12, 1949, p. 270). Chekhov believed in the possibility of human renewal and the victory of man over the "shell." In Chekhov, man is constantly being tested by the harsh truth of life. Another important aspect of Chekhov's observation is that literature should show

man his own image, without trying to persuade and without resorting to ennobling deceptions, generalized arguments, or attempts by the author to sway the reader's emotions.

Chekhov's artistic style is profoundly and organically linked to the ideological direction of his work—that is, the desire to awaken "the living soul" in modern man. His writing firmly establishes the principle of restrained and outwardly unemphatic narration: the greater the author's objectivity, the stronger the impact. Chekhov's terseness of expression, conciseness, and condensed narration ("Brevity is the sister of talent," *ibid.*, vol. 14, 1949, p. 342) stemmed from his faith in the reader's ability to catch the author's hidden and complex meaning. Linked to this is the heightened role of details that at first glance seem minor and of little importance; such details, which are not in the least incidental, are psychologically and emotionally significant. Chekhov's details not only hint at what is important and characteristic but also serve as vehicles for the internal movement of the story, novella, or play. Examples of such details are Iuliia's umbrella in "Three Years," the carriage in which Dr. Startsev rides in "Ionych," and the dead bird in *The Seagull*.

The mature Chekhov avoided tense action, intrigue, and external diversion, shifting the center of gravity to the internal plot, the story of the hero's soul, and the hidden dynamics of the hero's struggle against circumstance, the environment, and the mire of a parochial existence. The tragic meaning of many of Chekhov's works lies precisely in the fact that nothing happens—everything remains as it was. Complex plotting, which played an important role in the anecdotal novellas of Antosha Chekhonte, is put aside in the works of the mature Chekhov. Events "dissolve" into the flow of daily life or into psychology. In this respect the plot structure of Chekhov's prose works resembles that of his plays.

An integral trait of Chekhov the artist is the profound realization that tragedy does not consist of what is terrible, exceptional, or out of the ordinary but of what is prosaic, everyday, and commonplace. The "tragedy of the prosaic" is all the more dangerous because it destroys the hero imperceptibly, by lulling him to sleep and convincing him that a different kind of life—one that is not prosaic—is impossible. For Chekhov, terror lies in that which is not terrible; the benign and the bloodless are what is fatal. This is also related to the evolution of Chekhov's humor. The writer's development as an artist did not consist of the transition from the comic to the serious but rather of his deeper understanding of the comic as tragicomic, uniting laughter, irony, and sadness. Few of the Russian satirical writers have created such a complex yet outwardly simple mixture of laughter and seriousness, satire and lyricism. Chekhov's laughter is not a separate facet of his art; it is the very atmosphere of his works, representing a complex gamut of feelings. What is encompassed in his laughter ranges from accusation, derision, and disdain aimed at an entire way of life to the revelation of the grievous rootlessness and humanity of the "little souls" who are Chekhov's protagonists.

Chekhov laid out new paths for the development of Russian and world drama. He refused to divide his characters into angels and villains, or one-sided representatives of good and evil. Just as in his prose works, he avoided plot intrigue and shifted the center of gravity to the hidden, internal plot involving the mental world of the hero. Plot emerges not as a chain of events but as the story of man's desire to act and his attempts to break out of his daily routine—out of the bonds of "prosaic tragedy."

Chekhov's plays are built around many themes and leitmotifs that unfold on many different levels and are associated with various men's fortunes. The theme developed in Chekhov's prose works emerges in his plays as well—namely, the loss of inner connections between people. The characters in Chekhov's plays are separated from each other by invisible barriers; each is immersed in his own condition. The dialogue in Chekhov's plays tends toward monologue; each character speaks his own particular "micromonologue." Nevertheless, the overall lyrical atmosphere unites the seemingly isolated heroes.

Even in his early plays Chekhov did more than re-create everyday reality. But *The Seagull* marks a new advance. Running through the entire play is an image that is raised to a symbol and is pregnant with meaning—the image of the seagull, symbolizing Treplev's and Nina Zarechnaia's dream of a new kind of art, pure and bold; also related to this image is the theme of wounded and tragic love. There is yet another side to the multifaceted image of the dead bird, representing a soulless, lifeless, mediocre art.

Discouraged by the failure of *The Seagull*, Chekhov retreated somewhat from the use of such devices. In *The Cherry Orchard*, however, he turned to them once again. Chekhov's notion of the dramatic genre acquired new content as well. *The Seagull* and *The Cherry Orchard* were called comedies by their author, but the comic components of these plays are inseparable from the tragic ones. The past experience of Russian and world theatre attests to the failure of those directors who view Chekhov as a "mere satirist" whose writing is based on farce or of those who go to the opposite extreme and adopt a lyrical approach to the plays while ignoring their comic elements. We are now entering the stage of integrated and multifaceted analysis of Chekhov the dramatist in all his dialectical complexity and inimitable mixture of lyricism and satire.

Chekhov inherited and carried forward the best realistic traditions of Russian literature. L. N. Tolstoy's definition—"Chekhov is Pushkin in prose" (*Ezhemesiachnyi zhurnal dlia vsekh*, 1905, no. 7, p. 427)—illuminates the role of A. S. Pushkin's poetry as an influence on Chekhov the prose writer and dramatist. Pushkin's perfect sense of rhythm and his attempt to achieve harmonious integrity, clarity, and musicality were interpreted by Chekhov in his own way. Chekhov was profoundly influenced by M. Iu. Lermontov, the author of "Thought" and of the novel *A Hero of Our Time*, who wrote of the "cooling" of the soul of modern man. Lermontov's "Taman'" was for Chekhov an unsurpassed model of prose. It has also been noted that I. S. Turgenev's plays foreshadowed the hidden lyricism characterizing Chekhov's dramatic work.

Among Chekhov's predecessors and contemporaries, the one who took first place in the writer's creative consciousness was Leo Tolstoy, whose brilliant artistic creations invariably earned Chekhov's enthusiastic praise. Although Chekhov was definitely influenced by Tolstoy's philosophy, the ideological differences between the two writers became more pronounced in the late 1890's. Tolstoy's concept of nonviolent resistance to evil aroused Chekhov's opposition. Tolstoy reproached Chekhov for his lack of a consistent moral position—in other words, for his skeptical attitude toward faith; he had, however, a high opinion of Chekhov's writing talent and called him "an incomparable artist." "Thanks to his sincerity," said Tolstoy, "Chekhov has created forms of writing that are new—entirely new, in my opinion—for the entire world [and] the likes of which I have not encountered anywhere" (cited in P. Sergeenko, *Tolstoi i ego sovremenniki: Ocherki*, Moscow, 1911, p. 226).

Chekhov exerted a strong influence on Russian and world literature—both prose and drama. His pupils included the young Gorky (particularly in drama), Bunin, Kuprin, and to some extent L. N. Andreev. K. A. Trenev and A. N. Arbuzov have written about Chekhov's role in the education of Soviet dramatists, and many European and American writers have noted the part he played in the art of the 20th century. G. B. Shaw's play *Heartbreak House*, published in 1919, was clearly written under Chekhov's influence; Shaw called it "a fantasy in the Russian style on English themes" (*Izbr. proizv.*, vol. 2, Moscow, 1956, p. 286). J. Galsworthy wrote of Chekhov's salutary effect on English literature. A. Wurmser, F. Mauriac, E. Triolet, and the French directors J.-L. Barrault and J. Vilar have pointed to the impact of Chekhov's work. In "A Word on Chekhov," T. Mann revealed in depth the Russian writer's unique position in terms of his creative ideology and his unpretentious and selfless goal—namely, the use of unvarnished artistic truth in the people's service.

Chekhov is one of the most popular playwrights of contemporary Soviet and foreign theater. Many of his works have been filmed for the cinema and television, including *The Wedding, The Lady With the Dog, The Seagull, Uncle Vanya, The Cherry Orchard*, and the early drama *Without Fathers*.

Russian prerevolutionary and Soviet studies of Chekhov have produced a wealth of textual information and commentary. In articles appearing even before the Revolution, Chekhov's prose works and plays were searchingly analyzed by such writers as M. Gorky, V. G. Korolenko, N. K. Mikhailovskii, F. D. Bati-

ushkov, D. N. Ovsianiko-Kulikovskii, and the Marxist critics V. V. Vorovskii and A. A. Divil'kovskii. In the Soviet period, enormous efforts have been devoted to the collection and publication of Chekhov's literary legacy and the study of his life and work. Among those who have contributed to this undertaking are A. V. Lunacharskii, S. D. Balukhatyi, Iu. V. Sobolev, A. B. Derman, A. I. Roskin, K. I. Chukovskii, I. S. Ezhov, G. A. Bialyi, E. N. Konshina, N. I. Gitovich, M. L. Semanova, V. V. Ermilov, and G. P. Berdnikov. New works and publications (such as *Literaturnoe nasledstvo*, vol. 68) were issued in commemoration of the 100th anniversary of Chekhov's birth.

The A. M. Gorky Institute of World Literature of the Academy of Sciences of the USSR is publishing the complete works and letters of Chekhov in 30 volumes. A series of collected research studies is being published to accompany the academy edition: the first such collection, *In Chekhov's Creative Laboratory*, was issued in 1974; the second, *Chekhov and His Times*, in 1977; the third, *Chekhov and Leo Tolstoy*, is being prepared for publication.

There are Chekhov museums in Taganrog and in Moscow (in the house where the Chekhov family lived from 1886 to 1890), as well as in Melikhovo, in the village of Luka in Sumy Oblast, and in Yalta.

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Z. S. PAPERNYI [29–400–3]

CHEKHOV, MIKHAIL ALEKSANDROVICH. Born Aug. 16 (28), 1891, in St. Petersburg; died Sept. 30, 1955, in Beverly Hills, Calif. Russian actor, director, and teacher. Honored Artist of the Republic (1924).

Mikhail A. Chekhov was A. P. Chekhov's nephew. In 1911 he graduated from the A. S. Suvorin Theatrical School in St. Petersburg; he worked in the Suvorin theater, where he played Fedor in A. K. Tolstoy's *Tsar Fedor Ioannovich*. In 1913 he joined the Moscow Art Theater and worked in its First Studio. The views on theater and ethics held by K. S. Stanislavskii, L. A. Sulerzhitskii, and E. B. Vakhtangov had a decisive influence on Chekhov. His acute perception of the world, infectious emotionality, brilliant gift for improvisation, and virtuoso talent marked Chekhov as one of the most prominent Russian actors.

Chekhov's best roles include Fräzer in Berger's *The Deluge*, Malvolio in Shakespeare's *Twelfth Night*, the title roles in Strindberg's *Erik XIV* and Shakespeare's *Hamlet*, Ableukhov in Belyi's *Petersburg*, and Khlestakov in Gogol's *The Inspector-General*. From 1919 to 1922, Chekhov was in charge of his own studio—the Chekhov Studio. In 1924 he became the head of the Moscow Art Theater's First Studio, which was reorganized and renamed the Second Moscow Art Academic Theater, or Second MKhAT, in the same year. In 1928, however, the disagreements within the theater, as well as the contradictions in Chekhov's own world view, led him to quit the Second MKhAT. In the same year, Chekhov went abroad.

The alien theater environment and language had a disastrous

effect on Chekhov's creative work; he enacted only two important stage roles—the title role in A. K. Tolstoy's *The Death of Ivan the Terrible* and the role of Foma Opiskin in *The Village of Stepanchikovo* (adapted from Dostoevsky). Chekhov's attempts to organize repertory theaters in Paris, Prague, and New York ended in failure. He directed actors' studios in Lithuania, Latvia (1932–34), and Great Britain, as well as an actors' training group in Hollywood in the 1940's. He also acted in films. Chekhov's students included the English actor P. Rogers and the American film actors G. Peck and Y. Brynner.

Chekhov wrote two books, *The Actor's Path* (1928) and *To the Actor, on the Technique of Acting* (1953).

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CHEKHOV, NIKOLAI VLADIMIROVICH. Born June 15 (27), 1865, in St. Petersburg; died Nov. 8, 1947, in Moscow. Soviet educator. Professor from 1923; doctor of pedagogical sciences from 1940; Honored Scientist of the RSFSR from 1940. Full member of the Academy of Pedagogical Sciences of the RSFSR (1944).

After graduating in history and philology from the University of St. Petersburg in 1888, Chekhov taught at the school of the Ekaterinoslav Railroad and at various schools in Tula and Moscow provinces, Tver', St. Petersburg, and Moscow. He was also active in the *zemstvo* school movement. A democratic educator, he organized several public courses and teachers' conferences. During the Revolution of 1905–07 he was one of the leaders of the All-Russian Union of Teachers and Workers in Public Education. In 1910 he was named chairman of the Moscow council of the D. I. Tikhomirov pedagogical courses for women.

After the socialist revolution of October 1917, Chekhov was given a responsible position in the People's Commissariat of Education of the RSFSR; he taught education and Russian language teaching methods in the faculty of pedagogy of the Second Moscow State University and in the Higher Courses of Scientific Pedagogy, and he did research work at the Institute of Children's Reading and at the Institute of Scientific Pedagogy. His principal works are on the history of the Russian school, the organization of children's reading programs, and the methods of teaching Russian in school. Chekhov was awarded the Order of Lenin in 1945.

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CHEKHOV (until 1954, Lopasnia), a city under oblast jurisdiction and administrative center of Chekhov Raion, Moscow Oblast, RSFSR. Situated on the Moscow-Simferopol' highway; railway station 77 km from Moscow. Population, 43,000 (1974). Chekhov's industrial plants include a power engineering machine-building plant, a regeneration plant, the Gidrostal'konstruktsiia Plant, printing and furniture combines, a mixed-feed plant, and a candy factory. The city was renamed in honor of A. P. Chekhov. A literary museum-preserve memorializing the writer is located at Melikhovo, 12 km from the city.

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CHEKHOV (until 1947, Noda), a city in Kholmsk Raion, Sakhalin Oblast, RSFSR. Situated on the western coast of southern Sakhalin Island, along the Sea of Japan (Tatar Strait). Railway station. The city has a cellulose and paper plant, a ship repair plant, a wine and vodka plant, and a milk plant. There is also a fishing kolkhoz in the city. [29–410–2]

CHEKHOV PRINTING COMBINE, the largest printing establishment for periodicals in the USSR, located in the city of Chekhov, Moscow Oblast. Construction was begun in 1959; the first stage began operations in 1966, and the second stage in 1972. In 1975 the Chekhov Printing Combine became the leading enterprise of the production association Periodika. The combine is equipped with modern, high-efficiency facilities and uses advanced technology for letterpress and offset printing and gravure as well as phototypesetting and automatic transfer machines for the production of books and pamphlets. In 1975 the combine printed 235 periodicals of different titles in Russian and in foreign languages, with a daily production of 900,000 copies. Since 1975 it has also printed a large number of hard-cover books and pamphlets. Between 1970 and 1975 production volume increased by 280 percent. The first stage of an automated production control system based on the Minsk-32 digital computer began operation in 1975. [29–410–4]

ČHEKIANG, a province in East China, on the coast of the East China Sea. Area, 100,000 sq km. Population, 30.2 million (1976). The capital is Hangchou.

The topography of Chekiang is largely mountainous, with an average elevation of approximately 1,000 m; the maximum elevation is 1,859 m above sea level. The mountainous regions are dissected by river valleys. There are plains in the northern part of the province, along the seacoast, and in the vicinity of the lake T'ai Hu, and there are many islands just off the jagged coastline. Chekiang has a subtropical monsoon climate. The average January temperature is 5°C, and the average July temperature is 27°C. Annual precipitation generally exceeds 1,000 mm, and typhoons often strike the region. The numerous rivers of Chekiang flow mainly through the mountains; the most important rivers are the Fuch'un Chiang and the Wu (Ou) Chiang. Subtropical forests are found on the slopes of the mountains.

Agriculture dominates the economy of Chekiang, with three-fourths of the economically independent population engaged in agricultural work. One-fourth of the land of the province is under cultivation, and approximately 80 percent of that area is irrigated. Rice is the main crop; sweet potatoes, wheat, and maize are also grown. The province has orchards of subtropical fruits, including citrus fruits. Industrial crops include sugarcane, fine-fiber cotton, and jute. More jute is raised in Chekiang than in any other province of the People's Republic of China; it is cultivated primarily in the vicinity of Hangchou. Fine-fiber cotton is grown on the Ningpo-Shaohsing plain. Chekiang produces more tea than any other Chinese province; tea is grown near the cities of Hangchou, Shaohsing, Suich'uan, and Wenchou. Animal husbandry—including the raising of cattle, swine, sheep, and poultry—is of secondary importance in the province's agriculture. Sericulture, logging, and fishing are also of some importance in the province's economy.

In 1971, Chekiang's industry accounted for 3.5 percent of the gross industrial output of the People's Republic of China. Fluorite, alunite, pyrite, lithographic stone, and iron ore are mined in the province. Chekiang is also a major supplier of salt from evaporated sea water. Electricity is produced primarily by hydroelectric power plants on such rivers as the Hsinan Chiang and the Wu Chiang.

The most highly developed branches of light industry are the processing of silk, jute, and cotton; tea processing is the most highly developed branch of the food-processing industry. The machine-building industry in Chekiang includes shipbuilding and the manufacture of textile machinery, agricultural equipment, and machine tools. The city of Wenchou has a porcelain factory, and Hangchou and Chiahsin have paper factories. The main industrial centers of the province are the cities of Hangchou, Ningpo, and Chiahsin, all of which are located in the northern part of

the province and linked with the Shanghai industrial complex. The seaports of the province are Hangchou, Wenchou, and Chenhai, which is the outport of Ningpo. I. M. FEDOROV

The area that is now Chekiang Province was inhabited in ancient times by Man tribes. From the sixth to fourth centuries B.C., various parts of the area belonged to the Wu, Yüeh, and Ch'u kingdoms. During the fourth through sixth centuries A.D., the area was settled increasingly by Chinese. It was part of the Chiangnan Region in the seventh and eighth centuries and part of Chetung and Chehsi regions in the ninth through 11th centuries. From 1127 to 1179, Hangchou was the capital of the Southern Sung Empire. In the 12th and 13th centuries, the area was part of Chiangche Region. In the 13th century it was linked with Peking by the Grand Canal.

The area received the name "Chekiang" in the 14th century, and in the mid-17th century it was made a province. Chekiang long played an important role in the maritime commerce of China and in the country's fishing and silk industries. After China's defeat in the Anglo-Chinese War of 1840–42 (First Opium War), foreign capital began penetrating the province. From 1860 to 1864 virtually all of Chekiang was under the control of Taiping rebels.

From 1930 to 1934, the western part of Chekiang Province provided a base for the movement to establish soviets, or local centers of revolutionary democratic power. From 1937 to 1945 the province was occupied by the Japanese. In May 1949 the mainland part of Chekiang was liberated from the Kuomintang by the People's Liberation Army of China; the island of Choushan was liberated in May 1950. V. P. ILIUSHECHKIN [29–542–4]

CHEKMAREV, ALEKSANDR PETROVICH. Born Aug. 30 (Sept. 12), 1902, in the village of Bol'shaia Znamenka, in what is now Kamenka-Dneprovskaia Raion, Zaporozh'e Oblast; died Mar. 11, 1975, in Dnepropetrovsk. Soviet scientist; specialist in pressure shaping. Academician of the Academy of Sciences of the USSR (1968). Academician of the Academy of Sciences of the Ukrainian SSR (1948). Hero of Socialist Labor (1972). Member of the CPSU from 1945.

After graduating from the Dnepropetrovsk Mining Institute in 1927, Chekmarev worked as an engineer and as an instructor. He became a professor at the Dnepropetrovsk Metallurgical Institute in 1934. From 1948 to 1975 he was also a staff member at the Institute of Ferrous Metallurgy in Dnepropetrovsk. Chekmarev's principal works were devoted to the theory of metal rolling, the improvement of rolling equipment, and the development of new production processes. Chekmarev received the State Prize of the USSR in 1941 and 1949 and was awarded two Orders of Lenin, five other orders, and various medals.

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CHELEK, an urban-type settlement in Paiaryk Raion, Samarkand Oblast, Uzbek SSR. Chelek is situated 35 km north of Samarkand. It has a cotton-ginning plant. [29–133–1]

CHELEKEN, a city (since 1956) under oblast jurisdiction in Krasnovodsk Oblast, Turkmen SSR. Cheleken is located in the western part of the Cheleken Peninsula, on the Caspian Sea, 70 km south of Krasnovodsk. There are oil and gas fields in the area. Cheleken has a chemical plant that produces iodine, bromine, potassium iodide, and iodoform and a plant that manufactures carbon black. There is an evening division of the Krasnovodsk Chemical Engineering Technicum in Cheleken. [29–133–3]

CHELEKEN, a peninsula on the eastern edge of the Caspian Sea, in the Turkmen SSR. In the 1930's, Cheleken—which had been an island up to that time—was joined to the mainland as a peninsula as a result of the lowering of the level of the Caspian Sea. With an area of approximately 500 sq km, the peninsula is basically flat; elevations reach 100 m. It consists primarily of sands and solonchaks. Oil and ozokerite are extracted on Cheleken, and there is commercial fishing. [29–133–2]

CHELEKEN, IUZHNYI, the northern part of the Turkmen Gulf of the Caspian Sea, off the southern coast of the Cheleken Peninsula. It is separated from the sea by the low-lying Dervish Peninsula and by the Iuzhnyi Cheleken spit. Iuzhnyi Cheleken is approximately 20 km long, 35 km wide, and 5–7 m deep. The port of Aladzha is situated on the bay. [29–133–5]

CHELEKEN, SEVERNYI, the southeastern part of the Krasnovodsk Gulf of the Caspian Sea, off the northern coast of the Cheleken Peninsula. Severnyi Cheleken is separated from the sea by the Severnyi Cheleken spit. It is 20 km long, approximately 25 km wide, and as much as 3.8 m deep. The entrance to the bay is very shallow and inaccessible to ships. [29–133–4]

CHELIABINSK, a city and the administrative center of Cheliabinsk Oblast, RSFSR; an important economic, cultural, and scientific center of the Soviet Union and a major transportation junction. Situated on the eastern slopes of the Southern Urals, on the banks of the Miass River of the Ob' River basin. Area, 486 sq km. Population, 1,007,000 (1977; 20,000 in 1897, 59,000 in 1926, 273,000 in 1939, 689,000 in 1959, 875,000 in 1970). The city is divided into six urban districts.

Cheliabinsk was founded in 1736 as a Russian fortress on the site of the Bashkir settlement of Seliaba (Cheliaba). In 1743 it was designated a city and the capital of the subprovince of Iset'. In early 1774 it was occupied by detachments of E. I. Pugachev. In 1781, Cheliabinsk became a district capital of Ekaterinburg Subprovince, in Perm' (later Ufa) Namestnichestvo (Vicegerency); in 1796 it became the capital of Orenburg Province.

In the 1890's, with the construction of the Trans-Siberian Railroad and a rail line to Ekaterinburg, Cheliabinsk became a major transportation and commercial center, through which grain from Western Siberia was shipped. Industry underwent rapid development. At the beginning of the 20th century the city had several metallurgical plants, 15 tanneries, and three railroad depots; these establishments employed a total of 1,500 workers. In 1896 the Ural Labor Union was organized in Cheliabinsk, and in 1903 a group of the Ural Union of the RSDLP was formed. Soviet power was established in the city on Oct. 26 (Nov. 8), 1917. In May 1918, Cheliabinsk was captured by White Czechs (*see* CZECHOSLOVAK CORPS MUTINY OF 1918). The city was liberated during the Cheliabinsk Operation of 1919.

In the Soviet period Cheliabinsk has become a major industrial and cultural center of the Urals. In 1933 the Cheliabinsk Tractor Works went into operation. The city became the administrative center of Cheliabinsk Oblast in 1934. During the Great Patriotic War of 1941–45 approximately 60 industrial enterprises were evacuated to the city, whose industries produced a wide variety of war matériel.

Cheliabinsk is one of the country's major industrial centers, with ferrous metallurgy, machine building, and food processing constituting the leading industries. The largest plants include the fully integrated Cheliabinsk Metallurgical Plant, the Teplopribor Plant, the Cheliabzhivmash Plant, a zinc refinery, a machine shop, and a watch factory. Other major plants produce steel pipes and pressings, road-construction machinery, machine tools, truck trailers, electric machines, and abrasives. The city's production association for the manufacture of tractors includes a tractor factory and a plant for the production of tractor parts; both turn out tractors for industry and for construction work.

The chemical industry is represented by a paint and varnish plant and a chemical and pharmaceuticals plant. Light industry is represented by a tannery and by spinning and weaving, footwear, and knitwear factories. Enterprises of the food-processing industry include a meat-packing combine, a flour mill, a milk combine, and pasta and confectionary factories. The highly developed building-materials industry includes brickyards and plants for the manufacture of metal structural members, houses assembled from precast panels, and gypsum-plaster products; there are also wood-products combines. The city has several district heat and power plants, and electricity is provided by the Ural Power Grid.

Cheliabinsk is situated at the junction of two railroad trunk lines: the Moscow-Kuibyshev-Ufa-Cheliabinsk-Kurgan-Omsk-Novosibirsk line, which runs from east to west, and the

Polunochnoe–Serov–Nizhnii Tagil–Sverdlovsk–Cheliabinsk–Orsk–Kandagach line, which runs from north to south. An additional line to the Northern Urals passes through Kamensk-Ural'skii. Cheliabinsk is a junction for highways that serve the oblast and republic, and it has an airport. Two pipelines that pass through the city, the Middle Asia–Urals and the Northern Tiumen' Oblast–Urals, supply the city with natural gas.

In the Soviet period Cheliabinsk has been rebuilt and modernized. The city center has grown up around the intersection of two main arteries—Kirov and Lenin streets—and Revolution Square, which has a monument to V. I. Lenin (bronze and granite, 1959, sculptors L. N. Golovnitskii and V. S. Zaikov, architect E. V. Aleksandrov). The downtown area includes the building of the oblast executive committee (1936–37, architects P. V. Kukhtenkov and A. P. Maksimov, engineer D. G. Vinogradov), the building of the oblast committee of the CPSU (1938, architect I. A. Golombek), the M. I. Glinka Theater of Opera and Ballet (1954, architect N. P. Kurennoi), and the Palace of Sports (1967, architects S. D. Filimonov, V. N. Malyshev, and T. M. Erval'd, engineer V. V. Korzhevskii). Of particular interest is the monument to the Komsomol heroes of the October Revolution and the Civil War in the Urals, entitled *Young Eagle* (bronze and granite, 1958, sculptor L. N. Golovnitskii, architect E. V. Aleksandrov).

Housing construction, which is being carried out on a large scale, has resulted in numerous *mikroraions* (basic units in city planning), including those along Gorky Street (1958–59, architects T. N. Druzhinina and others) and along Salute and Turist streets (1963–76, architects E. V. Aleksandrov and others). Large public buildings have been constructed, including a trade center (1975, architects F. Kh. Selitskii, V. I. Zhdanovskaia, and L. A. Ragozin), a complex of residential buildings and shops on Lenin Prospect (1975, architects B. V. Petrov, I. V. Talalai, and B. A. Baranov), and the complex that comprises the house of political education, the archives of the oblast committee of the CPSU, and a headquarters of the central district committee of the CPSU (1975, architect I. V. Talalai).

In addition to a university, Cheliabinsk has a polytechnic institute, an institute of the mechanization and electrification of agriculture, and institutes of medicine, physical culture, pedagogy, and culture. The city also has numerous scientific research and design institutes, the largest of which include Cheliabgiprotiazhmash and Cheliabgipromez, and 22 secondary specialized educational institutions.

In 1903 a theater, the People's House, was built in Cheliabinsk; performances were staged primarily by amateur companies. In 1976 the city's cultural institutions included the S. Tsvilling Cheliabinsk Drama Theater; the M. I. Glinka Cheliabinsk Theater of Opera and Ballet, which had moved from its old building; the Puppet Theater (founded 1935); the Young People's Theater (founded 1965); and a philharmonic society, which has its own concert hall. The city has a museum of local lore and an art gallery.

As of Jan. 1, 1977, Cheliabinsk had 50 hospitals, with a total of 14,600 beds (14.2 beds per 1,000 inhabitants). By contrast, in 1913 it had 4 hospitals, with a total of 175 beds (2.8 beds per 1,000 inhabitants), and in 1940 it had 15 hospitals, with a total of 2,700 beds (9.7 beds per 1,000 inhabitants). As of Jan. 1, 1977, there were 5,200 physicians, or one physician per 198 inhabitants, as opposed to 14 physicians (one per 4,400 inhabitants) in 1913 and 400 physicians (one per 686 inhabitants) in 1940. The city also had 11,700 secondary medical personnel in 1977, as opposed to 1,400 in 1940. Cheliabinsk has 487 preschool institutions, and eight childrens' sanitoriums are located within the city limits.

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Cheliabinsk: Proshloe, nastoiashchee, budushchee. Cheliabinsk, 1971. (Contains a list of suggested reading.) [29–157–2]

CHELIABINSK, UNIVERSITY OF, a university founded in 1974. In 1980 the university comprised departments of history, philology, physics, mathematics, and economics. The University of Cheliabinsk has 1,626 students. [29–169–1; updated]

CHELIABINSK DRAMA THEATER (full name, S. Tsvilling Cheliabinsk Drama Theater), a theater in the city of Cheliabinsk.

Before the October Revolution of 1917 performances in Cheliabinsk were staged, primarily by amateur companies, in a room of the People's House, which had been established in 1903. In 1920 an "agitational and demonstration troupe to aid the front" was formed as part of the political section of the Fifth Army. The actress and playwright L. N. Seifullina and the playwright V. P. Pravdukhin began their careers in the troupe, which staged their plays *Egorkin's Life* and *The New Schoolteacher*. On Oct. 21, 1922, the newly equipped theater of the People's House officially opened its doors. The finest productions of the late 1920's and early 1930's included Trenev's *Liubov' Iarovaia* (1927), Bill'-Belotserkovskii's *The Gale* (1927), Faiko's *Man With a Briefcase* (1928), Kirshon's *The Rails Are Humming* (1928), V. Ivanov's *Armored Train 14–69* (1929), and Romashov's *The Fiery Bridge* (1930).

In the 1930's Cheliabinsk developed into a major industrial center. The theater added to its repertoire plays that dealt with heroes of large construction projects, especially projects in the Urals; the new plays included Pogodin's *Tempo* and *My Friend*, Bezymenskii's *The Shot*, and Afinogenov's *The Eccentric*. Notable actors of this period were E. I. Ageev, S. P. Vadova, P. A. Garianov, M. V. Kochubei, and E. O. Preis.

An important place in the theater's repertoire was occupied by plays about V. I. Lenin, such as Pogodin's *Man With a Gun* (1938), *The Kremlin Chimes* (1940), and *Third Pathétique* (1959); *The Bolshevik*, by Del' (1940); Popov's *The Family* (1965); and Shtein's *Between Downpours* (1966). During the Great Patriotic War of 1941–45, the theater staged Simonov's *The Russian People*, Leonov's *Invasion*, and Korneichuk's *Partisans in the Ukrainian Steppes*. In the 1950's and 1960's the theater often turned to classical Russian and Soviet plays, for example, Trenev's *Liubov' Iarovaia*, Chekhov's *The Three Sisters*, an adaptation of L. N. Tolstoy's *Anna Karenina*, and Mayakovsky's *The Bedbug*.

Productions of the 1970's included Salynskii's *Mariia* (1970), an adaptation of Dostoevsky's novella *The Village of Stepanchikovo* (1971), Vasil'ev's *The Final Day* (1971), Dvoretskii's *The Man From the Outside* (1972), Bokarev's *The Steelworkers* (1973), and Simonov's *The Russian People* (1975). Members of the theater's company include Honored Artist of the RSFSR L. I. Varfolomeev, T. O. Zolotarev, O. V. Klimova, V. Ia. Konoplianskii, P. I. Kuleshov, and V. I. Miloserdov. In 1975, Honored Art Worker of the Tatar ASSR N. Iu. Orlov became principal director of the Cheliabinsk Drama Theater. [29–166–1]

CHELIABINSK METALLURGICAL PLANT, a leading fully integrated enterprise of the USSR for the production of quality steels. Located in the city of Cheliabinsk, the plant specializes in the production of sheets and standardized rolled products; steel for ball bearings; and stainless, structural, and transformer steels. The plant also manufactures coke by-products, products obtained from the processing of metallurgical slags, and consumer goods.

Construction of the Cheliabinsk Metallurgical Plant began during the Great Patriotic War of 1941–45, and the first metallurgical unit began operating in 1943. The plant has high-output metallurgical equipment and makes extensive use of the latest production processes. On several occasions it has occupied first place in socialist competition with other enterprises of its branch of industry. The plant was awarded the Order of the October Revolution in 1976 and the Order of the Red Banner of Labor in 1966.

O. A. Labunovich [29–167–1]

CHELIABINSK OBLAST, part of the RSFSR. Formed on Jan. 17, 1934. Area, 87,900 sq km. Population, 3,403,000 (1977). Cheliabinsk Oblast is divided into 24 administrative districts and has 27 cities and 25 urban-type settlements. The administrative center is the city of Cheliabinsk. The oblast was twice awarded the Order of Lenin, on Oct. 23, 1956, and on Dec. 4, 1970.

Natural features. Most of the oblast lies on the eastern slopes of the Southern Urals and in the adjacent territories of the Trans-Ural Plain. In the northwest, which includes some of the moun-

tain ranges of the Urals, the oblast reaches its highest elevation, at Mount Nurgush (1,406 m). Cheliabinsk Oblast may be divided into two topographic areas: the western region has ridges and a hilly terrain, with an average elevation of 300–500 m; the eastern plain has numerous *zapadinas* (flat-bottom step depressions) and gently sloping parallel ridges (elevations of approximately 20 m) separated by depressions. The central part of the oblast is hilly, with elevations of approximately 100–200 m.

Cheliabinsk Oblast has a continental climate, with long, cold winters. The average January temperature ranges from −15°C in the northwest to −17°C in the southeast. Summers are warm or, in the southeast, hot. The average July temperature is 16°C in the northwest and 18°C in the southeast. The growing season lasts 130 days in the northwest and 150 days in the southeast. Annual precipitation ranges from 600 mm in the mountains to 350 mm in the plains; the greatest amount of precipitation falls in summer. The oblast's rivers, the largest of which are the Ural and the Miass, are capable of producing 0.3 gigawatt of hydroelectric power. The Verkhneural'sk, Cheliabinsk-Argazi, and Shershni reservoirs have been built to supply water to Magnitogorsk. The oblast has numerous freshwater and saltwater lakes, the largest being Uvil'dy, Irtiash, Turgoiak, Bol'shie Kasli, and Chebarkul'.

The predominant soils are typical and highly leached chernozems; gray-forest, mountain-forest gray, and meadow-chernozem soils are also found. More than one-fourth of the oblast is forested, with total timber reserves of 185 million cu m. Pine forests and forests of aspen and birch are found in the north. Most of the central part of the oblast is forest-steppe; the south is predominantly forb and grass steppe. The mountains have spruce and fir forests with an admixture of pine, larch, linden, and oak.

Fauna is represented primarily by forest and steppe animals, including such mammals as the elk, fox, wolf, blue hare, and squirrel. The most common birds are ducks, geese, grouse, willow ptarmigan, and hazel hens. The V. I. Lenin Il'men Preserve is located in the oblast.

Population. According to the 1970 census, Russians constitute approximately 81 percent of the oblast's population, with the remaining 19 percent made up of various peoples, including Tatars, Ukrainians, and Bashkirs. The average population density is 38.7 persons per sq km; 82 percent of the population is urban. The oblast's principal cities are Cheliabinsk, Zlatoust, Kopeisk, Korkino, Magnitogorsk, Miass, and Troitsk.

Economy. Cheliabinsk Oblast is one of the most highly industrialized areas in the USSR. Most of the economy's output comes from industry, principally heavy industry. The main industrial branches are ferrous and nonferrous metallurgy, machine building, metalworking, and the chemical industry. Power engineering is only partly based on local fuel, which comes from the Cheliabinsk Coalfield (brown coal). A variety of fuels are shipped into the oblast, such as coking coals from the Kuznetsk and Karaganda coal basins, power-generating coal from the Ekibastuz Coalfield, natural gas from Western Siberia, and petroleum products from other oblasts in the Urals, from the Volga Region, and from Western Siberia. The electric power industry of the oblast forms part of the Ural Power Grid. Most of the electric power is generated at local electric power plants, such as the Iuzhno-Uralsk and Troitsk state regional electric power plants and the fossil-fuel–fired steam power plants at Magnitogorsk, Cheliabinsk, and Argaiash.

The main enterprises of ferrous metallurgy are the V. I. Lenin Magnitogorsk Metallurgical Combine, the Magnitogorsk Sizing Plant, and the Magnitogorsk Hardware and Metallurgical Plant. Other large enterprises are metallurgical, pipe-rolling, and ferroalloys plants in Cheliabinsk and metallurgical plants in Zlatoust, Asha, and Chebarkul'. Refractories are produced at the Magnezit Plant in Satka. Nonferrous metallurgy includes the Karabash Copper-smelting Combine, the Verkhnii Ufalei Nickel Combine, and the Cheliabinsk Electrolytic Zinc Refinery.

Mining is represented by the extraction of iron ore (the Bakal, Magnitogorsk, and Zlatoust iron ore deposits), magnesite (the Satka group of deposits), graphite (the Taiginka deposit), brown coal (the Cheliabinsk Coalfield), and refractory clays (the Nizhneuvel'skoe deposit). Other major industrial branches are the transportation industry, which produces tractors and motor vehicles, and agricultural machine building; the oblast also produces construction and highway machinery and machinery for the mining industry. The machine-tool and instrument-making industries are highly developed. Major enterprises are the Cheliabinsk Tractor Works, the Urals Automotive Plant (Miass), the Kopeisk Machine-building Plant, and the Koliushchenko Cheliabinsk Plant, which manufactures road-paving machinery.

The chemical industry, which is concentrated in Cheliabinsk, Magnitogorsk, and Kyshtym, is integrated with ferrous and nonferrous metallurgy. The principal centers of the building-materials industry are Cheliabinsk, Magnitogorsk, and Korkino. The principal enterprises of light industry and the food-processing industry are located in the large cities; there are meat-packing plants, butter factories, leather-processing enterprises, garment factories, knitwear factories, and enterprises for the production of animal fats. The oblast is known for the artistic cast-iron articles produced at Kasli and Kusa, the engraved metal articles produced in Zlatoust, and watches.

In 1976, Cheliabinsk Oblast produced 31.2 billion kilowatt-hours of electricity, 5,000 metalcutting machine tools, 135 million standard slate tiles, 12.6 million pairs of leather footwear, and more than 214,000 radios.

The oblast's large-scale, mechanized agriculture is oriented toward animal husbandry and the cultivation of grains. Near the main industrial centers (Cheliabinsk and Magnitogorsk), agriculture specializes in supplying the urban market. In 1976 the oblast had 163 sovkhozes and 64 kolkhozes. Of the 5 million hectares (ha) of agricultural lands (56 percent of the oblast's territory), plowland occupies 3.2 million ha, hayfields 0.6 million ha, and pastureland 1.2 million ha. In 1976 the total sown area was 2.9 million ha, of which 1,828,000 ha were sown to grains and leguminous crops, including spring wheat (1,160,000 ha), feed crops (1,007,000 ha), potatoes (68,000 ha), and melons and gourds (12,300 ha).

Livestock is raised primarily for dairy products and meat. At the beginning of 1977 the livestock population included 1,114,000 cattle (of which 40 percent were cows), 773,000 sheep and goats, 382,000 swine, and 8,295,000 poultry. In 1978 several livestock-raising complexes, including the Uvel'skii Complex, were being constructed for the production of meat on an industrialized basis.

In 1976 the oblast had 1,800 km of railroad lines. The principal east-west lines are Ufa-Cheliabinsk-Kurgan and Beloretsk-Magnitogorsk-Kartaly-Tobol. Of major importance is the Orsk-Kartaly-Troitsk-Cheliabinsk-Sverdlovsk line, which runs from north to south. Motor-vehicle transportation is also highly developed: in 1976 there were 6,100 km of hard-surface roads. The main highways are Ufa-Asha-Miass-Cheliabinsk-Kurgan and Troitsk-Cheliabinsk-Sverdlovsk. The oblast is served by a network of transit petroleum and natural-gas pipelines and by air transportation.

Internal differences. Cheliabinsk Raion is the oblast's most densely populated and industrialized region, with numerous enterprises of heavy industry. Of particular note are the Cheliabinsk, Miass, Zlatoust, and Troitsk industrial complexes. Agriculture is oriented toward production for the urban market.

Magnitogorsk Raion is highly industrialized and contains most of the oblast's metallurgical enterprises. Agriculture is oriented toward animal husbandry and the cultivation of grains.

O. A. KIBAL'CHICH

Education, cultural affairs, and public health. In the 1914–15 academic year Cheliabinsk Oblast had 809 general-education schools, with 59,400 students; three specialized secondary educational institutions, with 173 students; and no higher educational institutions. In the 1976–77 academic year there were 1,513 general-education schools of all types, with more than 542,000 students; 127 vocational-technical schools, with 69,900 students; and 70 secondary specialized educational institutions, with more than 77,000 students. In that year 57,600 students were enrolled in the oblast's ten higher educational institutions, which include the Cheliabinsk Polytechnic Institute, the Cheliabinsk Institute of the Mechanization and Electrification of Agriculture, the Cheliabinsk Medical Institute, the Cheliabinsk and Magnitogorsk pedagogical institutes, the Magnitogorsk Institute of Ore Mining and Metallurgy, and the Troitsk Veterinary Institute.

Dozens of scientific institutions are located in the oblast, in-

cluding the Urals Branch of the F. E. Dzerzhinskii All-Union Scientific Research Heat Engineering Institute, the Scientific Research and Design Institute of the Opencut Mining of Minerals, and the All-Union Scientific Research Institute of Labor Protection and Accident Prevention in Ferrous Metallurgy.

In 1976, 209,000 children were enrolled in 1,976 preschool institutions. There were 976 public libraries, with more than 22 million copies of books and periodicals. The oblast's 13 museums are the oblast art gallery and oblast museum of local lore in Cheliabinsk; museums of local lore in Troitsk, Miass, Satka, Zlatoust, Verkhneural'sk, Magnitogorsk, and the village of Uiskoe; the Museum of the Il'men Preserve in Miass; the Museum of Artistic Casting in Kasli; the Museum of the History of Varna Raion in Varna; and a branch of the Cheliabinsk Oblast Museum of Local Lore in Kopeisk.

The oblast's seven theaters are a theater of opera and ballet, a drama theater, a young people's theater, and an oblast puppet theater, all in Cheliabinsk; a drama theater and puppet theater in Magnitogorsk; and a drama theater in Zlatoust. Cheliabinsk Oblast has 1,267 clubs, 1,532 stationary motion-picture projection units, and 50 extracurricular institutions.

The two oblast-level newspapers are *Cheliabinskii rabochii*, published since 1917, and *Komsomolets*, published since 1931. Three programs of All-Union Radio are broadcast for a total of 58 hours daily and are supplemented by oblast broadcasts for 2.5 hours daily. The television program *East* is transmitted for 12.9 hours daily, and local television programs are carried for 3.5 hours daily.

As of Jan. 1, 1977, Cheliabinsk Oblast had 284 hospitals, with 45,300 beds, or 13.3 beds per 1,000 inhabitants; there were 9,900 physicians, or one physician per 343 inhabitants. The climatic and balneological health resorts of Kisegach and Uvil'dy are located in the oblast, and Troitsk Raion offers climatic and koumiss therapy. The oblast has 30 sanatoriums, as well as houses of rest and a boarding hotel.

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CHELIABINSK OPERATION OF 1919, combat actions by Soviet forces of the Eastern Front carried out between July 17 and August 4 against Admiral A. V. Kolchak's White Guard troops during the Civil War of 1918–20.

Having captured Zlatoust and Ekaterinburg, the troops of the Eastern Front (commander, M. V. Frunze; members of the revolutionary military council, M. M. Lashevich, K. K. Iurenev, and N. I. Muralov) mounted an offensive moving the First and Fourth armies to the south and southeast, and the Third and Fifth armies to the east. M. N. Tukhachevskii's Fifth Army (approximately 32,000 foot soldiers and cavalry), while continuing to pursue the enemy, was to capture the areas near Cheliabinsk and Troitsk, drive the enemy south of the Trans-Siberian Railroad, and reach the Tobol River between Kustanai and Ikovskaia. The Fifth Army was opposed by General K. V. Sakharov's Western Army of White Guards (approximately 27,500 foot soldiers and cavalry), which in July had been renamed the Third Army.

The White Guard command, attempting to capitalize on the somewhat exposed position of the Soviet Fifth Army, planned a series of flank attacks west of Cheliabinsk designed to annihilate the Soviet force. Two assault groups were formed for this task: the assault group of General S. N. Voitsekhovskii, north of Cheliabinsk (approximately 16,000 foot soldiers and cavalry), and the assault group of General V. O. Kappel', south of Cheliabinsk (approximately 10,000 foot soldiers and cavalry).

The Fifth Army, pursuing the enemy, reached Cheliabinsk, and on July 24 the army's 27th Rifle Division, aided by insurgent workers, captured the city. Voitsekhovskii moved to the offensive on July 25, and Kappel' on July 27. Heavy defensive fighting ensued. Northwest of Cheliabinsk the enemy was able to push back the 35th Rifle Division and break through between it and the 27th Rifle Division. The White Guards were unable to penetrate the front from the south owing to the unwavering defense of the 26th Rifle Division, which repulsed all attacks by the troops under Kappel'.

The command of the Fifth Army then executed a bold countermaneuver: the 27th Division, reinforced by reserves and workers' detachments from Cheliabinsk, ignored the threat from the flanks and struck at the left flank of the northern group of White Guard forces. In bitter fighting, the Soviet troops regained the initiative and threatened to encircle the White Guard troops northwest of Cheliabinsk. On July 29 the Fifth Army mounted a final offensive. At the same time, the command of the Eastern Front ordered the 21st Rifle Division of the Third Army to proceed in a forced march to the Trans-Siberian Railroad near the Shumikha station and cut off the sole line of communications of the White Guards. Kolchak's troops, routed near Cheliabinsk, retreated in panic beyond the Tobol River. On August 4, units of the 24th Rifle Division liberated Troitsk.

The Cheliabinsk Operation completed the liberation of the Urals by the Red Army, which was now assured of access to Siberia. Kolchak's forces were split into two groups, which were unable to communicate with one another: an eastern group, comprising the First and Third armies, and a southern group, comprising the Second Army. On August 15, Soviet troops reached the Tobol River.

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S. D. GUSAREVICH [29–165–1]

CHELIABINSK POLYTECHNIC INSTITUTE (full name, Lenin Komsomol Cheliabinsk Polytechnic Institute), one of the largest higher technical-education institutions in the USSR. Founded in 1943 as an institute of mechanics and machine building, it was reorganized as a polytechnic institute in 1951. In 1968 the institute was given the name "Lenin Komsomol."

As of 1977, the Cheliabinsk Polytechnic Institute comprised departments of metallurgy, machine technology, automated machinery, motor vehicles and tractors, engines, instruments and automation, construction engineering, instrument-making, electric power, and industrial and civil construction. The institute has a branch in the city of Zlatoust and nine evening departments and divisions, five of which are located in the cities of Miass, Kopeisk, and Kyshtym, at the Cheliabinsk Tractor Plant, and at the Cheliabinsk Metallurgical Plant. There is a correspondence department, a preparatory division for workers, and a graduate program.

The institute has 76 subdepartments, a scientific computer center, two student computer centers, and a scientific research section that includes one special-problems laboratory, nine laboratories for research connected with branches of the national economy, and a student bureau of design. There are five specialized councils for the defense of doctoral and candidate's dissertations. The research library contains 1.3 million volumes.

In the 1976–77 academic year enrollment at the Cheliabinsk Polytechnic Institute was approximately 21,000, and there were more than 2,300 instructors and research workers, including one academician of the Academy of Sciences of the USSR, 34 professors and doctors of sciences, and 560 docents and candidates of sciences. Since its founding, the institute has trained more than 45,000 engineers.

V. V. MEL'NIKOV [29–167–2]

CHELIABINSK THEATER OF OPERA AND BALLET (full name, M. I. Glinka Cheliabinsk Theater of Opera and Ballet), a theater founded in 1956. Construction of the theater building, which seats 1,205, was completed in 1955 (architect N. P. Kurennoi). In 1956 the theater was named in honor of M. I. Glinka. The principal members of the opera company are students in

their final year at musical educational institutions; last-year students at the Leningrad and Moscow schools of choreography make up the nucleus of the ballet troupe.

The theater's repertoire includes works by Russian and Western European composers, with the works of Soviet composers occupying an important place. The theater has staged such Soviet operas as Shantyr's *City of Youth* (1957), Spadavecchia's *The Gadfly* (1959), Magidenko's *The Path of Thunder* (1961), and Meitus' *Stolen Happiness* (1962). Ballets staged at the theater include Asaf'ev's *The Fountain of Bakhchisarai* (1956), Morozov's *Doctor Ouch-It-Hurts* (1957), Iarullin's *Shurale* (1959), *The Flower of Happiness* by Mushel' (1959), Prokofiev's *The Stone Flower* (1960) and *Romeo and Juliet* (1963), Biriukov's *The Last Ball* (1961), and Laptunin's *Masquerade* (1962). The Cheliabinsk Theater of Opera and Ballet was the first in the USSR to produce B. Smetana's opera *The Brandenburgers in Bohemia* (1963).

Numerous artists, who have been associated with the theater at various times, have contributed to the development of the Cheliabinsk Theater of Opera and Ballet; these include the conductor I. A. Zak (1955–68), the stage directors D. N. Smolich and N. K. Dautov, the singer V. A. Dikopol'skaia, and the principal dancers V. M. Postnikov, L. S. Ratenko, and M. Ia. Shchukin.

The theater's finest opera productions since the mid-1960's have been Meyerbeer's *The Huguenots* (1964), Shantyr's *The Two Captains* (1965), Moussorgsky's *Boris Godunov* (1965), Dargomyzhskii's *The Stone Guest* (1966), Verdi's *Don Carlos* (1966), Katsman's *Liubava* (1967), Tchaikovsky's *Mazepa* (1969), Dzerzhinskii's *The Quiet Don* (1970), Glinka's *Ivan Susanin* (1970), Bizet's *Carmen* (1973), Verdi's *Un Ballo in maschera* (1974), Molchanov's *The Dawns Here Are Quiet* (1975), Rimsky-Korsakov's *Mozart and Salieri* (1975), and Smetana's *The Bartered Bride* (1976).

Outstanding ballets from this period are *Peer Gynt* (1964; music by Grieg), Prokofiev's *Cinderella* (1965), Melikov's *The Legend of Love* (1968), Vlasov's *Asel'* (1969), Pugni's *La Esmeralda* (1972), Khachaturian's *Spartacus* (1974), and Adam's *Giselle* (1976).

In 1976 the theater's company included the following singers: Honored Artist of the RSFSR V. Ia. Agafonov, Iu. M. Gorbunov, V. I. Drozdova, V. Ia. Kurochkin, N. I. Shaidarova; and actors V. D. Grichenko, Iu. P. Morozov, and K. I. Sidorova. Dancers included People's Artist of the RSFSR G. M. Boreiko, V. A. Dmitriev, E. M. Popov, and I. D. Sarametova. The principal conductor is V. M. Vasil'ev, the principal stage director is G. S. Miller, the principal choreographer is V. N. Butrimovich, the principal chorus master is V. M. Tolstov, and the principal stage designer is Ia. Z. Korsunskii.

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E. I. MARGINA [29–167–3]

CHELIABINSK TRACTOR WORKS (full name, V. I. Lenin Cheliabinsk Tractor Works), a major enterprise of the tractor-building and agricultural machine-building industries of the USSR that manufactures crawler tractors. Located in the city of Cheliabinsk, the works began operating in 1933 and until 1937 turned out S-60 tractors equipped with a 60-hp ligroin engine. In 1937, after retooling, it began producing the first diesel tractors in the USSR, with a 65-hp engine.

During the Great Patriotic War of 1941–45, the works was modified for the production-line manufacture and conveyer assembly of tanks. It produced various types of tanks, self-propelled guns (SPG), diesel tank engines, and semifinished parts for ammunition and supplied the front with the KV, IS, T-34, and SPG combat vehicles. After the war the works manufactured the 92-hp S-80 tractor until 1958 and the 100-hp S-100 tractor until 1963, when it began producing the 108-hp T-100M tractor and its modified versions: a swamp tractor for land reclamation work and hydraulic industrial and farm tractors. In 1961 the works began producing the 310-hp DET-250 diesel-electric tractors. The Cheliabinsk Tractor Works produces general-purpose tractors that operate with 120 trailer-type or toolbar-mounted implements; 90 percent of the tractors are supplied to industry.

The shops of the works are equipped with special unit-head machine tools, mechanized production lines, and automatic transfer machines. In 1970 general retooling began for the lot production of the 160-hp T-130 tractor. In the 1970's the works manufactured the standardized T-330 and T-500 industrial tractors, with 330-hp and 500-hp engines, respectively. In 1971 the V. I. Lenin Cheliabinsk Tractor Works Production Association was created; in addition to the main works, it includes four branch plants.

The Cheliabinsk Tractor Works exports to 70 countries, and its tractors won the Grand Prix at the Paris Exposition of 1937 and gold medals at international expositions at Leipzig in 1965 and Moscow in 1966. The works was awarded the Order of Lenin in 1970, the Order of Kutuzov First Class in 1945, and the Order of the Red Star in 1944. The pilot plant (now the pilot-production shop) at the works and the diesel design bureau (now the section of the chief diesel designer) were awarded the Order of Lenin in 1944 and 1945.
G. V. ZAICHENKO [29–168–1]

CHELIAD', a term used to designate the whole or a part of the Russian dependent population from about the sixth to 19th centuries.

From about the sixth to ninth centuries, the term referred to enslaved prisoners of war who lived and worked in their masters' households. In Kievan Rus' it was applied to the dependent population in general; in the ninth and tenth centuries, *cheliad'* became subject to purchase and sale. In the 11th century the term came to refer to that part of the dependent population employed in the feudal economy. In the 18th and 19th centuries, the landowners' domestic serfs were called *cheliad'*.

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[29–169–3]

CHELIDONIUM (celandine), a genus of herbaceous plants of the family Papaveraceae. There is a single species, *Chelidonium majus*, a perennial with bright orange milky sap. The leaves are deeply pinnatifid, and the tetramerous flowers are gathered in umbels. The fruit is a pod-like capsule.

The plant grows in the subtropical and temperate climates of the northern hemisphere. It is widespread throughout the USSR except in the northern regions and in Middle Asia. The plant grows in damp ravines, in undergrowth, in timber-felling areas, and in deciduous forests. Most commonly it occurs as a weed in parks, gardens, pastures, and weed-infested areas. A poisonous plant, it contains chelidonine and other alkaloids. There have been cases of celandine poisonings of goats and hogs. The sap is used externally to eliminate warts and to treat ulcers, wounds, and certain skin diseases. Tinctures from the grass act as bile-expelling agents.

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[29–644–5]

CHELIDZE, OTAR SILOVANOVICH. Born Sept. 8, 1925, in Tbilisi. Soviet Georgian poet. Member of the CPSU since 1958.

The son of a worker, Chelidze graduated from the department of philosophy of the University of Tbilisi in 1950 and studied at the M. Gorky Institute of Literature from 1950 to 1954. His work was first published in 1943. Chelidze's lyric epic ballads and narrative poems continue the traditions of the classical Georgian epos and occupy an important place in Georgian poetry. He has translated A. S. Pushkin's *Eugene Onegin* and A. T. Tvardovskii's *Vasilii Terkin* and *Distance Beyond Distance* into Georgian. Chelidze has been awarded the Order of the Red Banner of Labor and the Order of the Badge of Honor.

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CHELIEV, EGOR GERASIMOVICH. Born 1771; died circa 1839. Russian builder.

In his youth, Cheliev worked as a land surveyor in Saratov. Around 1801 he went to live in Moscow, where he helped plan and rebuild the city after the fire of 1812. He invented a hydraulic binder having properties similar to those of portland cement. In 1825, Cheliev published *Complete Instructions on the Preparation of a Cheap and Superior Mortar or Cement of Great Strength for Underwater Constructions*, in which he described the composition and method of preparation of the cement. [29–134–1]

CHÉLIFF (Oued Chéliff), the largest river in Algeria, North Africa. The Chéliff is 700 km long, as measured from the source of its farthest tributary, the Oued Touil (Oued Sebgag), and drains an area of approximately 35,000 sq km. It originates on the northern slopes of the Djebel Amour of the Saharan Atlas. Crossing a rock desert, the upper course of the Chéliff carries little water and dries up in places in the summer. Farther downstream, the river turns west and flows through a broad, well-developed alluvial valley before emptying into the Mediterranean Sea. Water levels are high in the winter, with the occurrence of sometimes disastrous freshets and a flow rate that can exceed 4,000–5,000 cu m per sec. The high water levels of winter are followed by a period of very low water, during which the flow rate may drop to several hundred or even tens of cubic meters per second. The Ghrib Reservoir and a hydroelectric power plant are on the Chéliff, whose waters are used extensively for irrigation. [29–1102–2]

CHELINTSEV, VLADIMIR VASIL'EVICH. Born Feb. 10 (22), 1877, in Saratov; died there Apr. 3, 1947. Soviet organic chemist. Corresponding member of the Academy of Sciences of the USSR (1933).

Chelintsev became a professor at Moscow University in 1910 and at the University of Saratov in 1917. His principal works dealt with heterocyclic and organomagnesium compounds. He isolated individual organomagnesium compounds, and in 1904 he showed that ether and tertiary amines catalyze the Grignard reaction. He proposed methods for synthesizing a number of derivatives of pyrrole, α-keto acids, and unsaturated ketones. Chelintsev also developed methods for detecting small amounts of such compounds as acetone, furfural, formaldehyde, and acetaldehyde.

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CHELIUSKIN, SEMEN IVANOVICH. Born circa 1700; died sometime after 1760. Russian arctic explorer; naval officer.

The son of a nobleman who held a small *pomest'e* (fief) in Kaluga Province, Cheliuskin enrolled in the School of Mathematical and Navigational Sciences in Moscow in 1714 and became a navigator's assistant in the Baltic Fleet in 1726. He was promoted to navigator in 1733 and assigned to the Second Kamchatka (Great Northern) Expedition, with which he remained until 1743. Cheliuskin worked in detachments led by V. V. Pronchishchev and Kh. P. Laptev.

In the spring of 1741, Cheliuskin journeyed overland from the Khatanga River to the Piasina River, charting the western shore of the Taimyr Peninsula as far as the Gulf of Middendorf. He then traveled from the mouth of the Piasina to the mouth of the Enisei. In the winter of 1741–42, journeying from Turukhansk to the mouth of the Khatanga, Cheliuskin charted the northern coastline of the Taimyr Peninsula from the Cape of Faddei in the east to the mouth of the Taimyr River in the west. En route he discovered the northernmost point of Asia, which in 1843 A. F. Middendorf named Cape Cheliuskin, in his honor. Cheliuskin was discharged from the Baltic Fleet in 1760 with the rank of captain third class.

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V. A. TROITSKII [29–154–2]

CHELIUSKIN, a Soviet steamship with a displacement of 7,500 tons, built in Denmark in 1933 and named in honor of S. I. Cheliuskin.

The *Cheliuskin* set out in 1933 to make a voyage from Murmansk to Vladivostok by way of the Northern Sea Route during one navigation season. The head of the expedition was O. Iu. Shmidt, and the captain of the ship was V. I. Voronin; 111 persons sailed on the voyage. After becoming ice-bound in the Bering Strait, the *Cheliuskin* was carried into the Chukchi Sea, where it was crushed by the ice and sank on Feb. 13, 1934. In a rescue that concluded on April 13, the members of the expedition were taken from the ice to Cape Vankarem on the mainland. Their rescuers, Soviet pilots A. V. Liapidevskii, S. S. Levanevskii, V. S. Molokov, N. P. Kamanin, M. T. Slepnev, M. V. Vodop'ianov, and I. V. Doronin, were the first to be honored with the title Hero of the Soviet Union. [29–154–3]

CHELIUSKIN, CAPE, the northernmost point of the Taimyr Peninsula and continental Asia (77°43′ N lat. and 104°18′ E long.). It was first reached by S. I. Cheliuskin in May 1742. [29–154–4]

CHELKAR, a city and the administrative center of Chelkar Raion, Aktiubinsk Oblast, Kazakh SSR. Chelkar has a railroad station on the Orenburg-Tashkent line, 363 km southeast of Aktiubinsk. The city has railroad transport enterprises and a butter factory. [29–134–4]

CHELLEAN CULTURE (also Abbevillian culture), a Lower Paleolithic archaeological culture widespread in Europe, Africa, Southwest Asia, and southern Asia 300,000 to 700,000 years ago. The Chellean culture, which replaced the Olduvai (pre-Chellean) culture, was identified in the 1860's by G. de Mortillet from the finds at Chelles, near Paris. Primitive implements are characteristic, including *coup de poings*, crude chopping tools (choppers), axe-like implements with a lateral cutting edge (cleavers), thick stone flakes (usually with trimmed edges), and spherical and cubic cores. The physical type of the inhabitants was Archanthropinae, including *Pithecanthropus* and *Sinanthropus*. Chellean man settled in open stations or in caves and engaged in hunting and gathering.

The Chellean culture belongs to the initial stage of the primitive communal system. It was replaced by Acheulean culture.

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CHELNOKOV, NIKOLAI VASIL'EVICH. Born Apr. 26 (May 9), 1906, in Irkutsk; died July 16, 1974, in Moscow. Twice Hero of the Soviet Union (June 14, 1942, and Aug. 19, 1944). Major general of aviation (1949). Member of the CPSU from 1940.

Chelnokov joined the Red Army in 1928. He graduated from the Sevastopol' School for Naval Pilots in 1931, academic courses at the Naval Academy in 1945, and the K. E. Voroshilov Higher Military Academy in 1949. He was a flight commander during the Soviet-Finnish War of 1939–40. During the Great Patriotic War of 1941–45, Chelnokov served as a squadron commander and as the deputy commander and, beginning in August 1942, commander of the 1st Guards Mine and Torpedo Air Regiment of the

Baltic Fleet. He commanded the 8th Guards Ground-attack Regiment of the Black Sea Fleet from June to August 1943, reassuming the post in December. From August to October 1944 he was the commander of the 9th Ground-attack Air Division of the Baltic Fleet. Chelnokov himself flew more than 270 missions.

After the war, Chelnokov served in command and staff capacities and held a teaching position, leaving active duty for the reserves in 1954. He was a deputy to the second convocation of the Supreme Soviet of the USSR and was awarded three Orders of Lenin, four Orders of the Red Banner, the Order of Ushakov Second Class, the Order of the Red Star, the Order of the Badge of Honor, and various medals. A bust of Chelnokov stands in Leningrad. [29–136–4]

CHELO. (1) In Russian, an archaic term for *lob* ("forehead"); the phrase *bit' chelom* (literally, "to beat with the forehead") means to bow deeply (as if all the way to the ground).

(2) The front part of a traditional Russian stove. [29–137–2]

CHELOBITNYE (also *chelobit'ia*), in Russia of the 15th to early 18th centuries, written addresses—particularly requests, complaints, or denunciations—submitted to central and local government institutions by individuals and by groups of, for example, *dvoriane* (nobles), *posadskie liudi* (merchants and artisans), or peasants. Persons to whom *chelobitnye* were addressed included the tsar, *pomeshchiki* (fief holders), *votchinniki* (owners of patrimonial estates), and church leaders.

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[29–137–3]

CHELOMEI, VLADIMIR NIKOLAEVICH. Born June 17 (30), 1914, in Sedlets. Soviet scientist in mechanics and control processes. Academician of the Academy of Sciences of the USSR (1962; corresponding member, 1958); twice Hero of Socialist Labor (1959 and 1963). Member of the CPSU since 1941.

After graduating from the Kiev Aviation Institute in 1937, Chelomei taught at the institute. In 1941 he joined the staff of the P. I. Baranov Central Institute of Aircraft Engine Construction. In 1942, independently of efforts in Germany, he developed the USSR's first pulse-jet engine. The engine was installed in a number of aircraft designed by Chelomei and in various airplanes, including the La-11; aircraft powered by Chelomei's engine were exhibited at the Tushino air show in 1947. Chelomei became a master aeronautical designer in 1944 and a chief aeronautical designer in 1959. He directed the development of a number of major rockets, spacecraft, and aircraft. In 1952 he became a professor at the N. E. Bauman Moscow Higher Technical School.

Chelomei's main works deal with the design and dynamics of machines, oscillation theory, the dynamic stability of elastic systems, and the theory of servomechanisms.

Chelomei became a member of the International Academy of Astronautics in 1974. He was a deputy to the ninth convocation of the Supreme Soviet of the USSR. He received the Lenin Prize in 1959 and the State Prize of the USSR in 1967 and 1974. He has been awarded four Orders of Lenin, the Order of the October Revolution, and various medals, including the N. E. Zhukovskii Gold Medal for the Best Work on the Theory of Aviation (1964) and the A. M. Liapunov Gold Medal of the Academy of Sciences of the USSR for distinguished work in mathematics and mechanics (1977).

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[29–152–1]

CHELOVEK I ZAKON (Man and the Law), a magazine issued monthly by the Ministry of Justice of the USSR and written for people who are not specialists in the law; published in Moscow since 1971. The main tasks of the magazine are to increase people's knowledge and understanding of Soviet law, propagate the Soviet way of life, and encourage socialist morality among the broad masses of the working people. *Chelovek i zakon* regularly presents discussions of legal problems and prints answers to questions asked by working people. The magazine also contains literary works by Soviet and foreign authors dealing with the fight against crime and has a section devoted to the history of the state and the law. Circulation, 4.9 million (January 1980). [29–149–1]

CHELPANOV, GEORGII IVANOVICH. Born Apr. 16 (28), 1862, in Mariupol'; died Feb. 13, 1936, in Moscow. Russian psychologist, philosopher, and logician.

Chelpanov was a professor at the universities of Kiev (1892–1907) and Moscow (1907–23). In 1912 he founded the Moscow Institute of Psychology—an important center of experimental psychology—and was its director until November 1923. As a philosopher, Chelpanov was close to neo-Kantianism and positivism. Criticizing materialism in such works as *The Brain and the Soul* (1900), he attempted to substantiate psychology by means of the "empirical parallelism" of the soul and the body—a concept that went back to the psychophysical parallelism of W. Wundt.

Chelpanov performed some important experiments on the perception of space and time and developed procedures for laboratory research (*Introduction to Experimental Psychology*, 1915). His textbooks on psychology and logic have been reprinted more than once. After the October Revolution, Chelpanov believed that Marxism could be applied to social but not to general psychology, which, in his opinion, must be free of any kind of philosophy.

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A. V. PETROVSKII [29–153–1]

CHEL'TSOV, IVAN MIKHAILOVICH. Born 1848 in Egor'evsk, in what is now Moscow Oblast; died 1904 in St. Petersburg. Russian chemist.

Chel'tsov graduated from the University of St. Petersburg in 1876 and began teaching at the Mine Officers' Class in 1880. He was a staff member of the Scientific and Technical Laboratory of the Naval Ministry, where, under the direction of D. I. Mendeleev, a new type of smokeless gunpowder known as pyroxylin powder was obtained and methods for its production were developed. In collaboration with the Russian inventor L. G. Fedotov, Chel'tsov designed the first pyroxylin factory in Russia.

Chel'tsov's principal works dealt with explosives and the process of explosion. Chel'tsov was the author of the textbook *Explosives* (2nd ed., 1880–83), which was highly regarded by Mendeleev. [29–154–1]

CHEMAL, a climatic koumiss health resort in the mountains of Altai Krai, RSFSR. It is situated at an elevation of 410–620 m, 186 km southeast of the Biisk railroad station. The winter is moderately cold, with a mean January temperature of −13°C, and the summer is warm, with a mean July temperature of 18°C. Precipitation is about 515 mm a year. Chemal has a sanatorium for patients with active cases of pulmonary tuberculosis. [29–169–4]

CHEMBAR, until 1948, the name of the city of Belinskii, in Penza Oblast, RSFSR. [29–169–7]

CHEMENZEMINLI (real name, Iusif Vezir Mirbaba ogly). Born Aug. 31 (Sept. 12), 1887; died 1943. Soviet Azerbaijani writer.

Chemenzeminli was born in the city of Shusha, in what is now the Azerbaijan SSR. He graduated from the law faculty of the University of Kiev in 1915. His work first appeared in print in 1907. Chemenzeminli's first publicistic articles, stories, and feuilletons were published in such periodicals as the satirical magazine *Molla Nasreddin*. In these early works, he criticized religious fanaticism, ignorance, and backwardness and portrayed the bitter fate of the common man and the difficult lot of Azerbaijani women.

Chemenzeminli lived in Istanbul and Paris between 1919 and 1925; he returned to Azerbaijan in 1926. In such short-story collections as *Pages From the Past* (1926) and *From Darkness to Light* (1933), he condemned the social vices of feudal-bourgeois society and depicted the new Soviet man and the upsurge in the social and cultural life of the people. In his two-part work *The Students* (1914–35) and in *1917* (1931–34) he portrayed the student revolutionary movement in tsarist Russia. He subsequently wrote the novel *Maiden Spring* (1934) and the novel *Covered with Blood* (published 1960–61), which describes 18th-century Azerbaijan and portrays the humanist poet Vagif. Chemenzeminli also wrote on the history of Azerbaijani literature and folklore.

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K. MAMEDOV [29–171–4]

CHEMEROVTSY, an urban-type settlement and administrative center of Chemerovtsy Raion, Khmel'nitskii Oblast, Ukrainian SSR. Chemerovtsy is situated on the Zhvanchik River (Dnestr River basin), 15 km from the Zakupnoe railroad station on the Kopychintsy-Iaromolintsy line. The settlement has a butter plant. [29–173–1]

CHEMESOV, EVGRAF PETROVICH. Born in 1737 in the province of Nizhny Novgorod; died Aug. 30 (Sept. 10), 1765, in St. Petersburg. Russian engraver and draftsman.

Chemesov studied with G. F. Schmidt at the St. Petersburg Academy of Arts. In 1762 he became an academician and organized an engraving class at the academy. He directed the engraving class from 1762 to 1765. Chemesov's works, which include engraved, etched, and drypoint portraits, emphasize the subject's intellect and personality. Marked by confident line and a gentle stroke, they demonstrate Chemesov's mastery of various graphic techniques. Noteworthy examples are a portrait of F. G. Volkov (engraving, 1764–65), derived from A. P. Losenko's original, and portraits of I. I. Shuvalov (engraving, 1760) and Empress Elizaveta Petrovna (etching, drypoint, and engraving; 1761), both based on originals by P. Rotari.

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[29–173–2]

CHENAB, a river in India and Pakistan. The Chenab measures approximately 1,100 km in length and drains an area of 138,000 sq km. Originating in the glaciers of the Western Himalayas, it flows through a deep valley in India and over the plains of Punjab in Pakistan. The main tributaries are the Jhelum and the Ravi, below the influx of which the Chenab is called the Trimab. The Chenab empties into the Sutlej River (Indus River basin).

The Chenab is fed by melting firn fields and glaciers and by rain, mainly during the summer monsoon season. The water level rises from June through October and is low in winter. The mean flow rate at the point where the river flows from the mountains is 890 cu m per sec; lower it decreases owing to the distribution of water through numerous irrigation canals (about 200,000 hectares of agricultural land is irrigated). Cities in the densely populated valley include Wazirabad, Chiniot, and Multan, all in Pakistan. [29–603–1]

CHENCHIANG (also Chinkiang), a city in East China, in Kiangsu Province. Population, more than 200,000 (1953). Chenchiang, a transportation junction and industrial center, is a port on the right bank of the Yangtze, near the intersection of the river and the Grand Canal. The city produces paper, silk fabric, and machinery for the lumber industry and has rice-polishing plants and flour mills. Chenchiang is situated in a rice-growing and sericultural region, and marble is quarried in the area.

[29–542–3]

CHENG CH'ENG-KUNG (in European sources, Koxinga or Coxinga). Born 1624; died 1662. Chinese general.

The son of a merchant, Cheng Ch'eng-kung in 1646 joined the struggle against the Manchu Ch'ing Dynasty, which at that time controlled nearly all China. Having established his power along the seacoast in Fukien, Kwangtung, and Chekiang provinces, Cheng won back from the Manchus a large part of Southeast China; in 1659, however, he was defeated at Nanking. In 1661 and 1662, Cheng drove the Dutch colonialists from the island of Taiwan and established a base there from which he fought against the Ch'ing Dynasty. Cheng's son and grandson ruled Taiwan until 1683, when the island was captured by the Ch'ing. [29–542–2]

CHENG CHEN-TO. Born Dec. 19, 1898, in the city of Wenchou, Chekiang Province; died Oct. 17, 1958. Chinese literary scholar, writer, and public figure.

Cheng Chen-to graduated from the Peking Institute of Railroad Transportation. He edited progressive journals and took part in the May Fourth liberation movement of 1919. In 1921 he helped found the Society of Literary Studies. He taught at the universities of Peking and Shanghai beginning in 1931 and also directed the institutes of literature and archaeology of the Academy of Sciences of the People's Republic of China. Cheng wrote poetry collections, short stories, and essays. He advocated the study of Chinese literature as a distinct form of world literature; he also studied literary genres that had previously been ignored by literary historians. He was the author of *Illustrated History of Chinese Literature* (1932), *History of Chinese Folk Literature* (1938), and *The Problem of Periodizing the History of Chinese Literature* (1958). Cheng translated A. P. Chekhov's *The Seagull*, A. N. Ostrovskii's *Poverty Is No Crime*, Goethe's *Reynard the Fox*, and poems by R. Tagore.

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[29–542–1]

CHENGCHOU, a city in North China and the capital of Honan Province. Population, 1 million (1974). A transportation junction and important industrial center, Chengchou has enterprises of the cotton, food-processing, chemical, textile, and machine-building industries. The city has a university.

Chengchou, an ancient Chinese city, was for many centuries a district capital. It grew rapidly after the construction of the Peking-Hank'ou railroad was completed in 1906, and it experienced particularly intense growth in the 1950's. In 1953 it became the capital of Honan Province. In 1952, remains dating from the Shang (Yin) period were uncovered near Chengchou (*see* SHANG). Archaeologists discovered a fortified settlement surrounded by a pisé wall (2 km by 1.7 km), numerous burials, and workshops in which artisans produced bronze castings, inscribed bones, and pottery.

The site at Chengchou is divided stratigraphically into four periods, the latest of which is contemporary with the Shang capital in the 13th to 11th centuries B.C. near Hsiaot'un (*see* ANYANG). Chengchou has tentatively been identified in its earlier period

with Ao, the capital of the Shang ruler Chung Ting. Finds at the site, such as crucibles and ceramic molds, have made it possible to reconstruct the main features of metallurgical production in the middle Shang. It has been established that bronze tools were used extensively to inscribe bones. The lower strata of the Chengchou site seem to correspond to the period when the Shang ethnopolitical community first emerged in the basin of the Huang Ho; some researchers, however, link these strata with the culture of the Hsia tribe. [29–541–5]

CH'ENG HAO. Born 1032; died 1085. Chinese philosopher; a founder of neo-Confucianism.

Ch'eng Hao, together with his brother Ch'eng I, developed one of the fundamental ideas of neo-Confucianism—the concept of *li*. *Li* is a universal law that is both singular and diverse; it is inherent in and governs all people, things, and phenomena. *Li* is self-evident and independent, and it can be neither increased, or strengthened, nor diminished, or weakened. Ch'eng Hao was greatly concerned with the idea of existence as a continual process of birth and rebirth; all things possess a "life-giving principle"—namely, *jen*, or "humaneness." *Jen* eliminates the barriers between the self and all else, and it unites the heavens, earth, and man.

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See references under CHU HSI. [29–783–2]

CHENG HO. Born 1371; died circa 1434. Chinese traveler, naval commander, and diplomat.

Cheng Ho led military and commercial maritime expeditions (1405–07, 1407–09, 1409–11, 1413–15, 1417–19, 1421–22, and 1431–33) to Indochina, Hindustan, the Arabian Peninsula, and East Africa.

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CH'ENG I (also Ch'eng I-ch'uan). Born 1033; died 1107. Chinese philosopher; a founder of neo-Confucianism. Brother of Ch'eng Hao.

As compared to Ch'eng Hao, Ch'eng I placed greater emphasis on the harmony between the oneness and the diversity of *li*, or "principle"; his thesis, "principle is one but its manifestations are many," is one of the best-known philosophical tenets in China. Ch'eng I held that *ch'i*, or "material force," always possesses a physical form, whereas "principle" precedes and is therefore devoid of physical form. According to Ch'eng I, *yin* and *yang* (the basic categories in Chinese natural philosophy) do not exist outside of "principle," and all things have both a corporeal and a nonmaterial aspect, corresponding to "material force" and "principle."

REFERENCES

See references under CHU HSI. [29–783–1]

CH'ENGTU, a city in Southwest China, in the valley of the Min Chiang. Capital of Szechwan Province. Population, 2.2 million (1975).

Ch'engtu is a major transportation junction and industrial center. The city's machine-building industry manufactures such products as radios, machine tools, instruments, precision tools, and transportation equipment. There is copper and aluminum smelting. The city also manufactures rolled pipes, chemical products, textiles, food products, wood products, and leather goods. A fossil-fuel-fired steam power plant is located in the city. Ch'engtu, which is noted for its fine handicrafts, has a university.

Ch'engtu was founded in the fourth century B.C. It was the capital of the Shu state from A.D. 221 to A.D. 263 and the capital of the Earlier and Later Shu kingdoms from 908 to 965. From 1644 to 1646 the city was occupied by the rebel army of Chang Hsien-chung. In the second half of the 17th century, after the Manchu conquest of China, it became the capital of Szechwan Province. In September 1911 the city was besieged by nationalist rebels (*see* SZECHWAN UPRISING OF 1911). The city was freed from Kuomintang rule by the People's Liberation Army of China on Dec. 27, 1949.

Early in the Common Era, Ch'engtu was renowned for its brocades and was often called Chinch'eng, or "city of brocade." The city has numerous gardens and parks, and its architectural monuments include the Wu-hou Tz'u shrine (16th–18th centuries), the temple Ch'ing Yang Kung (literally, "Black Sheep Palace"; 13th century), and the monastery Pao Kuang Ssu. The Tu Fu House-Museum and the Szechwan Provincial Museum are located in Ch'engtu. [29–782–5]

CH'ENGTZUYAI, the site of an ancient settlement of the Lungshan culture (third and early second millennia B.C.), located near the city of Lungshangch'eng, Shantung Province, People's Republic of China (*see* LUNGSHAN). Discovered in 1928, Ch'engtzuyai was enclosed by clay walls with a palisade. The dwellings, which were round and coated with clay, had a clay hearth in the center. Tools and weapons were made of stone, bone, and shells. No metal articles were found. There was a great variety of black and yellow, often glazed, pottery. The inhabitants engaged in land cultivation and the raising of cows, horses, sheep, hogs, and dogs. Settlements of the Ch'engtzuyai type belong to the late stage of the primitive communal system in China. [29–783–3]

CH'EN I (also Chen Yi, Ch'en Yi). Born 1901 in Leshan District, Szechwan Province; died Jan. 6, 1972, in Peking. Chinese political and state figure.

The son of a civil servant, Ch'en I graduated from the University of Shanghai; from 1919 to 1921 he studied in France. He joined the Communist Party of China (CPC) in 1923 and took part in the Nanch'ang Uprising of 1927. From 1928 to 1936, Ch'en held command posts in the Chinese Red Army. During the Chinese people's war against the Japanese invaders (1937–45) he served in the New Fourth Army, first as commander of the First Detachment, then as acting commander of the army, and finally as commander. In 1945 he became a member of the Central Committee of the CPC.

From 1946 to 1949, Ch'en commanded the Third Field Army. From 1949 to 1954 he was a member of the Central People's Government Council of the People's Republic of China (PRC) and commander of the military district of East China. Ch'en served as mayor of Shanghai from 1949 to 1958 and in 1954 became a deputy premier of the National Defense Council. From 1955 to 1965, when military ranks were abolished in the PRC, he held the title of marshal of the PRC. From 1956 to 1969 he was a member of the Politburo of the Central Committee of the CPC. In 1958, Ch'en became minister of foreign affairs of the PRC. [29–784–2]

CHÉNIER, ANDRÉ MARIE DE. Born Oct. 29, 1762, in Constantinople; died July 25, 1794, in Paris. French poet and publicist. Brother of M.-J. de Chénier.

A. M. de Chénier graduated from the Collège de Navarre in Paris in 1781. His poems deal with the naïve joys and sorrows of people living in harmony with nature and with the charm of their daily labor and cares. Chénier derived the themes and forms of his poetry from classical authors, but the sincerity and freshness of feeling in his lyric poems led the romantics to consider him their precursor.

Chénier shared the Enlightenment's abstract love of freedom, and he welcomed the French Revolution in the ode "The Tennis Court Oath" (1791). Frightened by the progress of revolutionary events, however, he adopted a hostile attitude toward the Jacobins and wrote biting pamphlets for the liberal monarchist press. He was arrested in 1793 and executed several months later. While in prison, Chénier wrote the anti-Jacobin cycle *Iambics* (1794) and the ode "The Young Captive" (1795). His poetry was not published until 1819. In Russia, some of Chénier's poems were translated by A. S. Pushkin, who devoted the poem "André Chénier" (1825) to him, and by E. A. Baratynskii, A. A. Fet, A. K. Tolstoy, and V. Ia. Briusov.

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IU. A. GINZBURG [29–1131–3]

CHÉNIER, MARIE-JOSEPH DE. Born 1764 in Constantinople; died Jan. 10, 1811, in Paris. French dramatist, poet, and publicist. Brother of A. M. de Chénier. Member of the Académie Française (1803).

Chénier graduated from the Collège de Navarre in Paris. His tragedy *Charles IX, or a Lesson to Kings* (staged 1789, published 1790; later called *Charles IX, or St. Bartholomew's Eve*) established revolutionary classicism in the French theater. During the French Revolution, Chénier was a Jacobin and a deputy to the National Convention. He was the author of many patriotic hymns for national festivals, including "Chant du 14 juillet" (1790) and "Chant du départ" (1794). A member of the moderate wing of the Jacobins, Chénier was opposed to revolutionary terror. After the revolution he remained faithful to his republican beliefs. A steadfast love of freedom pervades Chénier's tragedies *Philip II* (1803) and *Tiberius* (1805), and also his verse satires, which circulated in manuscript copies.

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IU. A. GINZBURG [29–1132–1]

CHENLA, a state of the mid-sixth to the eighth century that was formed by Mon-Khmer tribes living along the middle course of the Mekong River. Chenla, first mentioned as a vassal state of Funan, was situated southwest of Lin-Yi (Champa). Isanavarman I (ruled early seventh century to c. 635) conquered Funan, having extended his authority westward to Angkor, and founded the capital of Chenla at Isanapura, on the Stung Sen. Under Jayavarman I (ruled early eighth century), the last ruler of Chenla, the state split into rival principalities. The culture of Chenla is represented by brick temples, remarkable sculpture, and numerous epigraphs in Old Khmer and Sanskrit that have been preserved.

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[29–174–7]

CH'EN SHENG AND WU KUANG, UPRISING OF, a peasant uprising in China in 209 and 208 B.C. The uprising was initiated in August 209 in northern Anhwei Province by a detachment of some 900 peasant recruits under the command of Wu Kuang and Ch'en Sheng, a farmhand called up for military service. The rebel force soon numbered in the tens of thousands and continued to increase steadily. Although peasants constituted the principal driving force of the rebellion, soldiers, artisans, and, according to some sources, slaves also took part.

In early 208 B.C. the insurgent army approached the Ch'in capital of Hsienyang, in Shensi Province. It captured northern and central Anhwei, all of Honan, southern Shansi, and eastern Shensi. Members of ruling-class opposition groups, chiefly from the hereditary aristocracy in the kingdoms destroyed by the Ch'in Dynasty, gradually assumed leadership of the uprising. They hoped to use the popular movement as a means of overthrowing the Ch'in Dynasty and restoring their own rights and possessions. The new leaders pushed aside those close associates of Ch'en Sheng from the peasantry whom they could not use; some, including Wu Kuang, were physically removed. In the winter of 208 B.C., Ch'en Sheng himself was treacherously murdered. In February 208 a Ch'in army crushed the rebellion.

The uprising of Ch'en Sheng and Wu Kuang was the first major popular rebellion in China. Although it met defeat, the uprising dealt the Ch'in Empire a blow from which it never recovered.

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G. IA. SMOLIN [29–785–1]

CH'EN T'IEN-HUA. Born 1875 in Hsinhua District, Hunan Province; died Dec. 8, 1905, in Tokyo. Chinese bourgeois revolutionary.

In early 1904, Ch'en T'ien-hua helped Huang Hsing form the organization Hua-hsing Hui for the purpose of overthrowing the Manchu Ch'ing Dynasty. After attempts to raise an armed rebellion in Ch'angsha in October 1904 failed, Ch'en fled to Japan. A founder of the T'ung-meng Hui, he wrote patriotic revolutionary pamphlets that played an important role in the ideological preparation for the Hsinhai Revolution. [29–784–3]

CH'EN TU-HSIU. Born 1879; died May 24, 1942. Figure in the Communist Party of China (CPC).

Ch'en Tu-hsiu became editor of the journal *Hsin ch'in-nien* in 1915 and subsequently was a professor at the school of letters at Peking National University. He also served as dean of the school. Ch'en took part in the patriotic anti-imperialist May Fourth Movement of 1919. In 1920 he organized in Shanghai the first Communist circle in China. He was elected secretary of the Provisional Bureau at the First Congress of the CPC in 1921 and general secretary of the party's Central Committee at the Second Congress of the CPC in 1922.

At an extraordinary conference of the Central Committee of the CPC held on Aug. 7, 1927, Ch'en was removed from the post of general secretary because of his errors during the Revolution of 1925–27. In November 1929 the Politburo of the Central Committee of the CPC expelled Ch'en from the party for his Trotskyist positions. [29–784–1]

CHEPETSKII, an urban-type settlement in Zuevka Raion, Kirov Oblast, RSFSR. Chepetskii is situated on the right bank of the Cheptsa River, a tributary of the Viatka, 18 km north of the Zuevka railroad station on the Kirov-Perm' line. It has a logging and timber distribution establishment. [29–175–5]

CHEPIKOV, KONSTANTIN ROMANOVICH. Born Dec. 12, (25), 1900, in Vladimirskoe, in what is now Smolensk Oblast. Soviet geologist. Corresponding member of the Academy of Sciences of the USSR (1953). Member of the CPSU since 1919.

Chepikov graduated from the Moscow Academy of Mines in 1929. Between 1929 and 1939, he served on the staffs of various research and production organizations of the petroleum industry; from 1930 to 1932, he was the director of the Geological Oil Exploration Institute. He was on the staff of the Institute of Geological Sciences of the Academy of Sciences of the USSR from 1939 to 1954, becoming the head of the institute's petroleum laboratory in 1947. From 1954 to 1957, Chepikov was the deputy director of the Institute of Petroleum of the Academy of Sciences of the USSR. After the Institute of Petroleum was reorganized as the Institute of Geology and Fossil Fuel Treatment, he became the head of the institute's laboratory in 1957.

Chepikov's main works deal with problems of stratigraphy, lithology, and tectonics, as well as with formation conditions for reservoir rocks, the migration of oil and gas, and the estimation of oil and gas reserves in the Northern Caucasus, the Volga-Ural region, Siberia, and Sakhalin.

Chepikov received the State Prize of the USSR in 1946. He has been awarded the Order of the October Revolution, two other orders, and various medals. [29–175–6]

CHEPRAK, the Russian term for the middle part of an animal hide and the leather made from it. The *cheprak* is characterized by great density, thickness, and durability; it is used to make shoe soles, thongs, and other articles. [29–176–2]

CHEPTSA, a river in Perm' and Kirov Oblasts and in the Udmurt ASSR, a left tributary of the Viatka River of the Volga basin. The Cheptsa is 501 km long and drains an area of 20,400 sq km. It rises in the upland known as the Verkhnekama Elevation and flows through the upland westward in a deep and broad valley; in its lower course it crosses the Viatka Uval. The Cheptsa is fed mainly by snow. The mean flow rate 85 km from the mouth is 130 cu m per sec. The river freezes over in November, and the ice breaks up in April or early May. The Cheptsa is used for floating timber. It is navigable for 135 km from the mouth. The cities of Glazov and Kirovo-Chepetsk are situated on the Cheptsa. [29–176–4]

CHEPTSOV, EFIM MIKHAILOVICH. Born Dec. 28, 1874 (Jan. 9, 1875), in the village of Medvenka, now in Kursk Oblast; died Jan. 8, 1950, in Moscow. Soviet painter. Honored Artist of the RSFSR (1946).

Cheptsov began his career as an icon painter and illustrator. From 1905 to 1911 he studied at the St. Petersburg Academy of Arts with V. E. Savinskii and V. E. Makovskii. In 1922 he joined the Association of Artists of Revolutionary Russia. He taught at the Leningrad Institute of Painting, Sculpture, and Architecture from 1938 to 1940 and at the V. P. Potemkin City Pedagogical Institute in Moscow from 1945 to 1949.

Cheptsov's prerevolutionary paintings depicted themes from both rural and urban life, for example, *At the Country Fair* (1910, Kursk Picture Gallery) and *At the Doctor's Office* (1911, Art Museum, Krasnodar). Several of his works depict regions in Italy, especially the island of Capri. Cheptsov's most important works include *A Meeting of the Village Party Cell* (1924) and *The Retraining of Teachers* (1925), both housed at the Tret'iakov Gallery. Alive with the spirit of the new phenomena of rural life and marked by a precise rendering of details from everyday life, the paintings played a vital role in the development of Soviet genre painting. Cheptsov's later works include *Weeding the Beets* (1938), *The Last News From the Front* (1942), *The Harvest* (1944), and *On the Day Off* (1946), all at the Kursk Picture Gallery.

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CHEPURKOVSKII, EFIM MIKHAILOVICH. Born Jan. 20 (Feb. 1), 1871, in Kiev; died 1950. Russian anthropologist. Master of sciences (1913).

Chepurkovskii emigrated to the USA on the eve of World War II. His major works deal with the geographical distribution of anthropological features and the anthropology of the Russian people. Chepurkovskii also wrote works on general anthropology. He was the first in Russia to make use of statistical methods in the study of anthropological material. He also wrote a critical analysis of anthroposociological theories. Some of Chepurkovskii's general theoretical views are erroneous.

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CHER, a department in central France. Area, 7,800 sq km. Population, 316,000 (1975). The capital of Cher is Bourges. Industry employs 32 percent of the economically active population, and agriculture 32 percent (1968). The department's agriculture is diversified. Industry includes agricultural machine building, aircraft construction, food processing, and the production of glass and ceramic ware. The main industrial centers of Cher are Bourges and Vierzon. [29–1134–1]

CHERA, one of three ancient Tamil states, in the southern part of India's Malabar Coast. The Chera state was first mentioned in the third century B.C. It fell in about the ninth century A.D. Chera is the origin of the name Kerala, a historical region and state in India. [29–177–2]

CHERANOVSKII, BORIS IVANOVICH. Born July 1 (13), 1896, in the village of Pavlovichi, Volyn' Province; died Dec. 17, 1960, in Moscow. Soviet aircraft designer.

Between 1924 and 1927, Cheranovskii studied at the Air Force Academy. In 1922 he began to design and construct gliders and airplanes of the "flying wing" type, in which the tail assembly is located on the wing. In 1924 he developed the BICh-2 glider, in which the leading edge of the wing had a parabolic planform. Cheranovskii's BICh-8 glider, which was successfully tested in 1929, was the first to employ a delta wing. Cheranovskii also developed "flying wing" airplanes with a central vertical tail assembly (the BICh-3 in 1926 and the BICh-7A in 1933). He was awarded the Order of the Red Star.

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CHERBOURG, a city in northern France, in Manche Department. Population, 83,000 (1975). Cherbourg is a port on the Cotentin Peninsula, on the English Channel. Ships, agricultural machinery, photographic materials, clothing, furniture, and beer are manufactured in the city. [29–1134–7]

CHERBULIEZ, ANTOINE-ELISÉE. Born July 29, 1797, in Geneva; died Mar. 7, 1869, in Zürich. Swiss economist and judge.

Cherbuliez's ideas reflect the process of the replacement of the classical school of bourgeois political economy by the vulgar school. K. Marx called Cherbuliez's views an amazing combination of the mutually exclusive views of Sismondi and Ricardo (see K. Marx and F. Engels, *Soch.*, 2nd ed., vol. 26, part 3, p. 395). Cherbuliez's demand that the state abolish private ownership of land and collect rent as a substitute for taxes was described by Marx as "an open expression of the hatred of the industrialist capitalist for the landowner, whom he regards as useless and superfluous in bourgeois production" (*ibid.*, vol. 4, p. 174). [29–1134–8]

CHERCHE, a balneological and pelotheraputic resort in L'vov Oblast, Ukrainian SSR. Situated 80 km from L'vov and 7 km from the railroad station of Rogatin. The summer is moderately warm (mean July temperature 18°C), and the winter moderately mild (mean January temperature −5°C). The annual precipitation reaches 730 mm. Curative agents include sulfide sulfate-hydrocarbonate-calcium-magnesium water and sulfate calcium water (used for baths) and peat mud. Treatment is available for diseases of the organs of motion and support, gynecological diseases, and diseases of the peripheral nervous system. The resort has a sanatorium and a balneological and pelotherapeutic clinic. [29–333–3]

CHERCHELL, a city in northern Algeria, situated on the Mediterranean Sea. Located on the Algiers-Oran highway. Population, 11,700 (1966). Cherchell, a fishing port, produces canned fish and wine. [29–1153–2]

CHERCHEN (Chinese, Ch'iehmo), a city in Northwest China, in the southern part of the Sinkiang Uighur Autonomous Region, on the Ch'eerhch'en Ho. Population, approximately 15,000 (1957). Cherchen is a freight in-transit center on the North Kunlun Highway. Cottage industry includes the production of carpets and woolen and silk fabrics. Other industry includes the processing of livestock products and fruit products. Gold and marble deposits are found in the area. [29–334–1]

CHERDAKLY, an urban-type settlement and administrative center of Cherdakly Raion, Ul'ianovsk Oblast, RSFSR. Cherdakly has a railroad station on the Ul'ianovsk-Ufa line, 35 km east of Ul'ianovsk. The city has a meat-packing plant, a distillery, a butter factory, a mixed-feed plant, and a grain elevator. [29–185–2]

CHERDYN', a city and the administrative center of Cherdyn' Raion, Perm' Oblast, RSFSR. It is situated on the right bank of the Kolva River, near the confluence of the Kolva and the Vishera River. A landing is located 8 km from the city on the Vishera. Cherdyn' is 111 km north of the Solikamsk railroad station.

Archaeological data show that the inhabitants of a settlement on the site of modern Cherdyn' carried on trade with the Volga Bulgars in the ninth and tenth centuries. The city is known to have existed since at least 1472, when it became part of the Muscovite state. The Cherdyn' Road, an ancient route through the Urals and Western Siberia, began at Cherdyn'. Salt was mined in the Cherdyn' area in the 16th century, and a metallurgical plant was built in the 17th century. Cherdyn' became a district capital in 1781 and part of Perm' Province in 1796. It was an important trade center in the 19th century.

The lumber industry plays an important role in the city's economy. Cherdyn' has a forestry technicum and the A. S. Pushkin Museum of Local Lore, which was founded in 1899, is located in the city.

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CHERDYN' ROAD, an ancient road through the Urals to Western Siberia. From the city of Cherdyn', the road went upward along the valleys of the Vishera, Veslui, and Pochmoga rivers. It then went through the drainage divide to the Tal'tia River and down along the Ivdel', Loz'va, Tavda, and Tobol rivers. The Cherdyn' Road was the only road to Siberia established by the government during the first years after the fall of the Siberian Khanate in the late 16th century. Around 1590, Loz'va was founded on the Cherdyn' Road. In 1598 the shorter Babinov Road became the official road, and the Cherdyn' Road lost its importance. [29–185–3]

CHERDYNTSEV, VIKTOR VIKTOROVICH. Born May 4 (17), 1912, in Moscow; died there Aug. 16, 1971. Soviet physicist and geochemist. Doctor of sciences in physics and mathematics (1947).

A student of V. I. Vernadskii and V. G. Khlopin, Cherdyntsev served on the staff of the Radium Institute of the Academy of Sciences of the USSR from 1930 to 1944 and on the staff of the Institute of Astronomy and Physics of the Academy of Sciences of the Kazakh SSR from 1944 to 1960. From 1946 to 1960, he was also the head of the subdepartment of experimental physics at the Kazakh University in Alma-Ata; he became a professor at the university in 1948. In 1960 he became the head of the laboratory of absolute age determination at the Geological Institute of the Academy of Sciences of the USSR in Moscow.

Cherdyntsev's main works dealt with the geochemistry of isotopes, nuclear geophysics, and radiogeology. Cherdyntsev was the first to substantiate the origin of heavy elements in massive stars. In 1954, together with P. I. Chalov, he discovered the spontaneous fission of the uranium isotopes ^{234}U and ^{238}U; the spontaneous fission of the two uranium isotopes is called the Cherdyntsev-Chalov effect. Cherdyntsev demonstrated the importance of radioactive and radiogenic isotopes, such as ^{4}He and ^{40}Ar, in the study of the earth's upper mantle.

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CHEREK, a river in the Kabarda-Balkar ASSR, a right tributary of the Baksan River of the Terek basin. The Cherek is 76 km long and drains an area of 3,070 sq km. It is formed by the confluence of the Cherek-Balkarskii and Cherek-Khulamskii rivers, which originate at glaciers on the northern slopes of the Greater Caucasus. The Cherek is fed mainly by glaciers and snow. High water occurs in the summer. The average flow rate below the confluence of the headstreams is 39.5 cu m per sec. The Cherek is used for floating timber. [29–193–3]

CHEREKHA, a river in Pskov Oblast, RSFSR; a right tributary of the Velikaia River. The Cherekha measures 145 km in length and drains an area of 3,230 sq km. It flows through a swampy lowland. It is fed mainly by snow. High water lasts from late March to early May. The mean flow rate 14 km from the mouth is 16.3 cu m per sec. The river freezes in late November to December, and the ice breaks up in late March or April. [29–219–2]

CHEREMISINOVO, an urban-type settlement and the administrative center of Cheremisinovo Raion, Kursk Oblast, RSFSR. Cheremisinovo has a railroad station on the Kursk-Voronezh line, 88 km northeast of Kursk. The settlement has a butter factory. [29–193–4]

CHEREMISOV, VLADIMIR ANDREEVICH. Born May 9 (21), 1871; date of death unknown. Russian general of the infantry (1917).

The son of a nobleman in Baku Province, Cheremisov completed courses at the Moscow Infantry Cadet School in 1891 and at the Academy of the General Staff in 1899. He taught at a military school and at the Academy of the General Staff and served in staff positions.

During World War I, Cheremisov commanded a regiment, was quartermaster general of the Twelfth Army, and served as a specially assigned general with the Seventh Army commander. After the February Revolution of 1917, the democratically inclined Cheremisov was appointed commander of a corps that operated successfully in the June Offensive of 1917. He became commander of the Eighth Army in June 1917 and commander of the Northern Front in September of the same year. During the October Revolution, the troops of the Northern Front did not support the Kerensky-Krasnov Rebellion of 1917, owing to the influence of the Bolsheviks among them as well as to orders from Cheremisov, who reflected the mood of his soldiers. Cheremisov left the service in November 1917, went to Kiev, and emigrated in 1918. He did not engage in political activities abroad.

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Osnovy sovremennogo voennogo iskusstva. Kiev, 1910.
Prikladnaia taktika, vols. 1–4. St. Petersburg, 1913–14. [29–193–5]

CHEREMKHOVO, a city under oblast jurisdiction and the administrative center of Cheremkhovo Raion, Irkutsk Oblast, RSFSR. Railroad station on the Trans-Siberian Railroad, 130 km northwest of Irkutsk. Population, 87,000 (1977). Cheremkhovo is one of the coal-mining centers of the Irkutsk Coal Basin. Industry includes a machine-building plant, a mining-equipment repair plant, a paperboard and Ruberoid plant, and building-materials enterprises. Cheremkhovo also has a brewery, a milk combine, a meat-packing plant, a stocking factory, and a clothing factory. Educational and cultural institutions include an evening division of the Irkutsk Polytechnic Institute, a mining technicum, a pedagogical institute, a medical school, and a drama theater. [29–196–4]

CHEREMNYKH, MIKHAIL MIKHAILOVICH. Born Oct. 18 (30), 1890, in Tomsk; died Aug. 7, 1962, in Moscow. Soviet graphic artist. People's Artist of the RSFSR (1952); member of the Academy of Arts of the USSR (from 1958).

Cheremnykh studied with K. A. Korovin and S. V. Maliutin at the Moscow School of Painting, Sculpture, and Architecture from 1911 to 1917. He taught at the V. I. Surikov Moscow Art Institute from 1949 to 1962, becoming a professor there in 1950. Cheremnykh was the creator of the Okna ROSTA and one of the creators of the Okna TASS (*see* OKNA ROSTA and OKNA TASS). He worked for several newspapers and for the magazines *Krokodil* (from 1922), *Bezbozhnik u stanka*, and *Smekhach*.

Cheremnykh's work is rich in satiric allegory and symbolism, tending toward grotesque solutions that have a tremendous effect upon the viewer. In his posters and caricatures dealing with international and domestic topics, he frequently used montages of drawings devoted to related subjects and different graphic techniques (for example, simple stylized silhouetting or great tonal

and linear detail). Examples of his posters are *We Must Be Ready* (Okna ROSTA, no. 744, 1920) and *May the Antifascist World Front Increase That the Knife Might Fall From This Claw* (1938). Cheremnykh also worked as a book illustrator (for example, drawings to the works of M. E. Saltykov-Shchedrin, charcoal and white pigment, 1936–39, Literary Museum, Moscow) and as a stage artist (for A. F. Pashchenko's *Madame de Pompadour*, Leningrad Malyi Opera Theater, 1939). A recipient of the State Prize of the USSR in 1942, he was also awarded the Order of the Badge of Honor and various medals.

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[Savostiuk, O., and B. Uspenskii.] *M. M. Cheremnykh*. [Moscow, 1970.] [29–194–2]

CHEREMOSH (also Cheremoshel'), a river in the western Ukrainian SSR, a right tributary of the Prut River. The Cheremosh is 80 km long and drains an area of 2,560 sq km. It is formed by the confluence of the Chernyi Cheremosh (87 km) and Belyi Cheremosh (51 km), which flow from the Eastern Carpathians. The Cheremosh is fed by mixed sources, but mainly by rain. The average flow rate below the confluence of the Chernyi Cheremosh and Belyi Cheremosh is 26.6 cu m per sec. The river is used for floating timber. The cities of Vizhnitsa and Vashkovtsy are situated on the Cheremosh. [29–195–1]

CHEREMSHANKA, an urban-type settlement in Cheliabinsk Oblast, RSFSR, under the jurisdiction of the Verkhnii Ufalei city soviet. Cheremshanka is situated 8 km northeast of the Verkhnii Ufalei railroad station. Nickel ore is mined nearby. [29–196–6]

CHEREMSHINA, MARKO (real name, Ivan Iur'evich Semaniuk). Born June 1 (13), 1874, in the village of Kobaki, in what is now Kosov Raion, Ivano-Frankovsk Oblast; died Apr. 25, 1927, in the city of Sniatin, in what is now Ivano-Frankovsk Oblast. Ukrainian writer.

The son of a peasant, Cheremshina graduated from the law faculty of the University of Vienna in 1901 and received his doctor of law degree in 1906. In 1912 he opened a law office in Sniatin, where he became known as the peasants' attorney. He conducted extensive cultural and educational work among the local population.

Cheremshina's first short story, "The Helmsman" (1896), dealt with the life of raftsmen on the Cheremosh River. His cycle of lyric prose poems *Leaves* (1898) was influenced by modernist aesthetics. Largely under the influence of I. Ia. Franko, Cheremshina subsequently turned to critical realism in such works as *Notches* (1901), a collection of short stories about poor Hutzul peasants. His collection *The Village Perishes* (1925) consisted of antimilitarist short stories dealing with the life of the people during World War I. The short stories Cheremshina wrote during the last years of his life about the poverty of the popular masses in bourgeois Poland appeared in Soviet Ukrainian periodicals and after his death were published in Kiev in 1929 in the collection *The Summit*.

Cheremshina's work was highly valued by Franko, O. Makovei, O. Kobylianskaia, and Lesia Ukrainka. Some of his works have been translated into languages of the USSR and foreign countries. A museum devoted to Cheremshina was established in Sniatin in 1949, and monuments have been erected to the democratic writer in Sniatin and Kobaki.

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CHEREMUKHIN, ALEKSEI MIKHAILOVICH. Born May 17 (29), 1895, in Moscow; died Aug. 19, 1918, in Palanga, Lithuanian SSR. Soviet airplane builder. Doctor of sciences in technology (1937), professor (1934); Honored Worker in Science and Technology of the RSFSR (1947).

In 1917 and 1918, Cheremukhin was an instructor at the Kacha Flight Training School. In 1923 he graduated from the Moscow Higher Technical School. From 1918 to 1922, he was on the staff of the Central Aerodynamic and Hydrodynamic Institute, where he helped design and construct the first Soviet airplanes. From 1927 to 1935, Cheremukhin designed and tested the first Soviet helicopters. In 1938 he joined the staff of A. N. Tupolev's experimental design office, becoming a deputy chief designer in 1953.

Cheremukhin received the Lenin Prize in 1957 and the State Prize of the USSR in 1949 and 1952. He was awarded three Orders of Lenin, three other orders, and various medals.

WORKS
Izbr. trudy. Moscow, 1969. [29–196–1]

CHEREMUKHOVO, an urban-type settlement in Sverdlovsk Oblast, RSFSR, under the jurisdiction of the Severoural'sk city soviet. Cheremukhovo is situated 32 km north of the Boksity railroad station. Bauxites are mined at Cheremukhovo. [29–196–2]

CHEREMUSHSKII, an urban-type settlement in Kotlas Raion, Arkhangel'sk Oblast, RSFSR. Cheremushskii has a railroad station on the Kotlas-Vorkuta line. Logging plays an important role in the settlement's economy. [29–196–3]

CHERENKOV, PAVEL ALEKSEEVICH (P. A. Čerenkov). Born July 15 (28), 1904, in the village of Novaia Chigla, in what is now Voronezh Oblast. Soviet physicist. Academician of the Academy of Sciences of the USSR (1970; corresponding member, 1964). Member of the CPSU since 1946.

Cherenkov graduated from the University of Voronezh in 1928. In 1930 he joined the staff of the Institute of Physics of the Academy of Sciences of the USSR. He is a professor at the Moscow Physical Engineering Institute.

In 1934, while investigating the luminescence of liquids, Cherenkov discovered a new optical effect that consists in the emission of distinctive optical radiation when a material is bombarded by charged particles traveling at a speed greater than the speed of light in the material (*see* CHERENKOV RADIATION). In 1958, Cherenkov shared a Nobel Prize for the discovery of the effect with I. E. Tamm and I. M. Frank, who developed the theory of the effect. Methods using Cherenkov radiation to detect charged particles have been developed (*see* CHERENKOV COUNTER).

Cherenkov has also carried out research in nuclear physics, high-energy particle physics, the study of cosmic rays, and the development of electron accelerators. He received the State Prize of the USSR in 1946, 1952, and 1977 and has been awarded two Orders of Lenin, three other orders, and various medals.

REFERENCE
"Pavel Alekseevich Cherenkov (k 70-letiiu so dnia rozhdeniia)." *Uspekhi fizicheskikh nauk*, 1974, vol. 113, issue 3. [29–197–1]

CHERENKOV COUNTER (or Čerenkov counter), a device that uses Cherenkov radiation to detect charged particles or gamma rays.

If a charged particle moves in a medium at a velocity v that is greater than the phase velocity of light waves in the medium, the particle emits Cherenkov radiation. The phase velocity of light waves in a given medium is equal to c/n, where n is the refractive index of the medium and c is the speed of light in vacuum. Cherenkov radiation is emitted in a specific direction, and the angle θ between the direction of the radiation and the trajectory of the particle is related to v and n. The relationship is given by the equation $\cos \theta = c/vn = 1/\beta n$, where $\beta = v/c$. The yield N of Cherenkov radiation per centimeter of path between wavelength limits λ_1 and λ_2 is specified by the equation

$$N(\lambda_1\lambda_2) = \frac{2\pi Z^2}{137}\left(\frac{1}{\lambda_1} - \frac{1}{\lambda_2}\right)\sin^2\theta$$

where Z is the charge of the particle in units of the charge of the electron.

In contrast to a scintillation counter, in which particles with any velocity are detected and the radiation is both isotropic and delayed, the light in a Cherenkov counter is emitted only by particles whose velocities $v \geq c/n$, that is, by particles for which $\beta \geq 1/n$. The emission occurs at the same time as the passage of the particles and at an angle θ to the trajectory of the particles. The angle θ and the radiation yield increase with increasing particle velocity above a certain threshold velocity. For particle velocities that approach the speed of light—that is, for $(1 - \beta) \ll 1$—the angle attains a maximum value $\theta_{max} = \cos^{-1}(1/n)$. As a rule, the amount of light emitted in a Cherenkov counter is a few percent of a light pulse in a scintillation counter.

The basic components of a Cherenkov counter are a transparent substance in which $v > c/n$; an optical system, which focuses the light; and one or more multiplier phototubes, which convert a light pulse into an electrical signal (see Figure 1). The transparent substance may be a solid, a liquid, or a gas. It should be transparent to Cherenkov radiation and have a low level of scintillation, since scintillations produce background signals. Among the conventional substances used are organic glass ($n = 1.5$), lead glass ($n = 1.5$), and water ($n = 1.33$).

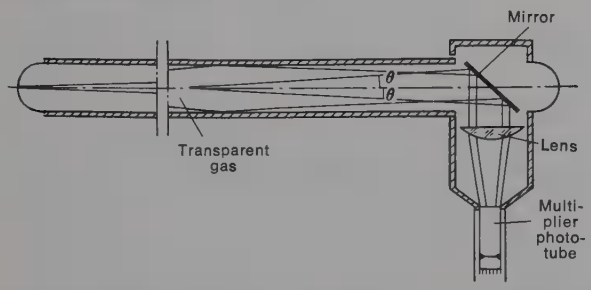

Figure 1. Schematic of a threshold gas Cherenkov counter used with the 70-GeV particle accelerator of the Institute of High-energy Physics (USSR). The Cherenkov light is collected at the cathode of the multiplier phototube by means of an optical system consisting of a plane mirror and a quartz lens.

Cherenkov counters are widely used in experiments employing particle accelerators, since the counters make it possible to pick out particles whose velocity lies in a specific range. As accelerator energies and, consequently, particle energies have increased, gas Cherenkov counters have been especially widely used. Gas Cherenkov counters can single out ultrarelativistic particles, for which $(1 - \beta) \ll 1$. The angle θ at which the radiation is emitted is very small in the case of a gas, and the radiation yield per unit path is low. To obtain a flash of light that is sufficient for the detection of a particle, the length of a gas Cherenkov counter must be increased to 10 m or longer. In gas Cherenkov counters, the refractive index may be varied continuously within a given range by changing the operating gas pressure.

Three types of Cherenkov counters are distinguished: threshold, differential, and total-absorption. The main characteristics of threshold and differential Cherenkov counters are the detection efficiency and the velocity resolution; the latter is a measure of a counter's ability to distinguish two particles moving with nearly the same velocity. A threshold Cherenkov counter should detect all particles with velocities greater than some threshold value. Therefore, a threshold counter's optical system, which is a combination of lenses and mirrors, should—if possible—collect all the emitted light at the cathode of the multiplier phototube.

Differential Cherenkov counters detect particles whose velocity lies between certain limits v_1 and v_2. In conventional differential Cherenkov counters, the desired particles are detected by using the optical system to select the light that is emitted at an angle lying between the corresponding limits θ_1 and θ_2. A lens or a spherical mirror placed in the path of the Cherenkov light focuses the light that is emitted at an angle θ into a ring of radius $R = f\theta$, where f is the focal length of the lens or mirror. If an annular slit diaphragm is placed at the focus of the optical system and one or more multiplier phototubes are placed behind the diaphragm, light will be detected only for particles that radiate at an angle lying within certain limits. A differential Cherenkov counter with a precision optical system makes it possible to single out particles whose velocity differs by just 10^{-6} from the velocity of other particles. Such Cherenkov counters require special control over the gas pressure and the formation of a parallel particle beam.

Total-absorption Cherenkov counters are intended for the detection and spectrometry of electrons and gamma rays. In contrast to threshold and differential Cherenkov counters, in which a particle loses a negligibly small fraction of its energy in the transparent substance, a total-absorption Cherenkov counter contains a very thick slab of transparent material, in which an electron or a gamma ray produces an electron-photon avalanche and loses all or most of its energy. As a rule, the slab is made of glass with a high lead content. An electron with an energy of up to 10 gigaelectron volts (GeV) may be virtually completely stopped in a slab of such glass with a thickness of, for example, 40 cm. The amount of light that is emitted in a total-absorption Cherenkov counter is proportional to the energy of the initial electron or gamma ray. The energy resolution $\Delta\mathcal{E}$ of a total-absorption Cherenkov counter is energy dependent and, for the most sensitive multiplier phototubes, may be specified by the equation $\Delta\mathcal{E} \sim (10\sqrt{\mathcal{E}})\%$, where $\mathcal{E}$ is the electron energy in gigaelectron volts.

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V. S. KAFTANOV [29–201–2]

CHERENKOV RADIATION (also Čerenkov radiation, Cherenkov effect, or Čerenkov effect), the emission of light by a charged particle when the particle moves in a medium at a velocity greater than the phase velocity of light waves in the medium, that is, greater than the velocity at which light waves propagate in the medium. Cherenkov radiation was discovered in 1934 by P. A. Cherenkov when, during a study of the gamma-ray luminescence of solutions, he observed a faint blue glow in liquids irradiated by gamma rays.

Even the early experiments of Cherenkov, which were undertaken on the initiative of S. I. Vavilov, revealed a number of characteristic features of Cherenkov radiation. The early experiments showed that the glow is observed in all pure transparent liquids, the brightness of the glow is weakly dependent on the chemical composition of such a liquid, and the radiation is polarized with the electric vector preferentially oriented parallel to the direction in which the charged-particle beam propagates. In contrast to luminescence, neither temperature quenching nor impurity quenching (*see* QUENCHING OF LUMINESCENCE) of the glow was observed in the experiments. On the basis of the observational data, Vavilov contended that the phenomenon discovered by Cherenkov was not the luminescence of a liquid and that the light was emitted by high-speed electrons moving in the liquid; during gamma irradiation, such electrons arise as a result of the Compton effect. Therefore, the phenomenon would more correctly be referred to as Vavilov-Cherenkov radiation, or the Vavilov-Cherenkov effect, rather than as the Cherenkov effect, which is the conventional term used, especially in the non-Soviet literature. Cherenkov radiation is also characteristic of solids.

Different types of glows caused by gamma rays were repeatedly observed after the discovery of radium. In particular, the glow in liquids irradiated by gamma rays was investigated between 1926 and 1929 by the French scientist M. L. Mallet, who obtained photographs of the glow's spectrum. However, no evidence that the glow was a new phenomenon was obtained, and the most characteristic property of the radiation—namely, its directivity at an acute angle to the direction of motion of the particle—was not established. The directivity of the radiation was discovered by Cherenkov in 1936.

The mechanism of the Cherenkov effect was explained in a paper published by I. E. Tamm and I. M. Frank in 1937. The paper also contained a quantitative theory based on the equations of classical electrodynamics. A quantum treatment by V. L. Ginzburg in 1940 led to the same results.

The conditions under which Cherenkov radiation occurs and the directivity of the radiation may be explained by means of the

Huygens-Fresnel principle. For this purpose, each point of the trajectory of a charged particle—for example, the point *A*, *B*, *C*, or *D* in Figures 1 and 2—should be regarded as the source of a secondary wave, which is generated when the charge passes through that point. In an optically isotropic medium, such secondary waves are spherical since they propagate in all directions at the same velocity $u = c/n$, where c is the speed of light in vacuum and n is the refractive index of a given medium. Let us assume that a particle moving with velocity v is at point E at the moment of observation. Since the distance between points A and E is equal to vt, t seconds before the particle is observed at E, it passes through A. Consequently, by the moment of observation, the wave emanating from A is a sphere of radius $R = ut$ (the circle 1 in Figures 1 and 2 corresponds to the sphere). Light is emitted from *B*, *C*, and *D* at increasingly later moments in time; the waves emanating from these points are represented by the circles 2, 3, and 4, respectively. According to Huygens' principle, as a result of interference, secondary waves cancel one another everywhere except at their common envelope. The wavefront of the light propagating in the medium corresponds to the common envelope.

Let the particle velocity v be less than the speed of light u in a medium (Figure 1). Then, the earlier the emission of forward-propagating light, the greater the distance at which the light overtakes the particle. In this case, the secondary waves do not have a common envelope; that is, all the circles 1, 2, 3, and 4 lie inside one another. This situation corresponds to the obvious fact that an electric charge undergoing uniform rectilinear motion at a speed less than the speed of light in a medium should not emit light.

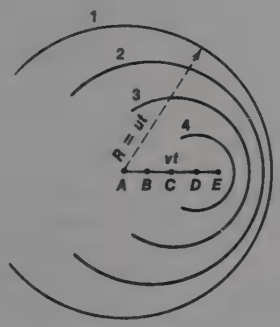

Figure 1. The motion of a charged particle in a medium at a velocity of $v < u$: the circles 1, 2, 3, and 4 represent the locations of the secondary waves emitted by the particle from points *A*, *B*, *C*, and *D*, respectively

However, the situation is different if

$$v > u = c/n, \text{ or } \beta n > 1 \tag{1}$$

where $\beta = v/c$, that is, if the particle moves faster than the light waves. In this case, the spheres corresponding to the light waves intersect (Figure 2). The common envelope of the light waves, or the wavefront, is a cone with its vertex at E, which coincides with the instantaneous position of the particle. The normals to the generators of the cone give the wave vectors, that is, the direction in which the light propagates. The angle that a wave vector makes with the direction of the particle's motion (see Figure 2) satisfies the relation

$$\cos\theta = u/v = c/nv = 1/\beta n \tag{2}$$

The same method may be used to consider optically anisotropic media. However, the fact that the speed of light in such a medium depends on the direction in which the light propagates must be taken into account. Therefore, the secondary waves are not spheres. In this case, different cones correspond to ordinary and extraordinary rays and, in accordance with equation (2), the radiation is emitted at various angles θ to the direction in which the particle propagates. For optically anisotropic media, criterion (1) is formulated somewhat differently. In all cases, the basic equations of the theory are in good agreeent with experiments.

Theory has shown that, in an optically isotropic medium, a particle of charge e traveling a distance of 1 cm at a velocity of $v > u$ radiates an energy of

$$E = \frac{e^2}{c^2} \int_{\beta n(\omega)>1} \omega \left[1 - \frac{1}{\beta^2 n^2(\omega)}\right] d\omega$$

where $\omega = 2\pi c/\lambda$ is the circular frequency of the light; here, λ is the vacuum wavelength of the emitted light. The integrand gives the spectral energy distribution of the Cherenkov radiation, while the bounds of the domain of integration are specified by criterion (1).

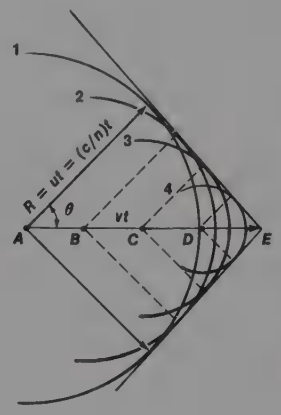

Figure 2. The motion of a charged particle in a medium at a velocity of $v > u$: the angle θ indicates the direction of the emitted radiation

Cherenkov radiation is produced not only when an electron moves in a medium but when any charged particle moves in a medium, provided criterion (1) is satisfied for the particle. For electrons in liquids and solids, criterion (1) is satisfied at energies of as low as $\sim 10^5$ electron volts (eV); many electrons associated with radioactive processes have such energies. Heavier particles should have higher energies. For example, to attain the required velocity, a proton, whose mass is ~2,000 times greater than the mass of an electron, should have an energy of $\sim 10^8$ eV. Such protons may be produced only in present-day accelerators.

Cherenkov radiation has been used to develop experimental methods that are widely employed in nuclear physics both to detect particles and to study the nature of particles (*see* CHERENKOV COUNTER). The velocity of a particle may be obtained from equation (2) or from criterion (1) by measuring θ in a medium or transparent substance for which n is known or by determining the radiation threshold. After a particle's velocity is obtained and its energy is determined on the basis of its deflection in a magnetic field, the mass of the particle may be calculated. Such a procedure was used, for example, in the discovery of the antiproton. For ultrarelativistic particles, criterion (1) is satisfied in compressed gases, such as those used in gas Cherenkov counters. The Cherenkov radiation that is produced in the earth's atmosphere is used to study cosmic rays.

Cherenkov radiation may be observed in pure form only in ideal cases, where a particle moves with constant velocity in a transparent substance of unlimited length. When a particle traverses the surface of a transparent substance, transition radiation is produced. Such radiation was predicted theoretically by Ginzburg and Frank in 1946 and was later investigated experimentally. The essence of transition radiation consists in the fact that the electromagnetic field of a particle is different in a vacuum and in a medium. Any change in the particle's field always results in the emission of light. For example, in the case of bremsstrahlung, the emission is caused by a change in the particle's velocity; in the case of transition radiation, the emission results from a change in the electromagnetic properties of the medium along the particle's trajectory. In a thin transparent substance that satisfies criterion (1), transition radiation is indistinguishable from Cherenkov radiation to a certain extent. At the surface of an opaque substance, the emitted transition radiation is more in evidence since the intensity of the Cherenkov radiation is reduced by absorption.

Transition radiation is also produced when criterion (1) is not satisfied—for example, at low particle velocities or, in contrast, when an ultrarelativistic particle radiates in the X-ray region, where $n < 1$ and, consequently, βn is always less than unity. The intensity of transition radiation is low and is usually inadequate for the detection of an individual particle. For the effective detection of transition radiation, the radiation emitted by a particle as it traverses several interfaces in succession may be summed.

In 1940, E. Fermi, taking into account the ability of a real medium to absorb light in at least several spectral regions, generalized the theory of Cherenkov radiation. The results obtained by Fermi substantially improved the theory of ionization losses by charged particles, which deals with the effect of the polarization of a medium.

Cherenkov radiation is an example of "faster-than-light" optics and is of fundamental importance. It is studied experimentally and theoretically not only in optically isotropic media but also in crystals, which are optically anisotropic media. Electric and magnetic dipole and multipole radiation is considered theoretically. The expected properties of the radiation of a moving magnetic charge have been used to search for magnetic monopoles. The radiation of a particle in a channel within a medium—for example, the radiation of a particle beam in a wave guide—has been examined. When Cherenkov radiation is emitted, the Doppler effect in a medium takes on new characteristics, as shown by the occurrence of anomalous and complex Doppler effects. It may be assumed that any system of particles that is capable of interacting with an electromagnetic field will emit light owing to its own kinetic energy if the velocity of the system exceeds the phase velocity of light waves.

The theoretical concepts that underlie Cherenkov radiation are closely associated with other phenomena of importance in contemporary physics, such as Mach waves in acoustics, some aspects of the stability of particle motion in a plasma and of wave generation in a plasma, certain problems in the theory of particle accelerators, and the generation and amplification of electromagnetic waves.

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I. M. FRANK [29–197–2]

CHEREPANOV, EFIM ALEKSEEVICH AND MIRON EFIMOVICH. Efim Alekseevich, born 1774 at the Vyiskii Zavod; died June 15 (27), 1842, in Nizhnii Tagil. Miron Efimovich, born 1803 at the Vyiskii Zavod; died Oct. 5 (17), 1849, in Nizhnii Tagil. Russian machine builders. Father and son were serfs of the Demidovs, a family of factory owners. Efim and his wife were freed in 1833; Miron and his wife were freed in 1836.

In the 1810's, Efim Cherepanov established a machine-building plant (the Vyia Metalworking Plant) completely equipped with metal-cutting machine tools, some of original design (in particular the screw lathes, gear-cutting lathes, and planers). From 1822 until his death he was chief mechanic of all the Nizhnii Tagil plants. Miron Cherepanov first studied with his father and in 1819 was named his assistant; he took his father's place after the latter's death.

The Cherepanovs developed equipment for blast furnace operations, ironworking, copper smelting, sawmilling, flour milling, and gold mining. Their work on steam engines, which they persistently promoted, was of great interest. In all, beginning in 1820, they constructed approximately 20 steam engines, varying in power from 2 to 60 horsepower. They developed Russia's first steam locomotive in 1833 and 1834 and the second, of greater power, in 1835; the latter incorporated the leading technological ideas of the time. A cast-iron railway was laid from the Vyia Plant to the Mednyi Mine. Despite the successful operation of the steam locomotives, the innovation received no support, and the steam locomotives were replaced with horse traction. The railway operated in this manner until the early 1900's.

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F. N. ZAGORSKII [29–210–3]

CHEREPANOV, SERGEI ALEKSANDROVICH. Born Mar. 19 (31), 1881, in Kungur; died August 1918 in Tiumen'. Participant in the Russian revolutionary movement. Member of the Communist Party from 1903.

Cherepanov was the son of a worker. He conducted party work, which he first undertook in 1903, in Ekaterinburg (now Sverdlovsk), Samara (now Kuibyshev), Ufa, and Perm'. In 1916 he was drafted into the army, where he conducted revolutionary work among the soldiers. After the February Revolution of 1917, Cherepanov was one of the leaders of the military organization of the St. Petersburg Committee of the RSDLP(B). In June 1917 he became a member of the All-Russian Bureau of the Military Organization of the Central Committee of the RSDLP(B). Cherepanov took part in the October Armed Uprising in Petrograd. In 1918 he helped organize the Tomsk provincial council of the national economy and became the council's chairman. In the summer of 1918 he joined the Bolshevik underground in Sibera. Cherepanov was arrested and shot by White Guards.

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CHEREPANOVO, a city and the administrative center of Cherepanovo Raion, Novosibirsk Oblast, RSFSR. Cherepanovo has a railroad station 109 km southeast of Novosibirsk. Industry is represented by a building-materials plant, a meat-packing plant, a milk combine, a clothing factory, and a furniture factory. [29–210–2]

CHEREPASHINSKII, MIKHAIL MIKHAILOVICH. Born 1845; died Apr. 30, 1916. Russian scientist; specialist in structural mechanics.

Cherepashinskii graduated from the University of Technology, Vienna, in 1873. He became a professor at the Moscow Higher Technical School in 1885 and an honored professor in 1907. His principal works dealt with design problems of engineering structures (in particular, he developed methods of calculating statically indeterminate systems), the history of structural mechanics, and bridge design. He was the inventor of an original slide rule. [29–213–1]

CHEREPASHKA, a reed instrument equipped with a single keyboard; a type of small, diatonic accordion. The *cherepashka* was popular in the late 19th century and in the 1920's. It has from two to six keys on the right headboard and two on the left. The body is up to 70 mm in height. The scale is diatonic, and the sound produced can be altered by changing the movement of the bellows. Reconstructed variants of the *cherepashka* include the P. E. Nevskii *cherepashka*, which has chromatic semitones added, and the V. S. Varshavskii *cherepashka*, which produces a full chromatic scale on the right headboard (up to ten keys) and a bass chord accompaniment on the left.

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CHEREPET', an urban-type settlement in Suvorov Raion, Tula Oblast, RSFSR. Cherepet' is situated on the Cherepet' River, a tributary of the Oka. It has a railroad station on the Tula-Kozel'sk line. The settlement has enterprises of the railroad industry. [29–214–1]

CHEREPET' STATE REGIONAL HYDROELECTRIC POWER PLANT, a steam power plant in the city of Suvorov, Tula Oblast, RSFSR. The plant has an installed capacity of 1,500 megawatts (MW), supplied by four 150-MW and three 300-MW turbines in unit with boilers. Brown coal from fields near Moscow is used as

fuel in the 150-MW units, and hard coal from the Kuznetsk Coal Basin is used in the 300-MW units. The water supply circulates from a reservoir and cooling plant on the Cherepet' River. Construction of the plant began in 1950; the first unit went into operation in 1953, and the seventh in 1966. Power is transmitted over high-voltage lines at voltages of 110 and 220 kilovolts to the Integrated Electric Power Grid of the USSR. [29–213–4]

CHEREPNIN, LEV VLADIMIROVICH. Born Mar. 30 (Apr. 12), 1905, in Riazin'; died June 12, 1977, in Moscow. Soviet historian specializing in Russian history of the feudal period, the study of sources, historiography, and subsidiary historical disciplines. Academician of the Academy of Sciences of the USSR (1972); Honored Scientist of the RSFSR (1970). Member of the CPSU from 1957.

Cherepnin passed his university examinations in 1925, and in 1929 he completed graduate study at the Institute of History of the Russian Association of Scientific Research Institutes of Social Sciences. In 1946, Cherepnin became a senior research worker at the Institute of History of the Academy of Sciences of the USSR (after reorganization in 1968, the Institute of the History of the USSR of the Academy of Sciences of the USSR). In 1951 he was made head of the section dealing with the feudal period in the territory now encompassed by the USSR. In 1969 he became head as well of the department for the history of precapitalist formations on the territory of the USSR. Cherepnin taught at various higher educational institutions, including Moscow State University; he became a professor in 1947.

Cherepnin wrote more than 350 scholarly works. A central concern of his research was the formation of the centralized Russian state; in addition to problems of sources and general theoretical questions, he dealt with specific historical problems of the state's formation. He studied the periodization of Russian history of the feudal period and the socioeconomic and political history of old Russian society during the tenth to 13th centuries. He also studied the development of estate monarchy and absolutism in Russia, the class and political struggle of the 14th to 17th centuries, and the typology of the historical process during the period of feudalism.

Cherepnin was one of the first Soviet scholars to work on the theoretical and methodological problems connected with the study of sources. In a series of works he dealt with important problems of historiography, with leading Russian and Soviet historians, and with major issues in the development of Soviet historical science. He subjected contemporary bourgeois historiography to criticism. Cherepnin wrote both scholarly works and textbooks dealing with subsidiary historical disciplines. He founded one of the Soviet schools of Russian medieval history. In 1970 he became vice-president of the International Commission for the History of Representative and Parliamentary Institutions.

Cherepnin received the M. V. Lomonosov Prize in 1957 and the State Prize of the Moldavian SSR in 1972. Cherepnin was also awarded the Order of the Red Banner of Labor and various medals.

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V. D. NAZAROV [29–214–3]

CHEREPNIN, NIKOLAI NIKOLAEVICH (also N. K. Tcherepnin). Born May 3 (15), 1873, in St. Petersburg; died June 27, 1945, in Issy-les-Moulineaux, near Paris. Russian composer, conductor, and teacher.

Cherepnin graduated from the faculty of law at the University of St. Petersburg in 1895; in 1898 he graduated from the St. Petersburg Conservatory, where he had studied with N. A. Rimsky-Korsakov. He conducted concerts of the Russian Society of Music and the Beliaev Symphony Concerts; he was a conductor at the Mariinskii Theater from 1906 to 1909 and at the St. Petersburg People's House from 1908 to 1913. From 1909 to 1914, Cherepnin took part in the Russian Seasons Abroad.

In 1905, Cherepnin began teaching classes in conducting at the St. Petersburg Conservatory, where he became a professor in 1909; his pupils included A. K. Gauk, V. A. Dranishnikov, and S. S. Prokofiev. From 1918 to 1921 he was director of the Tbilisi Conservatory. In 1921 he emigrated to Paris, where he founded the Russian Conservatory.

Although Cherepnin was in his later career influenced by the impressionist composers, his music, especially his early works, reflects the classic traditions of Russian music. His finest works are symphonic program compositions, such as the prelude *La Princesse lointaine* (1896), and such ballets as *Le Pavillon d'Armide* (1903; staged 1907) and *Narcissus and Echo* (1911). Cherepnin also composed operas, instrumental and vocal chamber works, and choral works, including *Do Not Weep Over the Corpses of Fallen Warriors*.

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CHEREPOVETS, a city under oblast jurisdiction and the administrative center of Cherepovets Raion, Vologda Oblast, RSFSR. Located on the Volga-Baltic Waterway. Port on the Rybinsk Reservoir. Railroad station on the Vologda-Leningrad line. Population, 246,000 (1977; 32,000 in 1939). The city is divided into two districts.

Cherepovets originated as a *sloboda* (tax-exempt settlement) near the Voskresenskii Monastery, which was founded in the 14th century. Cherepovets became a city in Novgorod Namestnichestvo (vicegerency) in 1777 and the capital of a district of Novgorod Province in 1780. The population of the city, which is situated on the Sheksna River, worked on the Mariinskaia Water System. Cherepovets was the administrative center of Cherepovets Province from 1918 to 1927 and then became the administratuve center of a raion in Leningrad Oblast. Since 1937 it has been the administrative center of a raion in Vologda Oblast. During the Soviet period the city has become an industrial center.

Cherepovets is an important center of ferrous metallurgy and the chemical industry; in addition to the Cherepovets Metallurgical Works, these industries are represented by a steel-rolling mill, a chemical plant, and a nitrogenous fertilizer plant. The city has a plywood and furniture combine and ship-building and ship repair yards. It also produces metal structural components, garage equipment, and building materials. Cherepovets has a pedagogical institute, a branch of the Northwest Correspondence Polytechnic Institute, metallurgical and forestry machinery technicums, and medical and music schools. There is a museum of local lore with an art department featuring paintings by V. V. Vereshchagin, a native of Cherepovets.

Cherepovets consists of a small old section, whose main street is Sovetskaia, and a new section, dating from the late 1950's, where the Leningrad State Institute for the Design of Metallurgical Plants is located. The new section was built according to a general plan (1951–58, architects A. A. Ol' and others), and its principal streets, such as Lenin, Metallurgi, Lomonosov, and Stalevary, are lined with large-block and large-panel buildings. Mass housing construction is under way, and a number of large public buildings have been erected, including a motion-picture theater (1958, architects I. V. Zholtovskii and others) and the Palace of Metallurgists. Cherepovets was awarded the Order of the Red Banner of Labor in 1977.

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[29–216–3]

CHEREPOVETS METALLURGICAL PLANT (full name, 50th Anniversary of the USSR Cherepovets Metallurgical Works), one of the largest enterprises of ferrous metallurgy in the USSR, working on a complete, closed metallurgical cycle. Located in the city of Cherepovets, Vologda Oblast, on the V. I. Lenin Volga-Baltic Waterway, the plant is part of the coal and metallurgical base of the Northwestern Region of the RSFSR; it was designed to use iron-ore concentrates from the Kola Peninsula deposits, coking coals of the Pechora Coal Basin, and ferrous scrap metal. Plant construction began in 1948, and the first pig iron was produced in 1955.

The plant specializes in the production of coke, pig iron, and sheet and standardized rolled products made of carbon and low-alloy steels, as well as curved sections. Approximately 10 percent of the output is exported to 45 countries. Construction of the second stage of the plant, designed to double plant capacity, was undertaken in 1974. The second stage includes a model 2000 wide-strip sheet mill with a capacity of 6 million tons per year (its first stage was put into operation in 1976), oxygen furnaces with a capacity of 350 tons each, and a blast furnace with a usable capacity of 5,580 cu m. In 1966 the Cherepovets Metallurgical Plant was awarded the Order of Lenin. [29–217–1]

CHEREPOVETS RESERVOIR (Sheksna Reservoir), a reservoir formed by the dam of the Cherepovets Hydroengineering Complex on the Sheksna River, Vologda Oblast, RSFSR. It consists of two sections: the river section and the Lake Beloe section. The reservoir was filled in 1963 and 1964. It has an area of 1,670 sq km, a volume of 6.5 cu km, and a length of 167 km; the greatest width is 20 km, and the average depth is 4 m. The water level varies over a range of 1.2 m as a result of seasonal regulation of runoff. The reservoir was created for water transport (it is part of the Volga-Baltic Waterway) and electric power generation. The cities of Belozersk and Kirillov are located on the Cherepovets Reservoir. [29–217–2]

CHEREVICHENKO, IAKOV TIMOFEEVICH. Born Sept. 30 (Oct. 12), 1894, in the village of Novoselovka, in what is now Orlovskii Raion, Rostov Oblast; died July 4, 1976, in Moscow. Soviet military commander; colonel general (1941). Member of the CPSU from 1919.

The son of a peasant, Cherevichenko fought in World War I as a senior noncommissioned officer. He entered the Red Guards in November 1917, later joining the Red Army. Cherevichenko served in the Civil War of 1918–20 as a platoon leader, a squadron commander, and a cavalry regiment commander. He graduated from cavalry courses in 1921, the Higher Cavalry School in 1924, and the M. V. Frunze Military Academy in 1935. In July 1940 he was appointed commander of the Odessa Military District.

During the Great Patriotic War of 1941–45, Cherevichenko was commander of the Ninth Army from June to September 1941, the Twenty-first Army from September to October 1941, the Southern Front from October to December 1941, and the Briansk Front from December 1941 to February 1942. He served as deputy commander of the Crimean and Northern Caucasus fronts from April to August 1942, commander of the Black Sea Group of Forces from September to October 1942, troop commander of the Fifth Army from October 1942 to February 1943, deputy troop commander of the Northwestern Front from April to September 1943, and commander of the Kharkov Military District in 1943 and 1944. In April 1945, he was appointed commander of a rifle corps on the First Byelorussian Front. Cherevichenko held various command positions after the war, retiring in May 1950.

Cherevichenko was a deputy to the first convocation of the Supreme Soviet of the USSR. He was awarded two Orders of Lenin, the Order of the October Revolution, four Orders of the Red Banner, the Order of Kutuzov First Class, the Order of Suvorov Second Class, the Order of the Red Star, and various medals. [29–186–4]

CHEREVICHNYI, IVAN IVANOVICH. Born Mar. 18 (31), 1909, in Ol'viopol', now Pervomaisk, Nikolaev Oblast; died Feb. 15, 1971, in Moscow. Soviet polar aviator. Hero of the Soviet Union (1949). Member of the CPSU from 1932.

From 1928 to 1930, Cherevichnyi studied at the Moscow Aviation School of the Society for Assistance to Defense, Aviation, and Chemical Construction; he later worked as a flight instructor. He became involved in polar aviation in 1934. Cherevichnyi reconnoitered several air routes in Siberia, including the Yakutsk-Kolyma route, and participated in the removal of I. D. Papanin's expedition from the ice island research station SP-1 in 1938. He also conducted ice reconnaissance in the Kara Sea and Laptev Sea and piloted vessels along the Northern Sea Route. In 1941 he headed an air expedition that made several ice landings in the airplane *SSSR N-169* in the Arctic Basin, and he was the first to reach the relatively inaccessible polar area. In 144 hours of flight time, the airplane piloted by Cherevichnyi covered a distance of 26,000 km. Cherevichnyi was a member of many high-latitude air expeditions (1948–55 and 1958–60). He commanded the air squadron in the first Soviet antarctic expedition (1955–57). Cherevichnyi was awarded three Orders of Lenin, five other orders, and various medals. [29–187–1]

CHEREVIKI, an old Russian name for leather footwear. In the Ukraine, *chereviki* are colored or, on occasion, black leather shoes with high heels and sharply pointed toes. In the northern areas of Russia, women wear shoes called *chereviki* on holidays. The Russian *chereviki* are frequently similar in design to the Ukrainian. [29–186–3]

CHERGA, a mountain range in the northwestern Altai; drainage divide between the Peschanaia and Sema rivers. The Cherga Range is approximately 120 km long and, in the south, up to 2,009 m high. The range is composed primarily of intensively dissected mountains of medium elevation, which are made up of sandstones and shales. Forest steppes and pine forests are found on the slopes. At higher elevations, mountainous taiga featuring larch and nut pine–fir forests is encountered. [29–185–1]

CHERGUI, CHOTT ECH, a *sebkha* (closed salt lake) in Algeria, north of the Saharan Atlas Mountains; situated at an elevation of 987 m. Chott Ech Chergui is actually a chain of three lakes joined together by narrow channels that dry up seasonally. The lakes stretch for a total of about 150 km; their width varies from a few kilometers to several dozen kilometers. The salt layer that forms on the surface during dry periods reaches a thickness of several dozen centimeters in some places. [29–1379–3]

CHERIKOV, a city and the administrative center of Cherikov Raion, Mogilev Oblast, Byelorussian SSR. Cherikov is located on the Sozh River, 32 km from the Krichev railroad junction, from which lines run to Mogilev, Orsha, Vorozhba, and Roslavl'. The city has a canned goods and starch combine, a branch of the Chausy creamery, and a brickyard. [29–220–2]

CHERIN'KO, IVAN IVANOVICH. Born July 22 (Aug. 4), 1908, in the village of Den'gi, in what is now Zolotonosha Raion, Cherkassy Oblast; died Oct. 6, 1948, in Ashkhabad. Soviet painter. Honored Art Worker of the Turkmen SSR (1945).

Cherin'ko studied at the Kiev Art Institute from 1926 to 1931 under B. F. Uits and M. D. Bernshtein. He was chairman of the administrative board of the Artists' Union of Turkmenistan in 1938 and from 1945 to 1948. He taught in the Sh. Rustaveli Turkmen Art School from 1933 to 1936 and from 1938 to 1940.

Cherin'ko played an important role in educating professional Turkmen artists and in promoting the method of socialist realism in the art of Soviet Turkmenistan. He painted thematic pictures, portraits, and landscapes dealing with social transformations in Soviet Turkmenia, such as *The Smithy* (1928), *The Bey: The*

Powers That Be (1940), *The Daring Horseback Riders* (1944–46), and *Spring in Bagir* (1947). These works by Cherin'ko are on exhibit in the Museum of Fine Arts of the Turkmen SSR, in Ashkhabad. [29–220–3]

CHERKASOV, NIKOLAI KONSTANTINOVICH. Born July 14 (27), 1903, in St. Petersburg; died Sept. 14, 1966, in Leningrad. Soviet Russian actor. People's Artist of the USSR (1947). Member of the CPSU from 1940.

From 1923 to 1926, Cherkasov studied at the Leningrad Institute of Stage Arts. He appeared with the Leningrad Theater for Young Audiences and in 1933 joined the A. S. Pushkin Drama Theater in Leningrad. He also performed in the *estrada* (variety stage) trio Pat, Patashon, and Charley Chaplin. Cherkasov, an actor of extraordinary versatility, expressed great socialist optimism and profound devotion to the Communist Party in his roles. He masterfully portrayed a number of famous historical figures. He became famous for his performance of Professor Polezhaev in the film *Baltic Deputy* (1937), a turning point in the development of the Soviet cinema.

Cherkasov subsequently played a number of roles on the stage, including the title role in A. N. Tolstoy's *Peter the Great*, M. Gorky in Kapler and Zlatogorova's *Stormy Year*, Ivan the Terrible in Solov'ev's *His Supreme Majesty*, I. V. Michurin in Dovzhenko's *Life in Blossom*, and V. V. Mayakovsky in Katanian's *They Knew Mayakovsky*. Cherkasov earned a place in motion-picture history for his performances of Tsarevich Aleksei in *Peter the Great* (1937–39) and the title roles in *Alexander Nevsky* (1938) and *Ivan the Terrible* (parts I and II, 1945 and 1958).

Cherkasov was also an outstanding comedian, occasionally tending toward the grotesque. In 1929 he performed in the Moscow and Leningrad music halls and then in the Leningrad Komediia Theater. He gave distinct interpretations of the role of Don Quixote—in the play of that name (1957) and in a film version of Cervantes' novel. Cherkasov was very successful in his film role of Paganelle in *Captain Grant's Children* (1936). His rendering of the role of Dronov in Aleshin's *Everything Is Left to the People*, both on the stage and in the film of 1963, was one of his most outstanding dramatic successes. He was also highly successful as General Khludov in Bulgakov's play *Flight*.

Cherkasov was a member of the Soviet Committee for the Defense of Peace. He was the author of the books *In India* (1952), *Notes of a Soviet Actor* (1953), *The Fourth Don Quixote* (1958), and *In the Theater and The Cinema* (1961). He was a deputy to the first and second convocations of the Supreme Soviet of the RSFSR and the third and fourth convocations of the Supreme Soviet of the USSR. He was awarded the Lenin Prize (1964), the State Prize of the USSR (1941, 1946, 1950, and twice in 1951), two Orders of Lenin, three other orders, and various medals.

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IU. A. ZUBKOV [29–220–4]

CHERKASSKII, ABRAM MARKOVICH. Born June 25 (July 7), 1886, in Belaia Tserkov'; died Nov. 30, 1967, in Alma-Ata. Soviet painter. People's Artist of the Kazakh SSR (1963).

Cherkasskii studied at the Kiev Art School under A. A. Murashko from 1901 to 1909 and at the St. Petersburg Academy of Arts under N. N. Dubovskii, V. E. Savinskii, and Ia. F. Tsionglinskii from 1909 to 1917. He was one of the first in the Ukraine to address the theme of Soviet peasant life (*At the Tractor*, 1928, Museum of Ukrainian Fine Arts of the Ukrainian SSR, Kiev). In 1941 he settled in Kazakhstan. He taught at the N. V. Gogol Art School in Alma-Ata from 1941 to 1958. As both a teacher and an artist, Cherkasskii played an important role in the training of professional Kazakh artists. His pupils included S. Mambeev and K. Tel'zhanov. Cherkasskii painted lyrical and epic landscapes, often executed in broad energetic strokes. His works also include thematic compositions, portraits (*People's Artist of the Kazakh SSR K. U. Badyrov*, 1958, T. G. Shevchenko Kazakh Art Gallery, Alma-Ata), and still lifes. Cherkasskii was awarded the Order of the Badge of Honor and a medal.

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CHERKASSKII, ALEKSEI MIKHAILOVICH. Born Sept. 28 (Oct. 8), 1680, in Moscow; died there Nov. 4 (15), 1742. Russian state figure; prince.

From 1719 to 1724, Cherkasskii was governor of Siberia. He became a senator and a privy councillor in 1726. Cherkasskii helped strengthen the autocracy of Anna Ivanovna by acting in opposition to the Supreme Privy Council. During the 1730's he was an advocate of close alliance with England. Cherkasskii was appointed grand chancellor, the de facto head of Russian foreign policy, in 1740. [29–226–2]

CHERKASSKII, IAKOV KUDENETOVICH (also Uruskan Cherkasskii). Date and place of birth unknown; died July 8 (18), 1666, in Moscow. State, political, and military figure in 17th-century Russia; boyar (1645); wealthy landowner.

A descendant of Kabardinian princes (*see* CHERKASSKII), Cherkasskii moved to Russia and was baptized in 1624. In 1648 he took part in a power struggle as the head of a boyar faction opposed to B. I. Morozov. After Morozov was exiled on June 12, 1648, Cherkasskii became the head of the government, but he was removed from all his posts upon Morozov's return to Moscow on Oct. 26, 1648. Cherkasskii took part in the Russo-Polish War of 1654–67 and the Russo-Swedish War of 1656–58. [29–227–1]

CHERKASSKII, VLADIMIR ALEKSANDROVICH. Born Feb. 2 (14), 1824, in Chern' District, Tula Province; died Feb. 19 (Mar. 3), 1878, in San Stefano, now Yeşilköy, Turkey. Russian public figure; prince.

Cherkasskii graduated from the law faculty of Moscow University in 1844. He was close to the Slavophiles and contributed to the journal *Russkaia beseda*. As a member of the Tula provincial committee and the Editing Commissions, Cherkasskii took part in the preparations for the abolition of serfdom; he advocated supplying the peasants with land in return for redemption payments. He served as the *mirovoi posrednik* (official assisting in the implementation of the Peasant Reform of 1861) of Tula Province from 1861 to 1863.

Until 1866, Cherkasskii was chief director of the government commission for the internal and spiritual affairs of the Kingdom of Poland. Together with N. A. Miliutin and Iu. F. Samarin, he drafted the law granting Polish peasants ownership of the land they used. In the early 1870's he served as *gorodskoi golova* (mayor) of the city of Moscow; he was the initiator of a liberal appeal to Alexander II. During the Russo-Turkish War of 1877–78, Cherkasskii was in charge of Red Cross work with the army in the field and headed the civil administration in Bulgaria.

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P. A. ZAIONCHKOVSKII [29–226–3]

CHERKASSKII, a princely family that originated in Russia during the second half of the 16th century. The first Cherkasskiis were primarily rulers of Kabarda who were descendants of Idar Murza and who had gone into Russian service. The name "Cherkasskii" derives from the Russian word *cherkasy*, which means Circassians; the Northern Caucasian Adyg tribes were often referred to in medieval literature as Circassians.

In Russia the Cherkasskii family belonged to the upper stratum of the ruling class. A list of the most famous members of the family from the 16th through the 19th century follows.

Mikhail (Saltankul) Temriukovich Cherkasskii, a son of the Kabardinian prince Temriuk Idarovich, moved to Russia in 1558 and became an appanage service prince and a prominent *oprichnik* (*see* OPRICHNINA). He died, or was executed, in 1571. His sister Mariia (Kuchenei) Temriukovna Cherkasskaia was the second wife of Tsar Ivan IV.

Prince Dmitrii (Kanshov) Mamstriukovich Cherkasskii (died 1651) entered Russian service in the late 16th century and was close to the Second False Dmitrii from 1608 to 1610. He was a member of the *zemskii sobor* (national assembly) of 1613 and became a boyar in 1619. With his death the line of Temriuk came to an end.

Boris (Khoroshai) Kambulatovich Cherkasskii (died 1601) was a nephew of Temriuk's. He entered Russian service in 1557 and held high military posts during the 1580's and early 1590's. He became a boyar in 1591.

Boris' son Prince Ivan Borisovich Cherkasskii became a boyar in 1613. After the death of Filaret in 1633, he was the de facto head of the Russian government.

In the mid-17th century Iakov (Uruskan) Kudenetovich Cherkasskii was the most prominent member of Boris' branch of the family. With the death of Aleksei Mikhailovich Cherkasskii in 1742, this branch of the family came to an end.

Prince Grigorii (Sunchalei) Sunchaleevich Cherkasskii went to Moscow in 1642 and became a boyar in 1657. He served as *voevoda* (military governor) in Astrakhan from 1660 to 1663 and was murdered on his patrimonial estate in 1672.

Grigorii's grandson Mikhail Alegukovich Cherkasskii (died first quarter of the 18th century) became a boyar in 1677 and occupied a prominent position under Peter I.

Mikhail's grandson Petr Borisovich Cherkasskii (died 1768) was governor of Moscow during the reign of the empress Elizabeth.

Vladimir Aleksandrovich Cherkasskii (1824–78) was a descendant of Mikhail Alegukovich.

There were also branches of the Cherkasskii family that did not stem from descendants of Idar. Prince Vasilii (Kazyi) Kardanukovich Cherkasskii, who moved to Russia in the late 1570's and became an appanage service prince, was from a family of Abaza murzas. The Agamashukov-Cherkasskii family, which existed from the mid-16th to the mid-17th century, was descended from Beslenei princes. The Egupov-Cherkasskii family existed from the early 17th century to the mid-19th century. Other families included the Bekovich-Cherkasskii family, which was founded at the end of the 17th century by Aleksandr Bekovich-Cherkasskii.

V. D. NAZAROV [29–225–1]

CHERKASSKOE, an urban-type settlement in Vol'sk Raion, Saratov Oblast, RSFSR. Cherkasskoe is located 15 km from the Chernavka railroad station on the Saratov-Syzran' line. Enterprises include an industrial combine, a mechanized forestry farm, and a fruit-tree nursery. [29–227–2]

CHERKASSKOE, an urban-type settlement in Slaviansk Raion, Donetsk Oblast, Ukrainian SSR. Cherkasskoe is located near the Shidlovskaia railroad station on the Slaviansk-Lozovaia line. It has a chalk and lime plant and a cannery that is part of the Slaviansk Food-processing Combine. [29–227–3]

CHERKASSY, a city and the administrative center of Cherkassy Oblast, Ukrainian SSR. Railroad and highway junction; port on the right bank of the Kremenchug Reservoir. Population, 229,000 (1977; 52,000 in 1939, 85,000 in 1959, 158,000 in 1970). Cherkassy is divided into two raions.

Cherkassy was first mentioned in 1394 as part of the Kievan Principality, then ruled by Lithuania. After the Union of Lublin in 1569 it was seized by Poland. On several occasions the population took part in the peasant and cossack uprisings of the 16th and 17th centuries, and the city supported B. Khmel'nitskii. In 1648, Cherkassy became the headquarters of the Cherkassy Cossack Regiment. Under the Armistice of Andrusovo in 1667 it remained under Polish rule. Cherkassy became part of the Russian empire in 1793, a district capital in 1795, and part of Kiev Province in 1797.

Soviet power was established in Cherkassy on Jan. 16 (29), 1918. During the Civil War the city fell to the Germans and A. I. Denikin's forces; Soviet power was reestablished in December 1919. In 1932, Cherkassy became the administrative center of a raion in Kiev Oblast. The city was occupied by fascist German troops from Aug. 22, 1941, through Dec. 14, 1943. It became an oblast administrative center in 1954.

The economy of Cherkassy is dominated by machine building, the chemical industry, light industry, and the food-processing industry. Enterprises of the machine-building industry manufacture machinery for the food-processing industry. The chemical industry is represented by a chemical combine and plants for the production of chemical fibers and yarn and chemical reagents. The city's light industry is represented by a silk-fabric combine, a garment production association, and plants for the production of absorbent cotton and knitwear. Enterprises of the food-processing industry include a sugar refinery, a milk plant, a brewery, a cannery, and a meat-packing plant.

Enterprises built after the war include a prefabricated-housing combine and plants for the production of telegraph equipment, silica bricks, and construction machinery and equipment. Plants of light industry and the food-processing, chemical, metalworking, and building-materials industries were modernized.

Cherkassy has retained the regular street plan it was given in 1828 by the architect V. I. Geste. In the Soviet period multistory apartment buildings have been constructed, as well as such large public buildings as the House of Soviets (1959, architect V. I. Shtokman), the railroad station (1965, architects L. M. Chuprin and others), the T. G. Shevchenko Theater of Music and Drama (1964), the hotel Turist (1970, architects N. B. Chmutina and others, engineer A. V. Lozovskii), and an enclosed market (1971).

In addition to the Monument to Eternal Glory (1975, sculptors G. N. Kal'chenko, E. M. Kuntsevich, and B. P. Mikitenko, architects A. F. Ignashchenko and A. S. Ren'kas), the city has monuments to V. I. Lenin (1969, sculptor K. A. Kuznetsov) and T. G. Shevchenko (1964, sculptors M. K. Vronskii and A. P. Oleinik).

Cherkassy's educational institutions include a pedagogical institute, the department of general technology of the Kiev Construction Engineering Institute, and technicums of electrification and agricultural construction, finance, Soviet trade, and cooperation. The city has medical, music, and fire-fighting schools. Cultural institutions include a theater of music and drama, a puppet theater, a philharmonic society, a planetarium, and a museum of local lore.

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[29–227–4]

CHERKASSY OBLAST, part of the Ukrainian SSR. Formed on Jan. 7, 1954. Area, 20,900 sq km. Population, 1,552,000 (Jan. 1, 1977). Cherkassy Oblast is divided into 20 raions and has 15 cities and 19 urban-type settlements. The administrative center is the city of Cherkassy. The oblast was awarded the Order of Lenin on Feb. 26, 1958.

Natural features. Cherkassy Oblast is situated along the middle course of the Dnieper River. Most of the oblast lies along the right bank of the river within the Dnieper Upland and has a maximum elevation of 270 m. Adjoining the Dnieper River valley are the Kanev Hills and the Moshnogorskii Ridge, which rises 160–180 m above the Dnieper. The smaller part of the oblast, along the left bank of the river, lies in the Dnieper Lowland, where elevations do not exceed 150 m.

The oblast has a moderate continental climate, with mild winters and warm summers. The average January temperature is −5.9°C, and the average July temperature is 19.5°C. Annual precipitation is 450–520 mm, and the growing season lasts approximately 210 days. The oblast's rivers are in the basins of the Dnieper and Iuzhnyi Bug. The principal river, the Dnieper, flows within the oblast for 150 km; its water level has been raised considerably by the Kremenchug and Kanev reservoirs. Right tributaries of the Dnieper in the oblast are the Ros', Ol'shanka, and Tiasmin; left tributaries include the Supoi and Sula. The basin of the Iuzhnyi Bug includes the Gornyi Tikich and the Gniloi Tikich rivers.

In the right-bank area of the oblast, the soil cover is primarily made up of podzolic and average-humus chernozems; the upland

areas have gray and light-gray podzols. Soddy-gley, thick meadow, and sod-podzol soils are widespread in the area along the left bank. Forests, predominantly oak forests, occupy approximately one-sixth of the oblast; near Cherkassy there is a large forest tract known as the Cherkassy Pine Forest. Steppe vegetation has remained along the edges of the forests and on the slopes of *balki* (small flat-bottomed valleys).

The forests are inhabited by elk, deer (including roe deer), wild boars, squirrels, wolves, foxes, hare, and marten. Along the river banks and the shores of lakes and ponds live beavers, otters, wild ducks, and birds of the suborder Limicolae. In the waters of the oblast swim European bream, Eurasian perch (*Perca fluviatilis*), pike, pike perch, and domesticated carp.

Population. According to the 1970 census, Ukrainians make up 92.8 percent of the oblast's population, Russians approximately 6 percent, and Jews approximately 0.7 percent. In 1977 the average population density was 74.3 persons per sq km, reaching 100 persons per sq km in the urban areas and near the Dnieper; 44 percent of the population was urban. The principal cities are Cherkassy, Uman', Smela, Zvenigorodka, Zolotonosha, Kanev, and Shpola.

Economy. The electric power industry is based on the Cherkassy District Heat and Power Plant; the Kanev Hydroelectric Power Plant went into operation in 1972. Brown coal is mined in Zvenigorodka Raion, and peat is extracted in Cherkassy Raion. The oblast is supplied with natural gas from Shebelinka, and is crossed by a natural-gas pipeline that extends from Orenburg to the western border of the USSR; the pipeline was laid in 1978 by member countries of the Council for Mutual Economic Assistance (COMECON).

The food-processing industry produces the greatest share of the oblast's gross output. In 1976 sugar factories, located mainly in the right-bank area, produced 524,000 tons of granulated sugar and 254,000 tons of refined sugar. Cherkassy's cannery, which is capable of turning out more than 100 million standard cans annually, and tobacco factory produce for the entire country. Also highly developed are meat packing (Cherkassy, Uman', and Vatutino), distilling, flour milling, brewing, and dairying.

The oblast has machine-building plants in Cherkassy, Smela, Uman', Kamenka, and Monastyrishche; a machine-tool plant in Korsun'-Shevchenkovskii; an electrical machinery and repair plant in Smela; and an instrument-making plant in Uman'.

During the ninth five-year plan (1971–75) the output of chemical products increased by a factor of 2.5. A large plant for the production of chemical fibers and yarn and a chemical combine have been built in Cherkassy, and a plant for the production of chemical reagents is being enlarged. Light industry is represented by a combine producing silk fabrics, a garment production association, and plants for the production of absorbent cotton, knitwear, fine cloth articles, and fulled felt fabric, all located in Cherkassy. There are hemp mills in Zolotonosha and Irkliev and a cotton factory in Steblev.

The wood-products industry is represented by such production associations as Cherkassymebel'. The construction industry has developed rapidly. The oblast has a prefabricated-housing combine, and there are plants for the production of silica bricks and construction machinery and equipment in Cherkassy. Brickyards are located in numerous raions, including Zolotonosha, Uman', Gorodishche, and Zhashkov raions, and there are granite quarries in Uman', Zvenigorodka, and Gorodishche raions. A plant for the production of fired refractory materials, which uses refractory clays from the Novoselitsa deposits, has been constructed; in 1978 construction was nearing completion on a combine for the production of bentonite clays in Lysianka Raion.

Agriculture is oriented toward the cultivation of sugar beets and grains, along with other vegetables and fruit. There is also livestock raising for meat and dairy products. In 1976 the oblast had 389 kolkhozes and 58 sovkhozes; 70 percent of the oblast was agricultural land, of which 91 percent was plowland and 7 percent was pastures and hayfields. The total sown area in that year was 1,320,700 hectares (ha): 609,000 ha were cultivated with such grains and legumes as winter wheat, spring barley, peas, maize, and millet; 201,700 ha with such industrial crops as sugar beets; 74,200 ha with potatoes; 21,800 ha with other vegetables; and 410,000 ha with feed crops. Tree-fruit and small-fruit plantings occupied 48,000 ha, and there were 34,000 ha suitable for dry farming.

In 1976 the livestock population included 887,000 head of cattle (including 320,800 cows), 936,400 swine, and 280,900 sheep and goats. There is poultry farming, and a fur farm for the production of mink pelts has been established near Moshny.

The oblast has 605 km of railroad lines, exclusive of spur lines. The most important trunk lines are Kiev-Dnepropetrovsk, Moscow-Odessa, and Donetsk-L'vov; the principal rail junctions are T. G. Shevchenko and Khristinovka. There are 6,500 km of roads, including 4,700 km of hard-surface roads. The main highways are Kiev-Dnepropetrovsk and Kiev-Odessa. There is navigation on the Dnieper. Air routes connect Cherkassy with Kiev, various oblast administrative centers, and many cities in the Ukrainian SSR.

Education, cultural affairs, and public health. In the 1976–77 academic year Cherkassy Oblast had 785 general-education schools of all types, with an enrollment of 241,700; 25 vocational-technical educational institutions, with an enrollment of 12,800; and 20 specialized secondary educational institutions, with an enrollment of 18,100. In that year 8,500 students attended the oblast's three higher educational institutions—a pedagogical institute in Cherkassy and pedagogical and agriculture institutes in Uman'—and the department of general technology of the Kiev Construction Engineering Institute, in Cherkassy. In 1976 approximately 71,700 children were enrolled in 821 preschool institutions.

In 1976 the oblast had 1,045 public libraries, with more than 13,600 copies of books and periodicals, and seven museums: museums of local lore in Cherkassy and Uman'; a literary-memorial museum in Kamenka dedicated to A. S. Pushkin and P. I. Tchaikovsky, both of whom visited the city; the Museum of the History of the Battle at Korsun'-Shevchenkovskii, in Korsun'-Shevchenkovskii; the T. V. Shevchenko memorial grave site, a museum-preserve, in Kanev; the T. G. Shevchenko Literary-Memorial Museum, in the village of Shevchenkovo; and the I. S. Nechui-Levitskii Literary-Memorial House-Museum, in the village of Steblev, the writer's birthplace. The oblast has two theaters, both located in Cherkassy: a theater of music and drama and a puppet theater. Other cultural and educational institutions and facilities include 948 clubs, 961 stationary motion-picture projection units, and 24 extracurricular institutions.

There are two oblast-level newspapers, both published in Ukrainian: *Cherkas'ka pravda* (Cherkassy Pravda), founded in 1918, and the Komsomol newspaper *Molod' Cherkashchyny* (Youth of Cherkassy), founded in 1960. The oblast receives two programs of All-Union Radio for a total of 44 hours daily, information broadcasts of republic radio for a total of 19 hours daily, combined national and republic broadcasts for 19 hours daily, and local broadcasts for 1.1 hours daily; programming is in Ukrainian and Russian. Programs of Central Television are transmitted for a total of 13 hours daily, and republic television programming in Russian and Ukrainian is broadcast for 11.2 hours daily.

As of Jan. 1, 1977, there were 162 hospitals, with 18,000 beds (11.6 beds per 1,000 inhabitants), and 3,800 physicians (1 physician per 409 inhabitants). The climatic health resort Sosnovka is located in the oblast, which also has sanatoriums and houses of rest.

Tourism is highly developed in Cherkassy Oblast, whose principal tourist itineraries are in the regions of the Kremenchug Reservoir, the Dnieper, and the cities of Cherkassy, Kanev, Korsun'-Shevchenkovskii, and Uman', where the Sofievka Arboretum is located. There are tourist centers in Cherkassy and Kanev and at the Kremenchug Reservoir.

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F. N. Nepiivoda and V. K. Sobchenko [29–222–1]

CHERKESKA, the Russian name for a man's outer garment once common among many peoples of the Caucasus, including the Georgians, Circassians, Abkhazians, and Tsakhurs; it was also adopted by the Terek and Kuban' cossacks.

The *cherkeska* is a caftan with a single, unfastened opening down the front and no collar. It is usually black, brown, or gray and may be made from hand-woven or ready-made cloth. The *cherkeska* normally falls a little below the knee. It is gathered and pleated at the waist and is tied with a narrow belt. The sleeves are long and wide. From four to eight *gazyri* (leather pockets) are sewn on each side of the chest; they are designed to hold the wooden cylinders in which the Caucasians used to keep rifle cartridges.

The *cherkeska* is still worn on holidays and for special events, such as folk art performances. [29–229–2]

CHERKESS, the Adyg population of Karachai-Cherkess Autonomous Oblast, including the descendants of the Kabardins who settled in the Kuban' in the first third of the 19th century. According to the 1979 census the Cherkess number 46,500; they speak Kabarda-Cherkess, which belongs to the Abkhazo-Adyg group of the Caucasian languages.

As a general designation for Adygs, the term "Cherkess" appeared in written sources in the 13th century and was used in Russian texts until the first years of Soviet power. Inhabitants of mountainous regions of the Caucasus—including Adygs, Abkhazians, and Ossets—settled in Turkey in the 19th century. The descendants of these settlers also call themselves Cherkess, or Circassians; today they live in such Middle Eastern countries as Turkey and Syria and number approximately 150,000. In foreign sources the ethnonym "Circassians" is still used to refer to all Adygs.

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CHERKESSK (from 1825 to 1931 the *stanitsa* [large cossack village] of Batalpashinskaia; from 1931 to 1939 the city of Batalpashinsk), a city and the administrative center of Karachai-Cherkess Autonomous Oblast, Stavropol' Krai, RSFSR. Situated on the right bank of the Kuban' River. Railroad station on the Nevinnomysskaia-Dzheguta line, a spur of the Armavir-Baku railroad line. Population, 85,000 (1977; 29,000 in 1939, 42,000 in 1959, 67,000 in 1970).

Cherkessk was founded in 1804 as a military fortress on the Kuban' fortifications line at the place where the Russian Army defeated the Turkish military leader Batal Pasha in 1790. It became a district capital of Kuban' Oblast in 1860 and the capital of an *otdel* (military department) of the oblast in 1886. Cherkessk is the starting point of the Sukhumi Military Road, which was built between 1828 and 1878. In 1922 it became the administrative center of Karachai-Cherkess Autonomous Oblast.

In addition to light industry, Cherkessk has sizable machine-building, chemical, electrical-engineering, building-materials, and food-processing industries. The city has plants for the manufacture of refrigeration equipment, chemical products, industrial rubber goods, low-voltage equipment, and cement. Educational institutions include a branch of the Stavropol' Polytechnic Institute, a road transportation technicum, and pedagogical, medical, and music schools. Cherkessk has scientific research institutes of economics, history, and language and literature, a museum of local lore, and a drama theater.

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CHERLAK, an urban-type settlement and the administrative center of Cherlak Raion, Omsk Oblast, RSFSR. A landing on the right bank of the Irtysh River, Cherlak is located 41 km from the Cherlak railroad station and 140 km southeast of Omsk. A division of the Omsk Meat-packing Plant is located in the settlement. [29–230–1]

CHERMASAN, a river in the Bashkir ASSR, a left tributary of the Belaia River of the Volga basin. The Chermasan is 186 km long and drains an area of 3,970 sq km. It rises in the Bugul'ma-Belebei Elevation and is fed primarily by snow. The mean flow rate is 10 cu m per sec. The Chermasan freezes over in November, and the ice breaks up in April. [29–231–1]

CHERMOEV, ABDUL MEDZHID ORTSUEVICH. Born Mar. 3 (15), 1882; died 1936 in Paris. Chechen bourgeois nationalist figure (1917–19). Oil industrialist.

Chermoev graduated from the Nicholas Cavalry School in 1901. His cavalry service included membership in the personal escort of Nicholas II. He retired from the cavalry in 1908. During World War I, Chermoev was an officer in the Caucasian Native Horse Cavalry Division, nicknamed the Wild Division. After the February Revolution of 1917 he was one of the organizers of the counterrevolutionary Union of United Mountaineers and a leader of the bourgeois Terek-Dagestan Government. He supported the intervention of Turkish troops in Dagestan. After Soviet power was established in Dagestan at the end of 1919, Chermoev emigrated and continued his anti-Soviet activities abroad.

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CHERMOZ, a city in Il'inskii Raion, Perm' Oblast, RSFSR. Chermoz, a port on the Kama Reservoir, is situated 60 km from the Dobrianka railroad station and 212 km north of the city of Perm'. It has a log pond. Enterprises include a plant for the production of electrical equipment, and the Chermozskii Sovkhoz, which produces meat, milk, and grain. [29–231–3]

CHERNAIA, a river in the Crimea where a battle between Russian and allied (French, English, Sardinian, and Turkish) forces took place 8–12 km southeast of Sevastopol' on Aug. 4 (16), 1855, during the Crimean War.

In late June 1855, Emperor Alexander II demanded that the commander in chief of the Russian forces in the Crimea, General M. D. Gorchakov, mount a determined offensive to render aid to Sevastopol'. On June 28 (July 10) it was decided at a military council to attack the enemy at the Chernaia River. Preparations for the offensive proceeded slowly and with little attempt at concealment. About 58,000 troops, including 10,000 cavalry and 272 artillery pieces, were massed for the offensive. The enemy forces numbered about 60,000.

Two columns, the left led by General P. P. Liprandi and the right by General N. A. Reada, began the attack at dawn on August 4 (16) but were unable to advance because of insufficient troops, a lack of coordination in their operations, and unsatisfactory leadership by the Russian command. Reserves were brought into battle piecemeal and suffered heavy losses. The battle ended in sporadic skirmishes that were very bitter in some sectors. By 10 A.M. the Russian Army, having lost more than 8,000 men, had been driven from the Chernaia River. The allies' losses were about 2,000. The defeat at the Chernaia worsened the position of the Russian forces in the Sevastopol' area. [29–231–5]

CHERNAIA KHOLUNITSA, an urban-type settlement in Omutninsk Raion, Kirov Oblast, RSFSR. Chernaia Kholunitsa is located on the Chernaia Kholunitsa River, a tributary of the Viatka River, 47 km northwest of the Stal'naia railroad station on the Iar-Lesnaia line. Local industry includes reprocessing of wood. [29–240–3]

CHERNAIA MOGILA, a tenth-century Old Russian kurgan in Chernigov. Chernaia Mogila, which stands 11 m high and has a circumference of 125 m, was excavated by D. Ia. Samokvasov in 1872–73. It contained the cremated remains of two warrriors from the nobility and the slaves who were cremated with them; also in the mound were the remains of sacrificial animals, as well as various vessels, weapons, tools, and ornaments. After the cremation, a preliminary mound, measuring 7 m in height, was erected for the funeral celebration; the coats of mail and helmets were removed from the fire and placed on top of the mound, along with two sacrificial knives, two gold Byzantine coins, a bronze idol, two wisent horns, and a kettle with the bones of a

ram. The silver bands on the wisent horns are decorated with stamped plant designs. The larger horn also bears depictions of fantastical animals and of a man and a woman shooting at birds with bows. The mound was completed after the funerary feast, and a stela was installed at the summit.

Chernaia Mogila was the burial site of high-ranking members of the *druzhina* of a Kievan Rus' prince; it is similar to the large Gnezdovo burial mounds.

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CHERNAIA RADA, a Ukrainian all-cossack *rada* (council) that met near the city of Nezhin on June 17–18 (27–28), 1663.

The Chernaia Rada was convoked in order to elect a hetman of the Left-bank Ukraine after the Polish henchman P. Teteria had been elected hetman of the Right-bank Ukraine. The name of the *rada* derives from the participation in it of not only cossacks but also the *chern'* (peasants and urban lower classes). The *starshina* (cossack officials) nominated V. N. Zolotarenko and Ia. S. Somko for the position of hetman, but the rank-and-file Zaporozh'e cossacks and the representatives of the peasants and urban poor elected I. M. Briukhovetskii. He was supported by the tsarist government and had made demagogic promises to lower taxes and to limit the seizure of land by the *starshina*.

The people's dissatisfaction with the *starshina* during the elections culminated in the destruction of houses owned by merchants and members of the *starshina* in Nezhin and Pereiaslav. The new *starshina* leadership headed by Briukhovetskii, however, continued to oppress the popular masses. Popular uprisings resulted in the Left-bank Ukraine in 1666 and 1668 against the *starshina* and tsarist *voevody* (military governors). [29–239–3]

CHERNAIA RUS', a historical region in the basin of the upper course of the Neman River. Chernaia Rus' included the cities of Grodno, Novgorodok, Slonim, Nesvizh, and Zditov.

Until the 13th century part of Chernaia Rus' was in the Polotsk Principality. Between 1240 and 1260, Chernaia Rus' came under the rule of the Lithuanian prince Mindaugas and the Galician-Volynian princes. Together with the Lithuanian lands, Chernaia Rus' formed the core of the Grand Duchy of Lithuania in the 14th century. [29–239–6]

CHERNELITSA, an urban-type settlement in Gorodenka Raion, Ivano-Frankovsk Oblast, Ukrainian SSR. Chernelitsa is located 27 km from the Gorodenka railroad station. The settlement has food-processing enterprises. [29–240–4]

CHERNENKO, KONSTANTIN USTINOVICH. Born Sept. 11 (24), 1911, in the village of Bol'shaia Tes', in what is now Novoselovo Raion, Krasnoiarsk Krai. Soviet party and state figure. Hero of Socialist Labor (1976). Member of the CPSU since 1931.

The son of a peasant, Chernenko graduated from the Higher School of Party Organizers of the Central Committee of the ACP(B) in 1945 and the Kishinev Pedagogical Institute in 1953. Beginning in 1929 he engaged in Komsomol, soviet, and party work. He served as secretary of the Krasnoiarsk Krai Committee of the party from 1941 to 1943 and as secretary of the Penza oblast committee from 1945 to 1948. In 1948 he became head of the Agitation and Propaganda Department of the Central Committee of the Communist Party of Moldavia.

Chernenko headed a section in the Agitation and Propaganda Department of the Central Committee of the CPSU from 1956 to 1960, the Secretariat of the Presidium of the Supreme Soviet of the USSR from 1960 to 1965, and the General Department of the Central Committee of the CPSU from 1965 to 1976. In 1976 he was made a secretary of the Central Committee of the CPSU. He became a candidate member of the Central Committee of the CPSU in 1966 and a member in 1971. Chernenko was named a candidate member of the Politburo of the Central Committee of the CPSU in 1977 and a member of the Politburo of the Central Committee in 1978. He was a deputy to the seventh through tenth convocations of the Supreme Soviet of the USSR. Chernenko has been awarded two Orders of Lenin, three other orders, and various medals. [29–240–6]

CHERNENKO, SEMEN FEDOROVICH. Born Sept. 1 (13), 1877, in the village of Gremiachki, in what is now Sumy Oblast; died Jan. 17, 1974, in Michurinsk, Tambov Oblast. Soviet scientist and fruit breeder. Hero of Socialist Labor (1966).

In 1933, Chernenko graduated from the Fruit and Vegetable Institute in Michurinsk. In 1926 he joined the staff of the I. V. Michurin Central Genetic Laboratory, and from 1933 to 1952 he also worked at the Fruit and Vegetable Institute in Michurinsk. Chernenko developed winter-hardy apple and pear varieties with various ripening times. The best of these, the Oranzhevoe, Chernenko Pepin, Antonovka Novaia, and Progress apples, have been regionalized in the Central Chernozem Zone of the European part of the USSR, as well as in the Ukraine and the Lithuanian SSR. Chernenko was awarded the State Prize of the USSR in 1947. He received three Orders of Lenin, two other orders, and various medals.

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V. A. KOROVIN [29–241–1]

CHERNETSOV BROTHERS, Russian artists of the first half of the 19th century.

Grigorii Grigor'evich Chernetsov (born Nov. 12 [24], 1802, in Lukh, in present-day Ivanovo Oblast; died June 8 [20], 1865, in St. Petersburg) was a painter and draftsman. He studied with M. N. Vorob'ev at the St. Petersburg Academy of Arts from 1819 to 1827. Nikanor Grigor'evich Chernetsov (born July 21 [Aug. 2], 1805, in Lukh; died Jan. 11 [23], 1879, in St. Petersburg) was a painter and lithographer. He studied at the academy with Vorob'ev from 1823 to 1827. Nikanor traveled in the Caucasus (1829–31) and the Crimea (1833–36). Beginning in 1837 the two brothers worked together; they journeyed on the Volga (1838) and throughout various countries in Europe and the Middle East (1840–43).

Grigorii produced interiors, landscapes, and many-figured compositions. His painting *Review on the Tsarina's Meadow: October 6, 1831* (completed 1837, A. S. Pushkin All-Union Museum, Pushkin) is a collective portrait of all the outstanding figures in the development of Russian culture during the first three decades of the 19th century. Nikanor was primarily a landscapist; an example of his work is *View of Tiflis* (1831, Russian Museum, Leningrad).

The Chernetsov brothers' most important works—drawings, watercolors, and studies—were executed *en plein air* during the journey on the Volga. Also produced during the journey was a 1,981-page folio, in pencil and pen, depicting the shores of the Volga (completed 1851, M. E. Saltykov-Shchedrin Public Library, Leningrad). These works combine classical panoramic elements with documentary detail and accuracy of observation. Enlightened in character and imbued with a concern for the native environment, they represent a major stage in the development of the national landscape in Russian painting.

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CHERNIAEV, IL'IA IL'ICH. Born Jan. 8 (20), 1893, in the village of Spasskoe, Vologda Province; died Sept. 30, 1966, in Moscow. Soviet inorganic chemist. Academician of the Academy of Sciences of the USSR (1943; corresponding member, 1933).

A student of L. A. Chugaev's, Cherniaev graduated from the

University of Petrograd in 1915. He began teaching there the same year, and in 1932 he became a professor. In 1918, while continuing to teach at the university, he joined the staff of the Institute for the Study of Platinum of the Russian Academy of Sciences. In 1934 he became a staff member of the Institute of General and Inorganic Chemistry of the Academy of Sciences of the USSR; he was made the institute's director in 1941. From 1935 to 1941, Cherniaev was a professor at the Moscow Petroleum Institute, and in 1945 he became a professor at Moscow State University.

Cherniaev's principal works dealt with the chemistry of platinum complexes and complexes of the platinum group metals. While studying nitro derivatives of platinum(II), he discovered the trans effect of ligands—that is, he discovered that the reactivity of any ligand in the inner sphere of a complex depends on the nature of the ligand trans to it. The discovery of this effect, which was named for Cherniaev, enabled Cherniaev and his students to synthesize many new complexes. He also discovered that the sign of rotation of optically active amino compounds of platinum(IV) changes upon their conversion to amido or imido derivatives. Cherniaev devoted considerable effort to the refining of platinum group metals.

Cherniaev received four State Prizes between 1946 and 1952. He was also awarded four Orders of Lenin, two other orders, and various medals.

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CHERNIAEV, MIKHAIL GRIGOR'EVICH. Born Oct. 22 (Nov. 3), 1828; died Aug. 4 (16), 1898, in the village of Tubyshki, in what is now Mogilev Oblast, Byelorussian SSR. Russian military and public figure; lieutenant general (1882).

The son of a nobleman, Cherniaev graduated from the Military Academy in 1853 and fought in the Crimean and Caucasian wars. In 1864 and 1865, as commander of a special Western Siberian detachment, Cherniaev occupied Aulie-Ata, Chimkent, and Tashkent in the Kokand Khanate and was appointed military governor of the newly formed Turkestan Oblast. He was forced to retire in 1866 for overstepping his authority.

From 1873 to 1878, Cherniaev and R. A. Fadeev, a military affairs writer, published the conservative, nationalist newspaper *Russkii mir* in St. Petersburg. Against the wishes of the Russian government, Cherniaev traveled secretly to Belgrade in 1876, after the Bosnia-Hercegovina Uprising of 1875–78 had begun. He was appointed commander of the Serbian Army, which was defeated during Serbia and Montenegro's war with Turkey in 1876. When the Russo-Turkish War of 1877–78 began, Cherniaev enlisted for military service but was not taken into the active army. After serving as governor-general of Turkestan from 1882 to 1884, Cherniaev retired in 1886. [29–321–1]

CHERNIAKHOV, an urban-type settlement and administrative center of Cherniakhov Raion, Zhitomir Oblast, Ukrainian SSR. The settlement is located 24 km north of Zhitomir, on the Zhitomir-Mozyr' highway. It has a railroad station (Gorbashi) on the Zhitomir-Korosten' line. Cherniakhov has a brickyard, an asphalt plant, and a food-processing combine. A branch of the Polisianka Zhitomir Clothing Association is located in the settlement, and granite is worked there. [29–321–3]

CHERNIAKHOV CULTURE, an archaeological culture that flourished from the turn of the third century to the turn of the fifth century in the forest steppe and steppe, from the lower Danube in the west to the left bank of the Dnieper in the east. It is named after a burial ground near the village of Cherniakhov in Kagarlyk Raion, Kiev Oblast. In Rumania, the Cherniakhov culture is called Syntana-de-Mureş.

The settled agricultural and stock-raising tribes of the Cherniakhov culture lived in large unfortified settlements; dwellings, both ground-level and subterranean, were arranged in rows. The area of some ground-level houses, probably belonging to large patriarchal families, exceeded 100 sq m. Land cultivation was characterized by improvements of the plow and *ralo* with iron tips (*see* RALO), the probable use of oxen and horses as draft animals, and an increase in the number of cereals cultivated; increasingly more land was placed under cultivation. Ironworking, blacksmithing, bronze casting, stonecutting, and bone carving were well developed, with artisans working mainly to order rather than for the open market. Pottery (bowls, pitchers) was generally made on a potter's wheel. Trade with nearby Roman centers flourished. Imported items, such as amphorae in which wine and olive oil were transported, glass goblets, and, more rarely, red-laquered vessels, both intact and in fragments, were found at all sites of the Cherniakhov culture. Roman coins were used in internal and external trade. Certain features of the Cherniakhov culture were formed under the influence of late classical culture.

In the funerary rites of the Cherniakhov culture, both cremation (fields of burial urns) and inhumation were practiced, with the latter predominating. The majority of researchers believe that the Cherniakhov culture was formed by tribes of differing ethnic origin (Dacians, Sarmatians, Germans, late Scythians and Venedy-Slavs), mentioned by ancient authors as living in the area that the culture occupied. The theory of the polyethnic background of the Cherniakhov culture is corroborated in particular by the presence of local differences in house construction, pottery, and burial rites. The theory that the Cherniakhov culture was destroyed by the incursion of the Huns in the late fourth century is the most probable, although there is also a hypothesis that it eventually evolved into the ancient Slavic culture and even the ancient Russian culture.

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E. A. RIKMAN [29–321–5]

CHERNIAKHOVSK (until 1946, Insterburg), a city under oblast jurisdiction and administrative center of Cherniakhovsk Raion, Kaliningrad Oblast, RSFSR. Situated at the confluence of the Instruch and Angrapa rivers, which form the Pregolia River. Population, 34,000 (1974).

Cherniakhovsk is a railroad junction with lines to Kaliningrad, Sovetsk, Kaunas, and Zheleznodorozhnyi and is also a highway junction. Among the industrial enterprises in Cherniakhovsk are the Tekhmash Plant, a leather plant, a ceramic plant, a motor-vehicle repair shop, a wood-products combine, and a logging and timber distribution establishment. The city's food industry includes a meat-packing plant, a milk plant, and a confectionery factory. The city has a pedagogical school. Cherniakhovsk was named in honor of General of the Army I. D. Cherniakhovskii. [29–321–4]

CHERNIAKHOVSKII, IVAN DANILOVICH. Born June 16 (29), 1906, in the city of Uman', in what is now Cherkassy Oblast; died Feb. 18, 1945; buried in Vil'nius. Soviet military commander; general of the army (1944). Twice Hero of the Soviet Union (Oct. 17, 1943, and July 29, 1944). Member of the CPSU from 1928.

The son of a Ukrainian railroad worker, Cherniakhovskii joined the Red Army in 1924. He graduated from the Kiev Artillery School in 1928 and from the Red Army Mechanization and Motorization Academy in 1936. At the beginning of the Great Patriotic War of 1941–45, he commanded the 28th Tank Division and later the 241st Rifle Division on the Northwestern Front; he took command of the XVIII Tank Corps on the Voronezh Front in June 1942 and in July was appointed commander of the Sixtieth Army, which fought on the Voronezh, Central, and First Ukrainian fronts. He was appointed troop commander on the Western Front on Apr. 15, 1944, and troop commander on the Third Byelorussian Front on Apr. 24, 1944. He saw action during the liberation of Byelorussia, and, in the battle to crush the enemy's forces in East Prussia, he was mortally wounded near the

city of Mehlsack (now Pieniężno in the Polish People's Republic).

Cherniakhovskii was awarded the Order of Lenin, four Orders of the Red Banner, two Orders of Suvorov First Class, the Order of Kutuzov First Class, the Order of Bogdan Khmel'nitskii First Class, and various medals. [29–322–1]

CHERNIANKA, an urban-type settlement and administrative center of Chernianka Raion, Belgorod Oblast, RSFSR. The settlement is situated on the left bank of the Oskol River, in the Don River basin. It is a railroad station on the Elets-Valuiki line. Chernianka has a sugar refinery, a vegetable-oil mill, a plant that produces butter and dry milk, a meat- and poultry-packing plant, a food-processing combine, an industrial combine, a brickyard, and a grain elevator. [29–321–2]

CHERNIGOV, a city and administrative center of Chernigov Oblast, Ukrainian SSR. Port on the right bank of the Desna River. Railroad junction of lines to Gomel', Ovruch, and Nezhin; highway junction. Population, 233,000 (1977; 69,000 in 1939, 90,000 in 1959, and 159,000 in 1970). Chernigov is divided into two city raions.

Chernigov, one of the oldest cities in Russia, was the center of the East Slavic Severiane tribes in the ninth century. At the end of the ninth century, it became part of Kievan Rus'. It is first mentioned in the chronicle for the year 907. From the tenth through 12th centuries it was a major artisan and trade center. From the 11th to 13th centuries it was the capital of the Chernigov Principality. In 1239 it was destroyed by the Mongol Tatars.

In the second half of the 14th century, Chernigov came under the rule of the Grand Duchy of Lithuania. In 1503 it became part of the Muscovite state. In 1611 it was captured by Poland. The population of Chernigov fought in the Liberation War of the Ukrainian People (1648–54), and in 1654 it became part of the Russian state. In 1782 it became the administrative center of the Chernigov Namestnichestvo (Vicegerency), in 1797, of the Little Russian (Malorossiiskaia) Province, and in 1802, of Chernigov Province. It quickly developed as a local trade center. At the end of the 19th century, it was linked by rail with Kiev by way of Bakhmach.

Soviet power was established on Jan. 19 (Feb. 1), 1918. During the Civil War, Chernigov was captured by Austro-German troops, the Ukrainian Directory, and the Denikin forces. Soviet power was restored on Nov. 7, 1919. In 1932, Chernigov became the administrative center of the oblast. From Sept. 9, 1941, to Sept. 21, 1943, it was occupied by fascist German troops, who inflicted enormous damage. The city was rebuilt after the war.

Among the industries developed in Chernigov are the chemical industry (the Khimvolokno chemical-fiber production association), light industry (worsted-wool combine, factory for the primary processing of wool, and garment and shoe factories), and the food-processing industry (meat-packing combine, milk plant, brewery, and plants for the production of confectionery and macaroni products). Chernigov also has a plant for the production of spare parts for motor vehicles, an instrument-making plant, a large-panel home-building combine, and factories for the production of pianos, cardboard, and other goods.

Numerous examples of Kievan Rus' architecture have been preserved in Chernigov, including the Spaso-Preobrazhenskii Cathedral (11th century), the Cathedral of St. Boris and St. Gleb (12th century), the Uspenskii Cathedral (12th century), the St. Elias Church (late 11th or early 12th century) and Paraskeva Piatnitsa Church (late 12th or early 13th century). Architectural landmarks of the 17th and 18th centuries (Ukrainian baroque) include Lizogub's house (1690's), the collegium (1702), the cathedral (1679–89) and refectory (1677–79) of the Troitskii Monastery, and St. Catherine's Church (1715). At the beginning of the 19th century, Chernigov was built up according to a grid plan, with buildings in the classical style, such as the governor-general's residence (1804; archiect A. D. Zakharov; since 1975 the Historical Museum).

Heavily damaged during the Great Patriotic War, Chernigov was rebuilt in accordance with a number of general plans (1945, 1958, and 1966); the central section was built up (1950–55; architects P. F. Buklevskii and I. D. Iagodovskii), and theater buildings were erected (1958; architects D. S. Fridlin, S. P. Tutuchenko, and others), as were the oblast committee building of the Communist Party of the Ukraine and the House of Political Education (1974). The city has a monument to V. I. Lenin (bronze and granite, 1967; sculptors A. E. Belostotskii and O. A. Suprun, architect V. M. Ustinov) and a memorial to the victims of fascism (granite, 1974; architect A. A. Karnabed, sculptor G. P. Gutman).

Educational institutions include the T. G. Shevchenko Pedagogical Institute, a branch of the Kiev Polytechnic Institute, an evening mechanical and technical technicum, a cooperative technicum, a technicum of Soviet trade, a law technicum, a medical school, and a music school. There are two museums—the historical museum and the M. M. Kotsiubinskii literary memorial museum—in the city and a branch of the Sofia Museum Preserve. Chernigov also has an oblast theater of music and drama, an oblast puppet theater, and a philharmonic society.

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N. N. OSTRIANKO and S. K. KILESSO [29–242–2]

CHERNIGOVKA, an urban-type settlement and administrative center of Chernigovka Raion, Zaporozh'e Oblast, Ukrainian SSR. The settlement is situated on the Tokmak River (in the basin of the Sea of Azov), 7 km from the Verkhnetokmak I railroad station on the Berdiansk-Pologi line. Industry is represented by a plant that produces foodstuffs, a mixed-feed plant, and a butter-making section of the Molochansk Dairy Combine. Chernigovka has a forest-improvement station and a poultry hatchery. [29–244–1]

CHERNIGOV OBLAST, part of the Ukrainian SSR. Formed on Oct. 15, 1932. Area, 31,900 sq km. Population, 1.508 million (as of Jan. 1, 1977). Chernigov Oblast is divided into 22 raions and has 15 cities and 30 urban-type settlements. The administrative center is the city of Chernigov. On June 13, 1967, Chernigov Oblast was awarded the Order of Lenin.

Natural features. Chernigov Oblast is situated on the left bank of the middle Dnieper, in the Desna River basin. It occupies a lowland and a hilly plain, rising from elevations of 120–150 m in the southwest to 200–220 m in the northeast. The climate is temperate continental. The average January temperature varies in the range −6° to −8°C, and the average July temperature, in the range 18.4° to 19.7°C. Annual precipitation amounts to 500–600 mm. The growing season lasts 190–200 days.

The principal river is the Desna, which cuts across the oblast from northeast to southwest. Its left tributaries are the Seim and the Oster, and its right tributaries, the Ubed', the Snov, and the Belous. The Dnieper and its left tributary the Sozh flow along the northwestern border.

The northern part of the oblast—Poles'e—is characterized by soddy-podzolic, sandy, and sandy loam soils. The southern, forest-steppe part is dominated by chernozems, both podzolized and meadow-type.

The north (68 percent of the oblast's territory) is occupied by mixed forests, with predominantly pine, oak, birch, and hornbeam and some linden, maple, ash, and elm. The Trostianets Arboretum of the Academy of Sciences of the Ukrainian SSR is located in the southeastern part of the oblast; the variety of coniferous and ornamental plants in the arboretum is the most diverse in the Ukraine.

Animal life is represented by the European hare, fox, otter, raccoon dog, wolf, pine marten, badger, elk, roe deer, and wild boar. The rivers and lakes abound in roach, crucian carp, tench, pike, perch, pike perch, European bream, ide, and sheatfish.

Population. Ukrainians constitute (1970) 93.8 percent of the population, and Russians, 4.7 percent. The average population

density is 47.3 persons per sq km (1977). The forest-steppe regions are the most densely populated areas, with more than 50 persons per sq km. The urban population accounts (1977) for 43 percent of the total.

The most important cities are Chernigov, Priluki, and Nezhin.

Economy. During the years of Soviet power, Chernigov Oblast has been transformed from a backward agrarian region into a highly developed industrial-agrarian area. It abounds in peat and deposits of phosphorites and marl. The discovery, beginning in the late 1950's, of a number of petroleum deposits (Gnedintsi, Priluki, Leliaki, Monastyrishche, Malaia Devitsa) and petroleum-gas deposits (Bogdanovka, Mil'ki), has given rise to new branches of industry, the petroleum and natural-gas industries.

The most developed branches of light industry are the production of textiles (Chernigov), knitwear (Priluki), and garments (Chernigov and Nezhin) and the processing of flax and hemp. Machine building and metalworking are represented by plants for the construction of farm machinery (Nezhin and Priluki) and firefighting equipment (Ladan) and by plants for the production of motor-vehicle spare parts (a branch of the Gorky Automotive Plant), experimental hardware, and instruments and a repair plant (Chernigov). The chemical and petrochemical industries have been established, represented by the Khimvolokno chemical-fiber production association in Chernigov and by the production of synthetic resins and plastics in Priluki and varnishes and paints in Nezhin. The lumber, woodworking, and paper industries are represented by enterprises for the production of furniture and pianos in Chernigov and a mill for the production of industrial-grade paper in Koriukovka. Building-materials enterprises manufacture precast reinforced-concrete structural components and roofing materials (Chernigov), as well as bricks. The food-processing industry is dominated by meat-processing enterprises (Chernigov, Nezhin, Bakhmach, Priluki, Novgorod-Severskii) and enterprises for the production of butter, cheese, and milk (Ichnia, Bakhmach, and elsewhere). There are also sugar refineries, distilleries, breweries, and plants for the production of starch syrup. Vegetable processing is well developed (Nezhin).

Agriculture specializes in stock raising for meat and dairy purposes and the production of potatoes, grains, sugar beets, and flax. The oblast has (1976) 503 kolkhozes and 57 sovkhozes. Sixty-eight percent of the oblast's total land area is occupied by agricultural lands, of which lands under cultivation account for 72 percent, and pastures and hayfields, for 26 percent. In 1976, 1,587,100 hectares (ha) were under cultivation, of which 711,800 ha were under grains (winter wheat, rye, legumes, barley, oats, buckwheat, millet, and corn), 100,500 ha under industrial crops (sugar beets and long-staple flax), 193,300 ha under potatoes, 19,400 ha under melons, gourds, and vegetables, and 562,100 ha under fodder crops. Hemp and mint are also grown. Reclaimed lands total 196,000 ha, and irrigated lands, 10,000 ha.

In 1976 the oblast had 1,305,500 head of cattle (including 505,100 cows), 847,600 hogs, and 245,500 sheep and goats. Poultry farming, rabbit breeding, and beekeeping are also developing.

The operational length of railroads is 892 km (1976). The main lines are Moscow-Bakhmach-Nezhin-Chop, Kiev-Chernigov-Leningrad, Nezhin-Chernigov-Gomel', Simferopol'-Chernigov-Riga, Minsk-Bakhmach-Khar'kov, and Chernigov-Nezhin-Priluki. Railroad junctions include Nezhin, Bakhmach, Chernigov, and Priluki. Motor-vehicle roads total 7,500 km, of which 3,600 km are hard-surfaced. The Odessa-Kiev-Leningrad and Kiev-Moscow highways pass through the oblast. The Dnieper and Desna rivers are navigable. Chernigov is linked by air with Moscow, a number of oblast administrative centers of the Ukrainian SSR, and oblast raions.

The Dashava-Kiev-Moscow natural gas pipeline and the Priluki-Kremenchug petroleum pipeline pass through Chernigov Oblast.

Education, cultural affairs, and public health. During the 1914–15 academic year, the area that is now Chernigov Oblast had 1,374 general-education schools, with 111,000 pupils and students, two specialized secondary educational institutions, with 137 students, and one higher educational institution, with 134 students. During the 1976–77 academic year, the oblast had 1,113 general-education schools of all types, with 235,700 pupils and students, 17 vocational-technical schools, with 9,000 students, and 19 specialized secondary educational institutions, with 15,300 students. The Chernigov Pedagogical Institute, the Nezhin Pedagogical Institute, and the Chernigov branch of the Kiev Polytechnic Institute were attended by 8,300 students. In 1977, there were 404 preschool institutions in the oblast, caring for 42,900 children.

Chernigov Oblast has a number of scientific research institutes. It also has (as of Jan. 1, 1977) 1,105 public libraries, with about 11.8 million books and journals, and eight museums—a historical museum in Chernigov, museums of local lore in Nezhin, Oster, Priluki, and the settlement of Sosnitsa, the A. Dovzhenko literary memorial museum in the settlement of Sosnitsa, the M. M. Kotsiubinskii literary memorial museum in Chernigov, and the N. A. Shchors memorial museum in the city of Shchors. In addition, it has three theaters (an oblast theater of music and drama and the oblast puppet theater in Chernigov and a dramatic theater in Nezhin), 1,174 clubs, 1,204 motion-picture projection units, and 46 extracurricular institutions.

The following oblast newspapers are published in Ukrainian: *Desnians'ka pravda* (Desna Pravda; since 1917) and the Komsomol newspaper *Komsomol'skyi hart* (Komsomol Hardening; since 1933). Two programs of the All-Union Radio, totaling 44 hours a day and an informational republic-level program, totaling 19 hours, are broadcast in the oblast, as well as a joint Union-republic program, totaling 19 hours a day, and a local program, in both Russian and Ukrainian, totaling 1.1 hours. Two programs from the Central Television Studio, totaling 10.7 hours a day, are relayed, as well as republic-level and local programs in Russian and Ukrainian, totaling 13.5 hours a day.

By Jan. 1, 1977, the oblast had 194 hospitals, with 17,800 beds (11.8 beds per 1,000 inhabitants), and 3,400 physicians (one physician per 450 inhabitants). The Kachanovka climatological health resort is located in the oblast; there are also eight sanatoriums and four houses of rest.

The principal tourist sites are the areas around the Kiev Reservoir and the Desna and Oster Rivers, as well as the cities of Chernigov, Novgorod-Severskii, Nezhin, and the Trostianets Arboretum of the Academy of Sciences of the Ukrainian SSR (Ichnia Raion). There are tourist centers in Novgorod-Severskii and on the Oster River.

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V. K. MOLOCHKO [29–244–3]

CHERNIGOV PRINCIPALITY, an ancient Russian principality that flourished from the 11th through 13th centuries. Chernigov Principality occupied the lands inhabited by the Severiane and some of the lands of the Poliane, Radimichi, Viatichi, and other tribes. It stretched along both banks of the Dnieper and along the Desna, Seim, and Sozh Rivers, extending into the basin of the Upper Oka. The principal cities were Chernigov (the capital), Snovsk, Liubech, Novgorod-Severskii, and Starodub.

From 1024 to 1036 the principality was an independent possession of Mstislav Vladimirovich (*see* MSTISLAV VLADIMIROVICH), from 1054 to 1073, of Sviatoslav Iaroslavich (*see* SVIATOSLAV IAROSLAVICH), and from the end of the 11th to beginning of the 13th centuries, of the Sviatoslavich princes, descendants of Sviatoslav Iaroslavich. In 1097 the Severskii Principality separated from Chernigov Principality (*see* SEVERSKII PRINCIPALITY). In the 12th century, Chernigov Principality rapidly underwent disintegration. The last Chernigov prince was Mikhail Vsevolodovich, who died in 1246 (*see* MIKHAIL VSEVOLODOVICH). In 1239, the city of Chernigov was captured and burned by the Mongol Tatars, and the principality soon ceased to exist as a state entity.

The cities of Chernigov Principality were centers of ancient Russian culture. Churches in Chernigov include the Spaso-Preobrazhenskii (Transfiguration of the Savior) Cathedral (1036), the Uspenskii (Assumption) Cathedral of the Elets Monastery (12th century), and the Paraskeva Piatnitsa Church (12th and 13th cen-

turies). The *Khozhdenie* (Pilgrimage) of Daniil (early 12th century), a work by the abbot of one of the Chernigov monasteries, was well known in ancient Rus'.

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CHERNIGOV REGIMENT UPRISING, an armed insurrection of Decembrists in the Ukraine that lasted from Dec. 29, 1825, to Jan. 3, 1826.

Originally part of a larger plan to overthrow the government, the uprising was the final act of the Southern Society of Decembrists. Its purpose was to continue the Decembrist movement after the defeat of the uprising of Dec. 14, 1825, on Senate Square in St. Petersburg. It also aimed at creating a camp of revolutionary military units near Kiev to fight against the autocracy.

The uprising began on December 29, when the Chernigov Regiment officers A. D. Kuz'min, V. N. Solov'ev, I. I. Sukhinov, and M. A. Shchepilla freed Lieutenant Colonel S. I. Murav'ev-Apostol, a leader of the Southern Society who had been arrested in the village of Trilesy. On December 30, Murav'ev-Apostol led the 2nd Grenadier and 5th Musketeer companies of the regiment into Vasil'kov and seized weapons, ammunition, provisions, and the regimental treasury. Three more companies from the regiment joined the uprising.

On the morning of December 31, the "Orthodox Catechism," a revolutionary proclamation written by Murav'ev-Apostol and M. P. Bestuzhev-Riumin, was read to the insurgents as they stood in ranks. The proclamation called for an armed rebellion against the autocracy, serfdom, and compulsory service recruitment. Although the insurgents were joined in Brusilov by roughly two companies from the regiment, they were unable to link up with other units in which Decembrists were serving.

By January 1, the insurgents numbered some 1,000 soldiers and 17 officers. They started toward Zhitomir in an effort to link up with military units in which members of the Society of the United Slavs were active. Government troops cut them off and forced them to turn toward Belaia Tserkov'.

On Jan. 3, 1826, at the village of Ustimovka, the Chernigov Regiment was met by government troops as it attempted to break through to Zhitomir to join regiments of the 8th Infantry Division. After meeting volleys of canister fired point-blank, the insurgents wavered and were subsequently defeated by the cavalry. Shchepilla was killed, S. I. Murav'ev-Apostol was seriously wounded, and I. I. Murav'ev-Apostol and Kuz'min shot themselves. Six officers and 895 soldiers were taken prisoner.

In accordance with the sentence handed down by the Supreme Court, the leaders of the uprising, S. I. Murav'ev-Apostol and M. P. Bestuzhev-Riumin, were hanged. The officers Solov'ev, Sukhinov, A. A. Bystritskii, and A. E. Mozalevskii were given life terms of hard labor. More than 100 noncommissioned officers and soldiers received corporal punishment, and 805 men were transferred to the Caucasus. The regiment was later re-formed.

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I. V. POROKH [29–248–1]

CHERNIGOVSKII, VLADIMIR NIKOLAEVICH. Born Feb. 16 (Mar. 1), 1907, in Ekaterinburg, now Sverdlovsk. Soviet physiologist. Academician of the Academy of Sciences of the USSR (1960; corresponding member 1953) and the Academy of Medical Sciences of the USSR (1950).

In 1930, Chernigovskii graduated from the medical school of the University of Perm', where he studied under V. V. Parin and K. M. Bykov. He worked at the Medical Institute in Sverdlovsk (1932–37), the All-Union Institute of Experimental Medicine in Leningrad (from 1937; laboratory head, from 1946), and the Naval Medical Academy in Leningrad (1941–52; professor, from 1944). Chernigovskii was director of the Institute of Normal and Pathological Physiology of the Academy of Medical Sciences of the USSR from 1952 to 1959 and the I. P. Pavlov Institute of Physiology of the Academy of Sciences of the USSR from 1959 to 1977. He was academician-secretary of the physiology division of the Academy of Sciences of the USSR from 1963 to 1967.

Chernigovskii's main research has been on the functional interrelationships between the cerebral cortex and the internal organs, interoception, and space physiology and medicine. He discovered and studied several interoceptors and their sites and mechanism of excitation. He elucidated the role of signaling from the visceral receptors in several forms of behavior of higher animals. Chernigovskii also studied reflex regulation of the circulatory system, identified the cortical projection zones of several internal organs, and, with his colleagues, created a model of hypertension.

Chernigovskii was a deputy to the sixth convocation of the Supreme Soviet of the USSR. He has been awarded four orders, several medals, the I. P. Pavlov Prize of the Academy of Sciences of the USSR (1944), the I. M. Sechenov Prize of the Academy of Sciences of the USSR (1974, jointly with S. S. Musiashchikova), and the I. P. Pavlov Gold Medal of the Academy of Sciences of the USSR (1964). Chernigovskii is a foreign corresponding member of the Academy of Sciences of the Socialist Republic of Rumania (1965) and a member of the International Astronautics Federation (1965).

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CHERNISHNIA, a right tributary of the Nara River. During the Patriotic War of 1812, a battle was fought at the Chernishnia on October 6 between Russian troops and Napoleon's forces.

Aiming to weaken the enemy, the commander in chief of the Russian Army, Field Marshal M. I. Kutuzov, planned to crush the isolated vanguard of Marshal J. Murat—a force of more than 20,000 men located 6 km north of tbe Russian camp at Tarutino. Kutuzov divided his attack force into two arms. The left arm, which consisted of a cavalry unit commanded by General M. A. Miloradovich, was to make the main thrust. The right arm, commanded by General L. L. Bennigsen, comprised three columns. The first consisted of ten cossack regiments and a chasseur regiment, under General V. V. Orlov-Denisov; the second was formed by the II Infantry Corps, under General K. F. Baggovut; and the third was made up of the IV Infantry Corps and a cuirassier division, under General A. I. Osterman-Tolstoi. The III Infantry Corps and the I Cavalry Corps were held in reserve.

Army partisan detachments led by I. S. Dorokhov and A. S. Figner were assigned to move in the direction of the village of Voronovo to block the enemy's path of retreat. Orlov-Denisov's column skirted the enemy's flank and, in a surprise attack, overran the French cuirassier division. Owing to Bennigsen's poor leadership, however, and to a lack of coordination, the infantry columns were slow in reaching their assault positions. The attack in the center was repelled by the enemy, and Baggovut was killed. Despite successful operations by Miloradovich and Osterman-Tolstoi, Bennigsen halted the attacks. As a result, Murat,

who had suffered substantial losses (2,500 killed, 2,000 captured, and 38 artillery pieces disabled), was able to pull back to Voronovo.

The Russians pursued the vanguard as far as Spas-Kuplia, where Kutuzov, having received word of Napoleon's impending withdrawal from Moscow, halted the pursuit without bringing in his principal forces. Although the victory was incomplete, it played an important role in raising the combat morale of the Russian troops. [29–251–4]

CHERNITSYN, NIKOLAI NIKOLAEVICH. Born Nov. 20 (Dec. 2), 1883, in the village of Toikino, in what is now Perm' Oblast; died Mar. 31 (Apr. 13), 1917, in the city of Gorlovka. Russian mining engineer.

After graduating from the St. Petersburg Institute of Mines in 1910, Chernitsyn worked at the Makeevka Mine-rescue Station, where he organized and conducted the first studies in Russia on firedamp and coal dust and the reasons for their flammability. He was the first to use a vacuum process to degas hard coals, and he demonstrated that oxygen and nitrogen are absorbed from the air by methane-bearing coal seams.

Chernitsyn was killed during rescue operations in a mine.

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CHERNOBAI, an urban-type settlement and the administrative center of Chernobai Raion, Cherkassy Oblast, Ukrainian SSR. Chernobai is situated 22 km from the Zolotonosha railroad junction, from which lines run to Cherkassy, Grebenka, and Liapliava. The settlement has a wine-making combine and an industrial combine. Chernobai is also the location of a museum of local lore. [29–252–1]

CHERNOBYL', a city (since 1841) and administrative center of Chernobyl' Raion, Kiev Oblast, Ukrainian SSR. Situated on the Pripiat' River, 18 km from the Ianov railroad station on the Chernigov-Ovruch line. Chernobyl', a river landing, has an iron foundry, a cheese plant, a ship-repair dock, and a workshop of an artistic production association. The city has a medical school. [29–252–3]

CHERNOGOLOVKA, an urban-type settlement in Noginsk Raion, Moscow Oblast, RSFSR. The settlement is situated on the Chernogolovka River, a tributary of the Kliaz'ma. The Noginsk Scientific Center, a complex of scientific institutions of the Academy of Sciences of the USSR, is located in Chernogolovka. The center comprises a division of the Institute of Chemical Physics, as well as the Institute of New Problems in Chemistry, the Institute of Solid-state Physics, the Institute of Theoretical Physics, and the Institute of Experimental Mineralogy. [29–263–1]

CHERNOGORA, the highest mountain massif in the southeastern part of the Lesistye Carpathians; situated in Transcarpathian and Ivano-Frankovsk oblasts, Ukrainian SSR. Chernogora has an elevation of 1,800–2,000 m, rising to 2,061 m at Mount Goverla. It is composed of clayey shales, sandstones, and marls. On the slopes grow beech forests at 900–1,200 m and spruce forests at 1,200–1,500 m. The alpine meadows in the massif are used for pastures. [29–263–3]

CHERNOGORSK, a city under oblast jurisdiction in the Khakass Autonomous Oblast, Krasnoiarsk Krai, RSFSR. Terminus (Chernogorskie Kopi) of a branch of the Achinsk-Abakan railroad line. Population, 70,000 (1977). Chernogorsk is the center of the Minusinsk Coal Basin. Industry is represented by a motor-vehicle repair plant, a brickyard, an experimental plant for the production of lightweight structural members, a casting and metalworking plant, a plant that produces reinforced-concrete structural members, a prefabricated housing combine, a building-materials combine, a worsted-goods combine, a synthetic-leather combine, a factory for primary wool processing, a garment factory, and a furniture factory. The city has mining and textile technicums. [29–275–1]

CHERNOISTOCHINSK, an urban-type settlement in Prigorodnyi Raion, Sverdlovsk Oblast, RSFSR. Chernoistochinsk is situated on Chernoistochinsk Pond, 20 km south of the Nizhnyi Tagil railroad station. Enterprises include a branch of the Nizhnyi Tagil Knitwear Association and a division of the Visimskii Feed Sovkhoz. The settlement has a people's amateur theater. [29–287–2]

CHERNOMORKA (formerly Liustdorf), a seaside climatic health resort in the Ukrainian SSR; part of the Odessa health resort region. In addition to sanatoriums, mainly for children with various types of tuberculosis, Chernomorka has houses of rest and Pioneer camps. There is a broad beach made of fine sand. [29–291–2]

CHERNOMORSKII, an urban-type settlement in Severskaia Raion, Krasnodar Krai, RSFSR. Chernomorskii is located on the Krasnodar-Novorossiisk highway, 3 km from the Khabl' railroad station. The settlement has a plant that produces reinforced-concrete components. Petroleum is extracted nearby. [29–294–1]

CHERNOMORSKOE (formerly Ak-Mechet'), an urban-type settlement and administrative center of Chernomorskoe Raion, Crimean Oblast, Ukrainian SSR. Chernomorskoe is located 64 km from the Evpatoriia railroad station, which is the terminus of a branch of the Dzhankoi-Sevastopol' line. The settlement has a plant that produces commercial equipment, a mixed-feed plant, and an industrial combine. [29–299–1]

CHERNOSOSHNYE KREST'IANE, a category of the rural population of Russia from the 14th to 17th centuries directly dependent on the feudal government rather than on private owners.

By the mid-16th century the *chernososhnye krest'iane* had disappeared in central Russia but remained in the northern areas of European Russia and in Siberia, where they were known as *pashennye liudi* (plowmen). At the end of the 17th century they numbered more than 50,000 households. In the 16th and 17th centuries agricultural land, including plowland, was divided up and privately held by the families of the *chernososhnye krest'iane*; the bulk of the pastureland and the forests and rivers were communally owned and used. Generally speaking, the *chernososhnye krest'iane* were exploited to a lesser extent than privately owned peasants.

Among the *chernososhnye krest'iane* handicrafts and trade were highly developed, as were such activities as the extracting of salt, fur trapping, and fishing. In the mid-16th century property and social distinctions emerged. Great merchants and entrepreneurs, such as the Amosovs, Bosyis, Gusel'nikovs, and Stroganovs, came from the ranks of the *chernososhnye krest'iane*. The reform of the land of Ivan IV expanded the administrative, judicial, and financial responsibilities of elected bodies in the *volosts* (small rural districts) inhabited by the *chernososhnye krest'iane*; the bodies were headed by the richest peasants.

From the end of the 16th century, the government increased the taxes paid by the *chernososhnye krest'iane*, restricted their rights to dispose of land, and imposed limitations on local self-administration. Under the reforms of Peter I the Great, the *chernososhnye krest'iane* became part of the state peasants.

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CHERNOV, ALEKSANDR ALEKSANDROVICH. Born July 11 (23), 1877, in Solikamsk; died Jan. 23, 1963, in Syktyvkar. Soviet

geologist and paleontologist. Hero of Socialist Labor (1957). Honored Scientist of the RSFSR (1946).

Chernov graduated from Moscow University in 1903. From 1907 to 1909 he was a member of P. K. Kozlov's expedition to Mongolia and Szechwan. From 1909 to 1934 he taught at higher educational institutions in Moscow; he became a professor in 1917. Beginning in 1935, he worked in various institutions of the Academy of Sciences of the USSR.

Chernov's main works dealt with the geology and minerals of the Central and Northern Urals, the Pai-khoi mountains, and the Pechora region. Chernov provided theoretical substantiation for the existence of the Pechora Coal Basin and studied the structure of the Ukhta Oil-bearing Region. He collected extensive paleontological material, which helped establish the stratigraphy of the Paleozoic of the western slopes of the Northern Urals and of the Pai-khoi.

Chernov was awarded the A. P. Karpinskii Gold Medal (1952). He received two Orders of Lenin and two other orders, as well as various medals. A mountain ridge in the Komi ASSR has been named in honor of Chernov.

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[29–253–1]

CHERNOV, DMITRII KONSTANTINOVICH. Born Oct. 20 (Nov. 1), 1839, in St. Petersburg; died Jan. 2, 1921, in Yalta. Russian scientist; specialist in metallurgy, metal science, and the heat treatment of metals.

The son of a feldsher, Chernov graduated from the St. Petersburg Institute of Practical Technology in 1858 and worked in the mechanical department of the St. Petersburg Mint. From 1859 to 1866 he was an instructor, an assistant librarian, and a curator in the museum of the St. Petersburg Institute of Practical Technology. In 1866 he became an engineer in the forging shop of the Obukhov Steel Mill in St. Petersburg, and from 1880 to 1884 he was engaged in prospecting deposits of rock salt in the Bakhmut region of the Donets Coal Basin; the beds he discovered proved to be of industrial importance. Upon returning to St. Petersburg in 1884, Chernov worked on the Naval Engineering Committee. Beginning in 1886 he simultaneously served as chief inspector of the Ministry of Railroad Transport in charge of overseeing the filling of orders at metallurgical works. He became a professor of metallurgy at the Mikhail Artillery Academy in 1889.

Chernov engaged in a practical investigation into the causes of defective products in the manufacture of gun forgings and an intensive analysis of the works of his predecessors P. P. Anosov, P. M. Obukhov, A. S. Lavrov, and N. V. Kalakutskii on the problems of smelting, casting, and forging steel ingots. As a result, between 1866 and 1868, Chernov demonstrated the dependence of the structure and properties of steel on the hot working techniques and heat treatments used. He discovered the critical temperatures for steel at which, as a result of heating or cooling in the solid state, phase transformations occur that significantly alter the structure and properties of the metal. These transformation temperatures, which were determined from the temperature colors of the steel, have been called Chernov's points. Chernov also demonstrated graphically the effect of carbon on the transformation temperatures when he drew the first sketch of the configuration for the most important lines in the iron-carbon phase diagram (*see* IRON-CARBON ALLOYS). The results of his study, which marked the beginning of modern metallography, were published by Chernov in *Zapiski Russkogo tekhnicheskogo obshchestva* (Proceedings of the Russian Technical Society, 1868, no. 7) under the title "A Critical Review of the Aritcles of Messrs. Lavrov and Kalakutskii on Steel and Steel Guns and D. K. Chernov's Own Studies on the Same Subject."

In another major scientific article, "Investigations Concerning the Structure of Cast Steel Ingots" (1879), Chernov presented an elegant theory of the crystallization of a steel ingot. He made a detailed study of the formation and growth processes of crystals (in particular, the dendritic steel crystals sometimes called Chernov crystals), devised a diagram of the structural zones in an ingot, developed a theory of successive crystallization, made a thorough investigation of flaws in cast steel, and demonstrated effective measures to prevent such flaws. Chernov's studies greatly aided the transformation of metallurgy from a craft to a scientific discipline with a theoretical foundation.

Chernov's works on the intensification of metallurgical processes and on the improvement of production techniques were of major importance to the progress of steel metallurgy. He proved the value of completely deoxidizing steel during smelting and the expediency of using multiple deoxidizers; he also recommended a system of practices that resulted in a dense, bubble-free metal. He suggested agitating the metal during crystallization and proposed a rotating ingot mold for this purpose.

Chernov did much to improve the converter method of producing cast steel. In 1872 he proposed using a cupola furnace to heat low-silicon liquid pig iron, which was considered to be unsuitable for the Bessemer process, before processing in a Bessemer converter; the technique subsequently became common practice in Russian and foreign foundries. Chernov used a spectroscopic instrument to determine the completion of the Bessemer process, and he was one of the first to demonstrate the advantage of using air enriched with oxygen for blowing through liquid cast iron in a converter (1876). He also worked on the direct reduction of iron ore to produce steel without the blast furance process. He was responsible for a number of important studies relating to artillery, including the production of high-quality steel gun barrels and steel armor-piercing shells and an investigation of combustion in the bores of guns during firing that results from the action of the propellant gases and other factors. Chernov was also well known for a series of articles on mathematics, mechanics, and aviation.

Chernov was the founder of modern metal science and of a major scientific school of Russian metallurgists and metal scientists. His discoveries have been recognized throughout the world. Chernov was elected honorary chairman of the Russian Metallurgical Society and honorary vice-president of the Iron and Steel Institute in Great Britain. He was an honorary member of the American Institute of Mining Engineers and of several other Russian and foreign scientific institutions.

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A. S. FEDOROV [29–254–1]

CHERNOV, SERGEI NIKOLAEVICH. Born 1887 in Saratov; died Jan. 5, 1942, in Pushkin, Leningrad Oblast. Soviet historian. Doctor of historical sciences (1937).

Chernov graduated from the faculty of history and philology at the University of St. Petersburg in 1912. Between 1917 and 1927 he was on the staff of the University of Saratov and held positions in Leningrad and Middle Asia. In 1937 he became a professor in the subdepartment of the history of the USSR at the Gorky Pedagogical Institute.

Chernov's most important works are devoted to the feudal period in the territories that now make up the USSR, to various questions pertaining to the Decembrist movement, to Narodnichestvo (Populism), and to N. G. Chernyshevskii.

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[29–255–1]

CHERNOV, VIKTOR MIKHAILOVICH (pseudonyms included Iu. Gardenin). Born Nov. 19 (Dec. 1), 1873, in Kamyshin, in

what is now Volgograd Oblast; died Apr. 15, 1952, in New York City, USA. Russian political figure. A founder of the Socialist Revolutionary Party (SR's) and a member of its Central Committee.

Chernov joined the revolutionary movement in the late 1880's. He studied at Moscow University from 1892 to 1894, when he was arrested in a crackdown on the People's Right Party and exiled to Tambov Province. He emigrated in 1899 and, with M. R. Gots, headed the foreign organization of the SR's and the newspaper *Revoliutsionnaia Rossiia*. Chernov was the party's chief theoretician and developed its program; his philosophic views were an indiscriminate blend of Narodnik (Populist) socialism and empiriocriticism (Machism).

During World War I, Chernov took part in the Zimmerwald Conference of 1915 and the Kienthal Conference of 1916. After the February Revolution of 1917 he returned to Russia, where from May to August 1917 he served as minister of agriculture in the Provisional Government. After the October Revolution of 1917 he actively opposed Soviet power. Chernov was elected chairman of the Constituent Assembly, which met on Jan. 5 (18), 1918, and during the summer and autumn of that year served on the Committee of Members of the Constituent Assembly.

Chernov emigrated in 1920. He worked with the French Resistance during World War II and eventually took up residence in the USA. While abroad, Chernov published his memoirs, *Notes of a Socialist Revolutionary* (vol. 1, 1922) and *Before the Storms* (1953). [29–253–2]

CHERNOV-LÜDERS LINES (Lüders' lines), thin, dark lines that appear on the polished surface of a steel specimen when the yield point is reached during cold plastic deformation. During extension or compression they are oriented at an angle of approximately 45° to the axis of the specimen; that is, they coincide with the direction of the planes of the principal shearing stresses. The lines were first described by L. Lüders of Germany in 1859 and independently by D. K. Chernov in 1884. They are also known as stretcher strains, deformation bands, Hartmann lines, and Piobert lines. [29–256–1]

CHERNOVTSY (until 1944, Chernovitsy), a city and administrative center of Chernovtsy Oblast, Ukrainian SSR. Population, 214,000 (1977; 106,000 in 1939, 152,000 in 1959, 187,000 in 1970). Situated in the foothills of the Carpathians on the Prut River, Chernovtsy is a railroad and highway junction and also has an airport. It is divided into three city raions.

According to archaeological data, Chernovtsy originated in the 12th century. It first appears in written sources dating from 1408. From the mid-14th century to 1774 it was part of the Principality of Moldavia. In 1775 it came under the rule of Austria (from 1867, Austria-Hungary). During the offensive of the Southwestern Front of 1916, Chernovtsy was captured by Russian troops. In November 1918 it was occupied by Rumania. In June 1940, Chernovtsy, together with northern Bucovina, became part of the USSR and the administrative center of an oblast of the Ukrainian SSR. From July 6, 1941, to Mar. 29, 1944, it was occupied by fascist German troops.

The leading branches of industry in Chernovtsy are light industry, food processing, and machine building. Light industry is represented by the Voskhod cotton production association, the Trembita garment production association, a glove and knitwear production association, a hosiery production association, and factories for the production of shoes, textiles, notions and clothing accessories, and decorative textile goods. The food-processing industry is represented by a meat-packing combine and combines for the production of oils and fats, sugar, and other foodstuffs. The machine-building industry is represented by a machine-building plant, the Elektronmash and Chernovtsylegmash production associations, and a machinery repair plant. Other industries include the wood-products industry, represented by furniture and woodworking combines and a furniture factory, and the chemical industry, represented by rubber-footwear and chemical plants and a plant for the production of household chemicals. The building-materials industry is also important.

Noteworthy architectural works include the wooden churches dating from the 17th and 18th centuries—the Church of St. Nicholas (1607), the Piatnitskaia Church (1768), the Trinity Church on the Klokuchka (1774), and the Uspenie Church on the Kalichanka (1783)—and the buildings in the classical style, such as the town hall (now the city soviet; 1843; architect A. Mikulich) and the former residence of the metropolitan (now the university; 1864–82; architect I. Glavka). During the Soviet period, work has been conducted on improving the planning and construction of apartment-house blocks. Monuments include the Victory Monument (1946; sculptor G. L. Petrashevich, architect V. I. Grigor).

Chernovtsy has a university, a medical institute, a branch of the Kiev Institute of Commerce and Economics, and 12 specialized secondary educational institutions, including industrial, textile, construction, railroad transportation, and other technicums, as well as pedagogical, medical, cultural-educational, and music schools. There is a musical and dramatic theater and a philharmonic society in the city. Museums include a museum of local lore and the O. Iu. Kobylianskaia and the O. Fed'kovich literary memorial museums. Chernovtsy also has a television center.

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P. V. MIKHAILINA, A. S. ROMANETS, and S. K. KILESSO [29–261–2]

CHERNOVTSY, UNIVERSITY OF, a university in the city of Chernovtsy, Ukrainian SSR. Founded in 1875 on the basis of a seminary, it initially comprised the faculties of theology, law, and philosophy. During the years of Austrian rule in Bucovina (until 1918), German was the language of instruction. After the capture of Bucovina by boyar Rumania in 1918, the University of Chernovtsy was transformed into a Rumanian university (in 1920). During the 1938–39 academic year, 3.7 percent of the students were Ukrainians (in 1939–40 only four Ukrainians, that is, 0.8 percent, graduated). During the 1930's, a Marxist club and an underground Communist organization were active at the university.

In 1940, after Northern Bucovina once again became part of the Ukraine, the University of Chernovtsy was made a Soviet state university, with seven departments, and Ukrainian became the language of instruction. During the years of Soviet power, the university has become a major scientific and cultural center. It has (1977) departments of history, philology, foreign languages, mathematics, physics, chemistry, biology, geography, and general technology. It has a general correspondence school, a correspondence school in economics, an evening division, a division for preparing students for enrollment in the university, a department for improving professional qualifications, and a graduate school. It also has 51 subdepartments, a botanical garden (founded 1877), a biological station, an experimental fish plant, seismic and meteorological stations, and two special problem laboratories, one in the physics of semiconductors and one in the thermodynamics of nonreversible processes in chemistry. In addition, it has museums of zoology, botany, geology, and the history of the university. Its research library has more than 1.7 million books.

During the 1976–77 academic year, the University of Chernovtsy had an enrollment of about 10,000 students and a teaching staff of more than 500, including 26 professors and doctors of sciences and more than 290 docents and candidates of sciences. During the period of Soviet power, the university has trained more than 22,000 specialists. It has been awarded the Order of the Red Banner of Labor (1975). K. A. CHERVINSKII [29–260–2]

CHERNOVTSY OBLAST, part of the Ukrainian SSR. Formed on Aug. 7, 1940. Located in the southwestern part of the Ukrainian SSR. Area, 8,100 sq km. Population, 887,000 (as of Jan. 1, 1977). Divided into ten raions, Chernovtsy Oblast has ten cities and nine urban-type settlements. The administrative center is the city of Chernovtsy. On Feb. 26, 1958, Chernovtsy Oblast was awarded the Order of Lenin.

Natural features. The southwestern part of Chernovtsy Oblast is situated within the Ukrainian Carpathians, with elevations rising to 1,565 m. The central part occupies the Carpathian foothills, with elevations to 537 m, and the northern part, between the Prut and Dnestr rivers, occupies an upland plain, with elevations to 515 m. The climate is temperate continental. The average January temperature on the plain is −4° to −5°C, in the foothills, −5° to −6°C, and in the mountains, −6° to −10°C. In July the corresponding temperatures are 20°–18°C, 19°–17°C, and 18°–10°C. Annual precipitation amounts to 450–700 mm on the plain, 600–800 mm in the foothills, and 800–1,400 mm in the mountains. The growing season lasts 211–216 days on the plain, 206–212 days in the foothills, and 136–180 days in the mountains.

The most important rivers are the Dnestr, the Prut (with its tributary the Cheremosh), and the Siret (a tributary of the Danube).

The soil cover of the plains is dominated by gray forest soils and podzolized chernozems. The foothills have soddy-podzolic soils, and the mountain areas, mountain-type brown forest and soddy-brown soils. Forests and shrubs, which grow primarily in the mountains, occupy 29 percent of the oblast; the principal trees are spruce, fir, beech, oak, and hornbeam.

The forests are inhabited by the reindeer, roe deer, wild boar, bear, lynx, fox, marten, squirrel, muskrat, and European hare. The bison, elk, fallow deer, mink, and, among the birds, pheasant have all become acclimatized in the oblast. The rivers abound in sterlet, Danubian salmon, trout, sheatfish, European bream, and chub.

Population. Ukrainians constitute (1970) 68.8 percent of the population, Rumanians 10 percent, Moldavians 9.3 percent, Russians 6.3 percent, Jews 4.4 percent, and Poles 0.6 percent. The average population density is 109.5 persons per sq km (as of Jan. 1, 1977). The plain is the most densely populated area. In 1977 the urban population accounted for 37 percent of the total.

The most important cities are Chernovtsy, Khotin, and Storozhinets.

Economy. During the years of socialist construction, Chernovtsy Oblast has been transformed from a backward agrarian region into one of the most developed industrial-agrarian oblasts of the Ukraine. The food-processing industry is represented by a meat-packing combine, a combine for the production of oils and fats, and a milk combine (Chernovtsy, Novoselitsa), sugar refineries (Chernovtsy, Kel'mentsy, Zarozhany), vegetable-drying plants, and canneries. Machine building is dominated by the production of equipment for the petroleum-refining industry and by electric power production. It is represented by a machine-building plant, a mechanical repair plant, and the Elektronmash and Chernovtsylegmash production associations. The largest light industrial enterprises are located in Chernovtsy, including the Voskhod cotton production association, a glove and knitwear production association, a hosiery production association, and the Trembita garment production association. The lumber and wood-products industries are quite developed and are represented by logging and the production of furniture, plywood, and splint-slab panels in Chernovtsy, Vizhnitsa, Beregomet, Storozhinets, Khotin, and Putila. There are also plants for the production of chemicals and rubber footwear. The construction industry is represented by the production of brick and tile products and reinforced-concrete structural components and parts (Chernovtsy, Kostrizhevka, Storozhinets, Mamalyga, and Kel'mentsy). Various folk arts are also developed, including embroidery, rug weaving, and wood carving (Chernovtsy, Khotin, Vizhnitsa).

Agriculture specializes in the production of grain and industrial crops and in raising livestock for dairy and meat purposes. The oblast has (1976) 151 kolkhozes and 33 sovkhozes. Fifty-nine percent of the oblast's total land area is occupied (1976) by agricultural lands, of which lands under cultivation account for 73 percent, hayfields for 7 percent, and pastures for 14 percent. The sown area totals 351,900 hectares (ha), of which 147,300 ha are under grains (winter wheat, 45,800 ha; spring barley, 29,700 ha; seed corn; 47,700 ha; legumes, 14,300 ha), 35,800 ha under sugar beets, 5,000 ha under long-staple flax, 24,000 ha under potatoes, 8,000 ha under vegetable crops, and 126,300 ha under fodder crops. Fruit growing is also developed (apples, plums, pears, cherries, walnuts). The Bukovina and Dnestr production-agrarian orchard sovkhoz associations have been created in the Sokiriany and Khotin Raions. Fruit, berry, and grape plantings occupy 33,100 ha. Reclaimed land suitable for farming totals 57,000 ha.

Livestock raising accounts for more than 50 percent of the gross agricultural output. In 1976 the oblast had 448,700 head of cattle (including 154,000 cows), 266,200 hogs, and 169,800 sheep and goats. New forms of interbranch and intrafarm cooperation in stock raising have been widely introduced; at present, nine interfarm livestock-raising enterprises for fattening cattle, pigs, and poultry are in operation. Pond fisheries are widespread. Beekeeping is also developed.

Chernovtsy Oblast has 466 km of railroad. The following railroad lines pass through Chernovtsy Oblast: Mostiska–L'vov–Ivano-Frankovsk–Chernovtsy–Vadul-Siret, Ivano-Frankovsk–Chernovtsy–Ungeny–Kishinev–Odessa, and Chernovtsy–Oknitsa–Zhmerinka–Kiev. Motor-vehicle roads total 3,000 km, of which 2,800 km are hard-surfaced (1976). The principal highways are Chernovtsy–L'vov, Chernovtsy–Kiev (by way of Ternopol' and by way of Vinnitsa), and Chernovtsy–Kishinev–Odessa.

Education, cultural affairs, and public health. In 1914 there were 379 schools, with more than 71,000 pupils and students, in what is now Chernovtsy Oblast, as well as ten specialized secondary educational institutions, with 1,288 students, and the University of Chernovtsy, with an enrollment of 799. During the 1976–77 academic year, there were 478 general-education schools of all types, with 153,800 pupils and students, in the oblast, and 14 vocational-technical educational institutions, with 8,200 students, and 18 specialized secondary educational institutions with 15,000 students. More than 14,000 students were enrolled at the university, the medical institute, and a branch of the Kiev Institute of Commerce and Economics. There were 260 preschool institutions, providing care for 27,300 children.

The oblast has (as of Jan. 1, 1977) 579 public libraries, with 6.332 million books and journals, and three museums, all in Chernovtsy: a museum of local lore, the O. Iu. Kobylianskaia literary memorial museum, located in the house where the writer lived from 1928 to 1942, and the O. Fed'kovich literary memorial museum. The O. Iu. Kobylianskaia Musical and Dramatic Theater is located in Chernovtsy. There are also 490 clubs in the oblast, 479 motion-picture projection units, and 25 extracurricular institutions.

The following are published in the oblast: the oblast newspapers *Radians'ka Bukovina* (Soviet Bucovina; since 1940, in Ukrainian) and *Zorile Bukovinei* (Dawn of Bucovina; since 1941, in Moldavian) and the Komsomol newspaper *Molodyi bukovynets'* (Young Bucovinian; since 1940, in Ukrainian).

Programs of the All-Union and republic radio, totaling 28.1 hours per day, are broadcast in the oblast, as well as programs of the oblast radio in Russian, Ukrainian, and Moldavian, totaling two hours. Programs of the Central and republic television, totaling 23 hours per day, are relayed; there are also local television programs in Russian, Ukrainian, and Moldavian, totaling 2.7 hours.

By Jan. 1, 1977, there were 75 hospitals in the oblast, with 9,600 beds (10.9 beds per 1,000 inhabitants) and 2,700 physicians (one physician per 324 inhabitants). The oblast has six sanatoriums. The principal tourist sites are the Carpathians and areas along the Cheremosh River. There are tourist centers in Chernovtsy and Vizhnitsa.

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N. G. IGNATENKO, N. V. KURILIUK, and A. S. ROMANETS [29–256–2]

CHERNOVTSY UKRAINIAN MUSICAL AND DRAMATIC THEATER (full name, O. Iu. Kobylianskaia Chernovtsy Ukrainian Musical and Dramatic Theater). The Chernovtsy Ukrainian Musical and Dramatic Theater was founded in 1931 in Kharkov as the Theater of the Revolution; its troupe included actors of the Kiev and Odessa theaters and, beginning in 1937, actors of the Kharkov Theater of Young Workers as well. Until 1940 it was called the Lenin Komsomol Theater. In 1940, after Northern Bu-

covina once again became part of the Ukraine, the theater was moved to Chernovtsy; during the Great Patriotic War, it performed in Dagestan, Tataria, the Mari ASSR, and elsewhere. In 1944 it returned to Chernovtsy. Since 1954 it has borne the name of O. Iu. Kobylianskaia.

The most important place in the theater's repertoire is occupied by productions devoted to the past and present life of Bucovina. Known as the Bucovina Chronicle, these productions include *Land* (1947), *On Sunday Morning She Gathered Herbs* (1955), and *The She-wolf* (1963), all based on Kobylianskaia's works, as well as Prokopenko's *Spring Flood* (1949), Balkovenko and Miziun's *Luk'ian Kobylitsa* (1955), *The Steep Banks of the Dnestr*, based on a work by Fed'kovich (1959), and Andrievich's *Lesia* (1959).

The theater also stages classical works of Soviet and foreign drama. Among the productions of the 1960's and 1970's were Snigur's *The Passionate Hearts* (1968), Kocherga's *The Diamond Millstone* (1970), Stel'makh's *The Enchanted Windmill* (1970) and *A Song About Love* (1972), Ostrovskii and Solov'ev's *Belugin's Marriage* (1973), Volodarskii's *Our Debts* (1974), Krym's *Catch Your Train* (1976), and Gel'man's *The Minutes of One Meeting* (1976).

Among those who have been instrumental in the development of the theater are the directors M. S. Tereshchenko, V. S. Vasil'ko, and B. A. Borin, the actors Iu. A. Velichko and V. K. Sokirko, and the composer B. V. Krizhanovskii. As of 1977, the theater troupe included People's Artists of the Ukrainian SSR Iu. S. Kozakovskii, P. G. Mikhnevich, and A. Ia. Ianushevich and Honored Artists of the Ukrainian SSR A. N. Anan'ev, V. A. Zhikharskii, E. B. Zolotova, A. G. Litvinchuk, P. I. Nikitin, A. P. Ponomarenko, O. F. Rudnitskaia, N. G. Fialko, and A. V. Sheremet. The principal director is V. D. Opanasenko (since 1975), and the principal artist (stage designer), Honored Artist of the Ukrainian SSR V. V. Lassan (since 1966).

M. A. ANDRIEVICH [29–260–1]

CHERNOZEM, a type of soil that forms beneath steppe and forest-steppe vegetation in the sub-boreal belt. Chernozems form chiefly from carbonate-bearing parent rock—loesses, loess-like clays, and loams—and sometimes from more ancient limestones, sandstones, and marly clays in undrained or periodically drained circumstances. Chernozems are characterized by the accumulation of organic matter in the humus-accumulative horizon, by a high humus content, by a well-expressed cloddy-granular texture, and high potential fertility.

The first scientific observations about the origin of chernozems were made by M. V. Lomonosov (mid-18th century). Lomonosov believed that chernozems formed as a result of the decomposition of plant and animal matter. At the turn of the 19th century, P. Pallas and others proposed the hypothesis of a marine origin of chernozems, considering them to be marine oozes remaining after the retreat of the Caspian and Black seas; this hypothesis is only of historical importance, reflecting the idea prevalent at that time of soil as a geological formation. The hypothesis of the bog origin of chernozems also proved unfounded. Supporters of this theory, such as E. I. Eikhval'd and others in the mid-19th century, believed that the zone of chernozems had in the past been highly marshy tundra areas and that the decomposition of marsh vegetation caused by the onset of a warm climate led to the formation of chernozems. The theory of the terrestrial-plant origin of chernozems (F. I. Ruprekht, V. V. Dokuchaev, and others) links their formation to the establishment and development of meadow-steppe and steppe-grass vegetation. This theory was expounded in great detail by V. V. Dokuchaev in *Russian Chernozem* (1883), in which Dokuchaev proved that chernozems formed as a result of the close interaction of grassy vegetation, climate, topography, parent rock, and other soil-forming factors. The accumulation of humus is a consequence of this process.

Each year, grassy vegetation leaves extensive dead matter in the soil. This matter is plant remains, 70–80 percent of which are roots. The hydrothermal conditions of the steppe and forest-steppe zones are conducive to humification, as a result of which complex humus compounds are formed (primarily humic acids) and impart to the soil profile its dark coloring. The best conditions for humification occur in the spring and early summer, when the soil is supplied with adequate moisture as a result of autumn and winter precipitation and the snowmelt and when temperature conditions are favorable. During the period of summer drying out, the microbiological processes markedly weaken, which prevents humic matter from becoming rapidly mineralized. When plant remains, rich in ash elements and nitrogen, decompose, bases form (calcium is especially plentiful), which saturate the humic matter. This helps to fix the decomposed remains in the soil in the form of humates and to preserve a neutral or close-to-neutral reaction in the top horizons of the chernozems. In addition to the humus, the plant nutritional elements, such as nitrogen, phosphorus, sulfur, and iron, are fixed in the soil in the form of complex organomineral compounds, which form as a result of the interaction of humic acids with the ash elements of plant remains and the mineral part of the soil.

Chernozem soil formation is most intensive in the forest-steppe zone, where better moisture conditions promote more intensive development of grassy vegetation and active humification of its residue. In the steppe zone, inadequate moisture causes shallower root penetration, a decrease in the amount of dead matter entering the soil, and fuller decomposition of the matter.

The natural process of soil formation alters significantly when chernozems are brought into agricultural use. The cultivation of crops changes significantly the character of the biological cycle of matter and conditions of formation of the water and heat regimes. A large part of the biomass formed and consequently a significant quantity of nutrients are removed each year, and the period of vigorous interaction between the plant root systems and the soil is reduced. In addition, the soil remains for a long time without a plant cover, which reduces its absorption of winter precipitation. When virgin chernozems are first plowed, the structure of the soil is partially broken down and the content of humus and nitrogen in the plowed horizon drops, especially in the first years of cultivation. This process slows down in later years. At the same time, the activation of microbiological processes when chernozems are cultivated promotes the mobilization of nitrogen and phosphorus. Therefore, cultivated chernozems have a high content of nutrients that are available to plants. To maintain the high fertility of chernozems that have been brought into intensive cultivation, it is essential to introduce crop rotation, apply organic and mineral fertilizers, and use the proper soil tillage system.

The following genetic horizons are identified in the chernozem profile: A (humus-accumulative)—the most intensively colored, top part of the humus layer; B_1 (humus-transitional)—the lower, less colored part of the humus layer; B_2 (the horizon of humus streaks)—not observed in all types of chernozems; B_c (illuvial-carbonate horizon)—often combined with horizon B_2; and C—parent rock. Horizons A and B_1 both measure 40–120 cm in thickness and have a humus content of 4–12 percent.

Chernozems are broken down into the following subtypes: podzolized, leached, typical, ordinary, and southern. Each subtype has its own characteristic features; each differs in the thickness of the humus horizons, the humus content, the depth of carbonate occurrence, and other features determined by the conditions of development (see Table 1).

Table 1. Characteristics of chernozem subtypes

Subtype	Thickness of horizons A and B_1 (cm)	Depth of occurrence of carbonates (cm)	Humus content (percent)	Humus reserves in 1-m layer (ton/ha)
Podzolized	50–80	140–150	5–8	450–500
Leached	50–80	100–140	6–10	500–600
Typical	85–120	85–120	8–12	500–800
Ordinary	65–80	50–60	6–10	350–600
Southern	40–50	0–30	4–6	250–400

A clear pattern can be observed in the geographic distribution of chernozem subtypes. The zone of chernozems is subdivided from north to south into the subzones of podzolized, leached,

typical, common, and southern chernozems. These subzones are most clearly expressed in the European USSR.

Also identified are micellar-carbonate chernozems (Azov and Ciscaucasian), which form in regions with warm winters, where the soil does not freeze, and chernozems that develop under conditions of winter freezing. Chernozems are classified as ordinary, carbonate, solonets, solonets-solonchak, and the like according to the degree of salinity. According to the thickness of the humus layer (A and B_1), they are classified as thin (less than 40 cm), medium thick (40–80 cm), thick (80–120 cm), and super thick (more than 120 cm). They are grouped according to humus content into low-humus (less than 6 percent), medium-humus (6–9 percent), and high-humus, or fertile (more than 9 percent). The clay and loam varieties of chernozems predominate. They possess favorable physical and physicochemical properties, such as good water capacity and high capacity for absorption of cations (30–70 mg per 100 g of soil).

There are about 240 million hectares of chernozems in the world, confined to Eurasia and North and South America. In Eurasia the chernozem zone, the largest in the world, encompasses Western and Southeastern Europe (Hungary, Bulgaria, Austria, Czechoslovakia, Yugoslavia, and Rumania), stretches in a broad band across the USSR, and continues on into Mongolia and China. In North America chernozems cover several western states of the USA and the southern provinces of Canada. In South America they are located in southern Argentina and the southern foothill regions of Chile.

In the USSR, chernozems are found in Moldavia, the Ukraine, the central part of the RSFSR, the Northern Caucasus, the Volga Region, and Western Siberia. They are very fertile and nearly all of them are farmed. The chernozem zone is the most important agricultural region of the country, containing more than 50 percent (130 million hectares) of the country's plowed land. Winter and spring wheat, sugar beets, sunflowers, hemp, flax, buckwheat, and beans are grown on chernozems; animal husbandry, fruit and vegetable growing, and viticulture are highly developed in the chernozem zone.

The accumulation of moisture and its rational use are of paramount importance for increasing the fertility of chernozems, especially in the steppe regions of the zone, where a greater deficit of atmospheric moisture is observed. To improve the water regime of chernozems, irrigation is practiced and forest windbreaks are planted. Measures to prevent soil erosion, contamination by pesticides, and the salinization that can occur during irrigation play a special role.

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I. S. KAURICHEV [29–284–1]

CHERNUKHI, an urban-type settlement and the administrative center of Chernukhi Raion, Poltava Oblast, Ukrainian SSR. Chernukhi is situated 35 km from the Piriatin railroad station on the Grebenka-Priluki line. The settlement has a milk plant, a mixed-feed plant, and a factory that produces household goods. Chernukhi has a museum of history and local lore with a memorial *usad'ba* (ensemble of buildings) devoted to G. S. Skovoroda. [29–303–5]

CHERNUKHINO, an urban-type settlement in Pereval'sk Raion, Voroshilovgrad Oblast, Ukrainian SSR. Chernukhino is a railroad junction with lines to Debal'tsevo, Sterovka, and Ilovaisk. Coal is mined near the settlement, which has a poultry-raising sovkhoz and a poultry farm. A museum of local history is in Chernukhino. [29–304–1]

CHERNUSHKA, a city and administrative center of Chernushka Raion, Perm' Oblast, RSFSR. Chernushka is a railroad station on the Kazan-Sverdlovsk line. Petroleum is extracted nearby. Industry is represented by a metalworks, a meat-packing plant, and a creamery. The city has a people's amateur theater and a museum of local lore. [29–304–4]

CHERNYE BRAT'IA, a group of three small islands in the central part of the Greater Kuril Chain, between the Boussole and Urup straits. The islands of Chirpoi and Brat Chirpoev are separated by the Bystryi Strait, which is 2.7 km wide.

Chirpoi Island (area, 21 sq km) consists of four volcanic cones rising to a maximum elevation of 691 m. Two of the volcanoes are active: Chernyi has erupted in 1712 and 1713, 1854, and 1857; Snou, in 1879, 1960, and other years. The island is composed of andesitic basalts.

Brat Chirpoev Island (area, 20 sq km) is a chain of volcanic cones showing traces of recent activity and rising to a maximum elevation of 749 m. It is composed of basalts.

Morskaia Vydra Island, a rocky crag rising to an elevation of 150 m, is a volcanic dome. [29–304–5]

CHERNYE LIUDI, a category of rural and urban dwellers in Russia from the 12th to 17th century. The rural dwellers of this category were the *chernososhnye krest'iane*, who lived on what were called the *chernye zemli*.

In the *posady* (merchants' and artisans' quarters of towns), the *chernye liudi* paid state taxes; by contrast, such taxes were not paid by the *belomesttsy* (urban dwellers not subject to the *tiaglo*, a system of state duties). The *chernye liudi* were divided, according to socioeconomic position, into "better," "middle," and "lesser." Under the reform of the land of Ivan IV, the urban and rural *obshchiny* (communes) of the *chernye liudi* were given greater latitude in electing their own officials and carrying out the tasks of self-administration, including administrative, financial, and judicial responsibilities; this new system later became established primarily in the north. The importance of the self-governing bodies declined in the 17th century as government by *voevoda* (military governor) developed. The term *chernye liudi* went out of use in the early 18th century. [29–305–2]

CHERNYE MOUNTAINS ("Black Mountains," from the dark color of the wooded ridges), the name of the frontal ranges of the Greater Caucasus, situated north of the Skalistyi Range, between the Belaia River in the west and the Argun River in the east. The Chernye Mountains rise to elevations of 1,500 m and for the most part resemble cuestas, with gentle northern slopes and steep southern slopes. The slopes have forests of oak, beech, and other trees. [29–304–6]

CHERNYE ZEMLI (literally, "Black Lands"), a flat, semidesert region in the western part of the Caspian Lowland, mainly in the Kalmyk ASSR. Chernye Zemli is bounded by the Ergeni Upland on the west and the Volga delta on the east. It is an area of transhumant stock raising with pastures primarily for winter use. The name of the region derives from its not being completely covered by snow in winter. [29–304–7]

CHERNYE ZEMLI (literally, "black lands"), in 14th- to 17th-century Russia, the landholdings of *chernososhnye krest'iane* (a category of peasants under the direct control of the state) and of the part of the urban population subject to the *tiaglo* system of taxation (*see* TIAGLO). In the early 18th century *chernye zemli* came to be called state (*kazennye*) lands. [29–304–8]

CHERNYI, GORIMIR GORIMIROVICH. Born Jan. 22, 1923, in Kamenets-Podol'skii. Soviet scientist in mechanics. Corresponding member of the Academy of Sciences of the USSR (1962). Member of the CPSU since 1954.

Chernyi served in the Soviet Army from 1941 to 1945. He graduated from Moscow State University in 1949. From 1949 to 1958, he was on the staff of the Central Institute of Aircraft Engine Construction. He became a professor at Moscow State University in 1958 and was made the director of the university's Research Institute of Mechanics in 1960.

Chernyi's main works deal with aerodynamics. Chernyi proposed a new method of studying and analyzing gas flows behind strong shock waves, particularly in the case of hypersonic flows past bodies. He has written works on the theory of detonation and combustion, boundary-layer theory, and the theory of gas-fired machines.

Chernyi has received the State Prize of the USSR and has been awarded five orders and various medals.

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CHERNYI, SASHA (real name, Aleksandr Mikhailovich Glikberg). Born Oct. 1 (13), 1880, in Odessa; died Aug. 5, 1932, in Le Lavandou, France. Russian poet.

The son of a pharmacist, Chernyi was first published in 1904. Over a period beginning in 1905, he contributed to satirical journals in St. Petersburg, including, from 1908 to 1911, *Satirikon*. Chernyi's satirical verse was caustic and to the point. In the poems of his collection *Satiry* (1910), he unmasked political reaction, ridiculed liberal intellectuals who had betrayed their high ideals, and mocked philistinism and triviality in politics, literature, and everyday life. His sarcasm and pessimism subsequently intensified in his lyric poetry.

Chernyi emigrated in 1920. His book *Thirst* (1923) is colored with nostalgia for his lost homeland. In the last years of his life, in addition to conventional short stories, Chernyi wrote stories of a new type that were collected in *Soldier's Tales* (published 1933). In this collection Chernyi, who had fought in World War I, depicted the Russian soldier of that period. Chernyi was also a master of verse and prose for children.

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CHERNYI LES CULTURE, an archaeological culture of pre-Scythian farming tribes of the middle Dnieper region, which migrated in the tenth to eighth centuries B.C. from the forest-steppe region between the Dnestr and Dnieper rivers to the basin of the Vorskla River. It is named after an ancient site in the Chernyi Les on the upper Ingulets River.

The Chernyi Les culture originated from the Belogrudovo culture of the Bronze Age (*see* BELOGRUDOVO CULTURE). During the period of the Chernyi Les culture, bronze and stone tools were replaced by iron tools, although implements made from bone were still widespread. The culture is characterized by bronze celts and daggers, swords with iron blades and bronze hilts, bronze and bone arrowheads, wide bronze bracelets, and wire temporal rings. The pottery includes tulip-shaped jugs and glazed goblets, bowls, and buckets, ornamented with hatched triangles. A group of ancient towns of the Chernyi Les culture, including Subbotovskoe, an important center of bronze casting, were concentrated in the basin of the Tiasmin River. The dead were cremated, and burial mounds were sometimes erected; the graves of warriors are distinctive. In the seventh century B.C., the Chernyi Les culture merged with the Scythian cultures.

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CHERNYI OSTROV, an urban-type settlement in Khmel'nitskii Raion, Khmel'nitskii Oblast, Ukrainian SSR. Chernyi Ostrov is situated on the Iuzhnyi Bug River near the Chernyi Ostrov railroad station, 20 km northwest of the city of Khmel'nitskii. The settlement produces knitwear and footstuffs. There is a museum devoted to the Ukrainian poet L. I. Glebov in Chernyi Ostrov. [29–307–3]

CHERNYI PEREDEL (Black Repartition), the official journal of the Black Repartition, a revolutionary Populist organization. In 1880–81 five issues appeared. The first two were edited by G. V. Plekhanov, P. B. Aksel'rod, Ia. V. Stefanovich, L. G. Deich, and O. V. Aptekman. Because the organization's St. Petersburg printing house was seized by the government, the first two issues were printed in Geneva. The third through fifth issues were edited by A. P. Bulanov, K. Ia. Zagorskii, and M. I. Sheftel' and printed at the organization's Minsk printing house. Circulation, 1,000.

PUBLICATION

"Chernyi peredel": Organ sotsialistov-federalistov, 1880–1881. Moscow-Petrograd, 1923. [29–308–1]

CHERNYI POROG, an urban-type settlement in Segezha Raion, Karelian ASSR. Chernyi Porog is situated 45 km west of the Kochkoma railroad station on the Petrozavodsk-Belomorsk line. It has a logging station of the Nadvoitsy logging and timber distribution establishment. [29–308–2]

CHERNYI SHLIAKH (Black Road), a route used by the Crimean Tatars in the 16th and 17th centuries for raids on Galicia, Poland, and the Right-bank Ukraine. It led from the Perekop Isthmus north through Zaporozh'e. Between the upper courses of the Ingulets, Ingul, and Tiasmin rivers, it turned west and divided into the Kuchman Road and two other routes, of which the northern route passed near what are now Korsun', Boguslav, Lisianka, Zhashkov, and Tetiev, and the southern route passed not far from present-day Shpola, Tal'noe, Uman', and Dashev. The two routes joined near Lipovets. The *Chernyi shliakh* then proceeded west toward Khmel'nik, Ternopol', and L'vov. [29–308–5]

CHERNYSHEV, ALEKSANDR ALEKSEEVICH. Born Aug. 9 (21), 1882, in the village of Loven', in present-day Chernigov Oblast; died Apr. 18, 1940, in Moscow. Soviet scientist; specialist in electrical engineering. Academician of the Academy of Sciences of the USSR (1932; corresponding member, 1929).

Chernyshev graduated in 1907 from the St. Petersburg Polytechnic Institute, where he became a professor in 1919 and remained a faculty member until he moved to Moscow in 1936. He also worked at the Physicotechnical Institute in Petrograd (beginning in 1918) and later at several institutes of the Academy of Sciences of the USSR, including the Institute of Power Engineering and the Commission on Automation and Telemechanics. Chernyshev's principal works were devoted to high-voltage and radio engineering. Chernyshev also worked on electrical measurements, television, long-distance radiotelephone communications, railroad electrification, the planning and organization of scientific work, and the history of electrical engineering. He was also instrumental in developing the GOERLO plan. Chernyshev was awarded the V. I. Lenin Award in 1930.

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CHERNYSHEV, ALEKSANDSR IVANOVICH. Born Dec. 30, 1785 (Jan. 10, 1786), in Moscow; died June 8 (20), 1857, in Castellammare di Stabia, Italy. Russian military and state figure. Adjutant general (1812); general of the cavalry (1826); count (1826); grand duke (1849).

Chernyshev entered the guards cavalry in 1802 and fought in the war with France between 1805 and 1807. From 1808 to 1812 he performed important diplomatic assignments in France and Sweden and served as a military and diplomatic agent in Paris. Chernyshev was with Emperor Alexander I in the army field forces at the beginning of the Patriotic War of 1812, commanding a cavalry detachment. He took part in the foreign campaigns of the Russian army of 1813–14, became a member of the tsar's retinue in 1815, and assumed command of a cavalry division in 1821. In 1826, Chernyshev was a member of the commission investigating the Decembrists.

Chernyshev became a senator in 1827 and was appointed deputy chief of the Main Headquarters and head of the war ministry in 1828. Between 1832 and 1852, as minister of war he strengthened the recruiting system with the statute of 1831 and increased the centralization of the war department. He became chairman of the Council of State in 1848. An advocate of harsh discipline and obsolete linear tactics, Chernyshev was one of those primarily responsible for the defeat of the Russian Army in the Crimean War of 1853–56.

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CHERNYSHEV, ANDREI BORISOVICH. Born Apr. 9 (22), 1904, in St. Petersburg; died Nov. 22, 1953, in Moscow. Soviet scientist; specialist in the gasification of solid fuels. Corresponding member of the Academy of Sciences of the USSR (1939). Academician of the Academy of Sciences of the Estonian SSR (1951). Member of the CPSU from 1943.

Chernyshev graduated from the Leningrad Institute of Technology in 1929 and held a professorship at the Moscow Institute of Chemical Engineering. In 1948 he became the director of the Institute of Fuel Resources of the Academy of Sciences of the USSR.

Chernyshev's major work was devoted to problems of gasification, including underground gasification and the thermal conversion of solid fuels. He directed various research efforts, including a study of coal gasification at a pressure of 100 technical atmospheres, development of a method for the production of town's gas by the catalytic methanization of water gas, and work on the integrated electrochemical use of fuels. Chernyshev was awarded the State Prize of the USSR (1946), three other orders, and various medals.

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CHERNYSHEV, ARKADII IVANOVICH. Born Mar. 3 (16), 1914, in Nizhnii Novgorod (present-day Gorky). Soviet athlete; one of the founders of the Soviet school of ice hockey. Honored Master of Sport (1948); Honored Coach of the USSR (1956). Colonel.

Chernyshev graduated from the Higher Coaches' School in 1940. He was a champion of the USSR in soccer (1937, 1940) and ice hockey (1947). From 1937 to 1940 he played on the Moscow Dynamo bandy team, helping win the USSR Cup four times. From 1948 to 1972, he and A. V. Tarasov coached the national ice-hockey team of the USSR. Chernyshev's pupils included more than 30 Olympic, world, and European champions.

Chernyshev has been awarded four orders, as well as medals.

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CHERNYSHEV, FEODOSII NIKOLAEVICH. Born Sept. 12 (24), 1856, in Kiev; died Jan. 2 (15), 1914, in St. Petersburg. Russian geologist and paleontologist. Academician of the St. Petersburg Academy of Sciences (1909).

Chernyshev studied at the Marine School, and in 1880 he graduated from the Mining Institute in St. Petersburg. In 1882 he began working on the Geological Committee, becoming its director in 1903. Beginning in 1900, he was also director of the Geological Museum of the Academy of Sciences in St. Petersburg.

Chernyshev worked out the stratigraphy of the Paleozoic deposits of the Urals, which served as the basis for subdividing synchronous formations in the arctic, the Altai, Middle Asia, and elsewhere. As a result of his studies of the circumpolar region (Timan, Novaia Zemlia, and Spitzbergen), Chernyshev compiled a series of paleontological surveys of Devonian and Upper Carboniferous fauna (1889–1901). He completed a petrographic study of the eastern slopes of the Urals, as a result of which he concluded that the schists of the region were metamorphosed Silurian and Devonian sedimentary rocks. Chernyshev believed that the structure of the Urals formed under the influence of tangential forces that caused dislocations in the latitudinal and northeasterly directions, characteristic of all of Northern Europe. A geological survey of the Donets Coal Basin was begun under Chernyshev's direction in 1892.

A ridge in the Polar Urals and a mountain range in Transbaikalia have been named after Chernyshev, as well as a glacier and a mountain on Novaia Zemlia and a bay on the Taimyr Peninsula.

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CHERNYSHEV, GRIGORII PETROVICH. Born Jan. 21 (31), 1672; died July 30 (Aug. 10), 1745. Russian military leader and statesman. Count (1742). An associate of Peter I the Great.

Chernyshev participated in the Azov campaign in 1695 and fought in a number of significant battles during the Northern War of 1700–21. He distinguished himself in 1709 at the battle of Poltava, and in 1710 he commanded a large detachment during the capture of Vyborg. From 1713 to 1714 he headed the campaign into Finland. In 1718, Chernyshev became a member of the Admiralty College and a senator. When the Northern War ended, he occupied a series of important administrative positions and served as governor of Azov, Livland, and Moscow provinces. In 1730 he fought on the side of Empress Anna Ivanovna against the members of the Supreme Privy Council. Chernyshev left notes that contain valuable information about events in his time.

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"*Zapiski 1672–1745.*" *Russkaia starina*, June 1872. [29–311–2]

CHERNYSHEV, PAVEL FEOKTISTOVICH. Born circa 1854 in Samara Province; died the night of Mar. 26–27 (Apr. 8–9), 1876, in St. Petersburg. Russian Narodnik (Populist) revolutionary.

Chernyshev, who was of noble birth, attended the Medical and Surgical Academy. He was an organizer and the treasurer of the St. Petersburg student circle known as the Samartsy, and he took part in the "going to the people" movement. Arrested in Samara on Aug. 30, 1874, Chernyshev was sent to prison, where he contracted tuberculosis. He was released on bail on Mar. 11, 1876, and died in a hospital. He is buried in Volkovo Cemetery.

Chernyshev's funeral on Mar. 30, 1876, turned into a large antigovernment demonstration. G. A. Machtet dedicated the poem "Succumbed to the ordeal of imprisonment" ("The Last Farewell") to Chernyshev's memory. The poem became a song popular among young Russian revolutionaries. [29–312–1]

CHERNYSHEV, SERGEI EGOROVICH. Born Oct. 4 (16), 1881, in the village of Aleksandrovka, in what is now Moscow Oblast; died April 26, 1963, in Moscow. Soviet architect.

Chernyshev graduated from the Moscow School of Painting, Sculpture, and Architecture in 1901 and from the St. Petersburg Academy of Arts in 1907. At the latter institution he studied under L. N. Benois. Chernyshev was chief architect of Moscow from 1934 to 1941. He was chairman of the board of architecture

of the Moscow city executive committee from 1944 to 1948 and first secretary of the Architects' Union of the USSR from 1950 to 1955. Chernyshev taught at the Moscow Vkhutemas-Vkhutein (State Higher Arts and Technical Studios–Higher Art and Technical Institute) from 1918 to 1930 and at the Moscow Architectural Institute from 1931 to 1950.

Among Chernyshev's works were a general plan for the reconstruction of Moscow (with architect V. N. Semenov and others, 1931–35) and the Moscow University complex on the Lenin Hills (with architects P. V. Abrosimov, L. V. Rudnev, A. F. Khriakov, and others, 1949–53; State Prize of the USSR, 1949). Chernyshev was awarded the Order of Lenin, two other orders, and various medals. [29–312–2]

CHERNYSHEV, VASILII EFIMOVICH. Born Aug. 13 (26), 1908, in the village of Krasnoe, in what is now Livny Raion, Orel Oblast; died Nov. 12, 1969, in Moscow. Soviet party and government figure. A leader of the partisan movement in Byelorussia during the Great Patriotic War of 1941–45. Major general (1943). Hero of the Soviet Union (Jan. 1, 1944). Member of the CPSU from 1928.

The son of a worker, Chernyshev graduated from the Orel Infantry School in 1927 and Briansk Communist University in 1930. He took up party work, and in 1941 he became secretary of the Baranovichi oblast committee of the Communist Party of Byelorussia (Bolshevik). In 1942 he became the agent of the party's Central Committee in charge of organizing the partisan movement in Baranovichi Oblast, and in 1943 he became secretary of the underground oblast party committee and commander of a partisan formation. Chernyshev became first secretary of the Brest and Minsk oblast committees in 1944, and in 1950 he became secretary of the Central Committee of the Communist Party of Byelorussia (Bolshevik). From 1951 to 1959 he was first secretary of the Kaliningrad oblast party committee, and from 1959 to 1969 he was first secretary of the Primor'e Krai Committee.

Chernyshev became deputy chairman of the Party Control Committee of the Central Committee of the CPSU in 1969. He became a member of the Central Committee of the CPSU in 1952, and he was a deputy to the third through seventh convocations of the Supreme Soviet of the USSR. Chernyshev was awarded six orders of Lenin and three other orders, as well as various medals. [29–310–3]

CHERNYSHEV, VASILII IL'ICH. Born Dec. 29, 1866 (Jan. 10, 1867), in the village of Aleksino, in what is now Vladimir Oblast; died May 21, 1949, in Leningrad. Soviet Russian linguist. Corresponding member of the Academy of Sciences of the USSR (1931).

Chernyshev graduated from the Kirzhach Teachers' Seminary in 1886 and taught in village, district, and city schools from 1886 to 1912. He was recruited by A. A. Shakhmatov for lexicological work at the St. Petersburg Academy of Sciences. His main works dealt with lexicology, dialectology, orthography and orthoepy, stylistics, and the methodology of teaching Russian. In 1900 he drew up the most extensive plan to date for a complete dialect survey.

Chernyshev saw in the literary language the complex interrelations between the formal language and various dialect systems (*Regularity and Purity of the Russian Spoken Language*, 1911). He studied the language and style of E. A. Baratynskii, A. V. Kol'tsov, V. I. Maikov, N. A. Nekrasov, I. S. Turgenev, G. I. Uspenskii, and A. S. Pushkin. He also was the author of a number of textbooks. One of the initiators of the *Dictionary of the Modern Russian Literary Language*, he was the editor in chief of the first two volumes, which appeared in 1948 and 1950. Chernyshev was posthumously awarded the Lenin Prize in 1970.

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I. F. PROTCHENKO [29–311–1]

CHERNYSHEV, ZAKHAR GRIGOR'EVICH. Born Dec. 14 (25), 1796; died May 1862 in Rome. Decembrist; count.

Chernyshev joined the Kavalergardy in 1817 and held the rank of *rotmistr*. In the spring of 1825 he was accepted into the Southern Society's St. Petersburg council, established in 1823–24 by P. I. Pestel'. In the autumn of 1825 he helped plan an armed uprising and the assassination of the tsar (*see* DECEMBRISTS), but he did not take part in the uprising of Dec. 14, 1825, since he was on furlough in Orel Province. Arrested there, Chernyshev endured interrogation courageously. He was sentenced to four years at hard labor (commuted to one year) and to exile. In 1829 he was transferred to the Caucasus as a private. He was promoted to officer's rank in 1833 and retired in 1837. After his rights were restored by amnesty in 1856, Chernyshev moved to Italy.

[29–311–3]

CHERNYSHEV, a mountain range at the junction of the Transbaikalia and Amur mountain systems; western link of the Tukuringra-Dzhagdy mountain chain in Amur Oblast, RSFSR. The Chernyshev Range separates the valley of the Niukzha River of the Olekma basin from the valleys of the Ol'doi and Tynda rivers of the Amur basin. The range is 120 km long and reaches an elevation of 1,572 m at Mount Lukinda. It is composed of granites and schists and has flattened, swell-like crests. Mountain taiga predominates, and thickets of dwarf stone pine are found at higher elevations. The range was named in honor of F. N. Chernyshev. [29–313–3]

CHERNYSHEVA, LIDIIA DEM'IANOVNA. Born May 10 (23), 1912, in Berdiansk; died Sept. 23, 1975, in Simferopol'. Soviet ballerina and choreographer. People's Artist of the USSR (1967). Member of the CPSU from 1964.

In 1929, after graduating from the Leningrad Choreographic School, Chernysheva first performed with the musical-comedy theater in Kharkov and then with the traveling M. Kotsiubinskii Theater in Artemovsk and other theaters. From 1939 to 1941 she was director of the song and dance ensemble that she organized for the Donetsk Philharmonic Society. During the Great Patriotic War (1941–45), she headed a song and dance ensemble that performed on the Southern, Transcaucasian, and First Ukrainian fronts. From 1955 to 1970 she was director of the Song and Dance Ensemble of the Kazakh SSR. From 1971 she was director of Tavriia, a women's vocal and dance ensemble in the Ukraine. Chernysheva's choreography organically blended music, dancing, lyrics, and singing, and it was distinguished by ethnic distinctiveness and high professionalism.

Chernysheva was awarded the Order of Lenin and six other orders, as well as various medals. [29–313–1]

CHERNYSHEVICH, ARKADII DMITRIEVICH. Born July 26 (Aug. 8), 1912, in the village of Kulaki, in what is now Soligorsk Raion, Minsk Oblast; died Jan. 18, 1967, in Minsk. Soviet Byelorussian writer.

The son of a peasant, Chernyshevich lived in the Northern Urals from 1930 to 1950 and worked as a logger, builder, and primary school teacher. He was first published in 1940. His works include the cycle of children's stories *Summer* (1940), the novellas *In One Family* (1951) and *On the Ponds* (1954; Russian translation, 1958), and short stories, such as those in the collection *Through Winters and Springs* (1960). In the novel *Dawn* (1957) Chernyshevich described the life of a Byelorussian village in the early 1920's. In *The Malinovka Torture Chamber* (1964–65; Russian translation under the title *Turn of the Century*, 1966), a novel dealing with revolutionary history, he depicted the life of the people on the eve of the Revolution of 1905–07 and a young peasant's difficult path to revolution. Works by Chernyshevich have been translated into various languages of the USSR.

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F. I. KULESHOV [29–313–4]

CHERNYSHEV RIDGE, an upland in the Komi ASSR and Arkhangel'sk Oblast, RSFSR. The Chernyshev Ridge extends southward to the Polar Urals. It is about 300 km long and reaches an elevation of 205 m. It has a plateau-like surface and is composed of sandstones and limestones. The southern part is covered by taiga forest consisting primarily of spruce, with some larch and birch. Tundra is encountered in the northern part. The ridge was named in honor of F. N. Chernyshev. [29–313–2]

CHERNYSHEVSK, an urban-type settlement and the administrative center of Chernyshevsk Raion, Chita Oblast, RSFSR. Chernyshevsk is situated on the Kuenga River, a tributary of the Shilka. The settlement is a railroad junction (Chernyshevsk-Zabaikal'skii) of lines to Bukachacha and Mogocha. Chernyshevsk has enterprises serving railroad transportation. [29–314–1]

CHERNYSHEVSKII, NIKOLAI GAVRILOVICH. Born July 12 (24), 1828, in Saratov; died there Oct. 17 (29), 1889. Russian revolutionary, writer, economist, and philosopher.

Chernyshevskii was the son of a priest. From 1842 to 1845 he attended the theological seminary at Saratov, and in 1850 he graduated from the department of history and philology of the University of St. Petersburg. His world outlook, basically formed during his student years, was shaped by the reality of serfdom in Russia and the revolutionary events of 1848–49 in Europe. Chernyshevskii's views were influenced by the classics of German philosophy, English political economy, and French utopian socialism—including G. Hegel, L. Feuerbach, D. Ricardo, and C. Fourier—and especially by the works of V. G. Belinskii and A. I. Herzen. By the time he graduated from the university, Chernyshevskii was a confirmed democrat, revolutionary, socialist, and materialist. From 1851 to 1853 he taught Russian language and literature at the Saratov Gymnasium; he openly expressed his convictions to his students, many of whom later became revolutionaries. In 1853, Chernyshevskii moved to St. Petersburg. He began to write for *Otechestvennye zapiski* and then for *Sovremennik*, where he assumed a leading position shortly thereafter.

The underlying principle of Chernyshevskii's world outlook was anthropological. Starting from general ideas about human nature and man's tendency to act in his own interest, Chernyshevskii drew revolutionary conclusions on the need to change social relations and forms of ownership. According to Chernyshevskii, the anthropological principle consistently applied coincides with the principles of socialism.

In adopting the positions of anthropological materialism, Chernyshevskii considered himself a follower of Feuerbach, whom he called the father of modern philosophy. In Chernyshevskii's view, Feuerbach's teaching represented "the culmination of German philosophy, which—having now for the first time achieved positive solutions—has abandoned its former scholastic type of metaphysical transcendentalism and, admitting that its own results are identical to the teachings of the natural sciences, has merged with the general theory of natural science and anthropology" (*Poln. sobr. soch.*, vol. 3, 1947, p. 179). In Chernyshevskii's elaboration of Feuerbach's ideas, what was regarded as the criterion of truth was practice—"that immutable touchstone of all theory" (*ibid.*, vol. 2, 1949, p. 102). Chernyshevskii counterposed the dialectical method to abstract metaphysical thought, recognizing the class and party nature of political theories and philosophical teachings.

In 1855, Chernyshevskii defended his master's dissertation, *The Aesthetic Relation of Art to Reality*, which laid the basis for the development of a materialist aesthetics in Russia. Criticizing Hegel's aesthetics, he affirmed the social basis of the aesthetic ideal and formulated the thesis that "beauty is life" (*ibid.*, vol. 2, p. 10). According to Chernyshevskii, the sphere of art is not limited to the beautiful: "what is of general interest in life—*that* is the content of art" (*ibid.*, vol. 2, p. 82). The goal of art is to reconstruct life, to explain it, and "to pass judgment on its manifestations." Art should be a "textbook of life" (*ibid.*, pp. 90, 85, and 87). Chernyshevskii's aesthetic precepts struck a hard blow against the apolitical theory of "art for art's sake." At the same time, Chernyshevskii considered such aesthetic questions to be merely a "field of battle." His dissertation proclaimed the principles of a new revolutionary trend.

Chernyshevskii's journalistic activities were devoted to the struggle against tsarism and serfdom. In Lenin's words, "he approached all the political events of his times in a revolutionary spirit and was able to exercise a revolutionary influence by advocating, in spite of all the barriers and obstacles places in his way by the censorship, the idea of a peasant revolution, the idea of the struggle of the masses for the overthrow of all the old authorities" (*Poln. sobr. soch.*, 5th ed., vol. 20, p. 175).

From 1855 to 1857, Chernyshevskii's published articles were mainly on literary history and criticism; defending the realist trend in literature, he propagandized the idea that literature should serve the interests of the people. His study of Russian journalism and public opinion from the late 1820's to the 1840's (*Essays on the Gogol Period of Russian Literature*, 1855–56) carried on the tradition of Belinskii's democratic criticism. In his analysis of the period of the Enlightenment in Germany "as adapted to our domestic circumstances" (*Lessing: His Time, Life, and Work*, 1857), Chernyshevskii examined the historical circumstances in which literature could become "the principal motive force of historical development" (*Poln. sobr. soch.*, vol. 4, 1948, p. 7). Chernyshevskii had a high regard for A. S. Pushkin and especially for N. V. Gogol; he considered N. A. Nekrasov the best contemporary poet.

In late 1857, Chernyshevskii turned over the department of criticism to N. A. Dobroliubov and devoted himself entirely to economic and political problems. He joined the campaign waged in the magazines for discussion of the impending peasant reform; in a series of articles, such as "On the New Conditions of Rural Life" (1858), "On Methods of Buying the Peasants Out From Serfdom (1858), "How Difficult Is the Redemption of Land?" (1859), and "The Way of Life of the *Pomeshchich'i Krest'iane*" (1859), Chernyshevskii criticized the reform plans of the liberal nobility and proposed instead a revolutionary-democratic solution of the peasant question. He advocated the abolition of the system of landownership without redemption payment to the landowners. In December 1858, finally convinced that the government was incapable of satisfactorily resolving the peasant question, Chernyshevskii warned against the unparalleled impoverishment of the peasant masses and called for a revolutionary end to the reform.

Going beyond anthropologism, Chernyshevskii came close to a materialist interpretation of history. He repeatedly pointed out that "intellectual development, like development in any other area, including the political, depends on economic circumstances" (*Poln. sobr. soch.*, vol. 10, 1951, p. 441).

In order to substantiate his political program, Chernyshevskii studied economic theory and, in the words of K. Marx, "has thrown the light of a master mind on an event which is a declaration of the bankruptcy by bourgeois economy" (K. Marx and F. Engels, *Soch.*, 2nd ed., vol. 23, p. 17). Chernyshevskii's studies included "Economic Activity and Legislation" (1859), "Capital and Labor" (1860), "Comments on the 'Principles of Political Economy' of J. S. Mill" (1860), and "Essays on Political Economy (According to Mill)" (1861); here the author exposed the class nature of bourgeois political economy and contrasted to it his own economic "theory of the working people," which demonstrates "the need to replace the present economic system with a communist one" (*Poln. sobr. soch.*, vol. 9, 1949, p. 262).

Chernyshevskii's economic theory represented the high point of pre-Marxian economic thought. Chernyshevskii rejected the inevitability of exploitation and maintained that economic forms such as slavery, feudalism, and capitalism were transitory. In his judgment, the criterion for the preeminence of one form over another was the ability to ensure growth in the productivity of social labor. It was on such grounds that he was able to make his exceptionally profound criticism of serfdom.

Recognizing the relative progressiveness of capitalism, Chernyshevskii criticized it for the anarchy of its production, for its competition and crises, for its exploitation of the workers, and for its inability to maximize the productivity of social labor. He considered the transition to socialism to be a historical necessity, determined by mankind's entire development. Under socialism "the separate classes of hired worker and employer will disappear, being replaced by a single class of people who will be workers and managers at the same time" (*ibid.*, p. 487).

Chernyshevskii saw that Russia's economy was already coming under the influence of the laws of capitalism, but he wrongly believed that Russia could avoid "the plague of proletarianism," since the question of the "nature of changes in Russian economic life" had not yet been resolved. In such articles as "On Land Ownership" (1857), "Critique of Philosophical Prejudices Against Communal Ownership" (1858), and "Superstition and the Rules of Logic" (1859), Chernyshevskii proposed and justified the idea that Russia might skip the capitalist stage of development and pass to socialism through the peasant commune. In Chernyshevskii's opinion, this possibility would open up as the result of a peasant revolution. In contrast to Herzen, who believed that a socialist system would evolve independently in Russia out of the patriarchal peasant commune, Chernyshevskii considered the assistance of industrially developed countries a necessary guarantee of such development. This idea, which became a reality for the backward countries with the victory of the October Socialist Revolution in Russia, was utopian in the historical conditions of that earlier time. Together with Herzen, Chernyshevskii was one of the founders of *narodnichestvo*, or Populism.

By early 1859, Chernyshevskii was generally recognized as the leader of revolutionary democracy, and his journal *Sovremennik* as its militant organ. Convinced of the inevitability of an imminent popular uprising, Chernyshevskii inclined toward a peasant revolution and developed a political program for revolutionary democracy. In a series of articles on the history of France in which he analyzed revolutionary events, he sought to bring to light the leading role of the masses and their interest in fundamental economic changes. In his article "A Russian at an Assignation" (1858), which he wrote in reference to I. S. Turgenev's novella *Asya*, Chernyshevskii showed the practical impotence of Russian liberalism. His monthly surveys of international events (*Politika*, 1859–62) relied on the historical experience of Western Europe to throw light on pressing questions in Russia and to indicate possible solutions.

Chernyshevskii's article "The Anthropological Principle in Philosophy" (1860) was a systematic presentation of his philosophical views and set forth his ethical theory of "rational egoism." Chernyshevskii's ethics does not separate the interest of the individual from that of society; "rational egoism" is the free subordination of personal advantage to the general cause—whose success, in the final analysis, contributes to the individual's personal advantage as well.

In his "Introduction to Current Austrian Affairs" (February 1861), Chernyshevskii responded directly to the peasant reform with the argument that absolutism could not allow the destruction of feudal institutions and the establishment of political freedom. At the same time he organized a small group of like-minded associates who decided to appeal to various sections of the population. In his proclamation "Greetings to the Landlords' Peasantry From Their Well-wishers," which was confiscated during the seizure of the illegal printing house, Chernyshevskii exposed the predatory quality of the peasant reform; he warned the *pomeshchich'i krest'iane* (peasants owned by noble landlords) against uncoordinated spontaneous action and called on them to prepare for a general uprising upon a signal from the revolutionaries. From the summer of 1861 to the spring of 1862, Chernyshevskii was the source of ideological inspiration and advice for the revolutionary organization Land and Liberty. In his "Letters With No Address" (February 1862, published abroad 1874) he laid before the tsar two alternatives—renunciation of autocracy or revolution.

Fearing Chernyshevskii's growing influence, the tsarist government put a forcible stop to his activity. The *Sovremennik* was banned for eight months; Chernyshevskii, who had been under secret police surveillance since September 1861, was arrested on July 7, 1862, and imprisoned in the Aleksei Ravelin of the Peter and Paul Fortress. The arrest was made on the grounds of a letter, written by Herzen to N. A. Serno-Solov'evich and intercepted by the police, in which Chernyshevskii was named in connection with the proposed publication of the banned *Sovremennik* in London. In solitary confinement and unable to engage in journalistic activities, Chernyshevskii turned to literature.

In his novel *What Is to Be Done?* (1862–63), Chernyshevskii described the lives of new types of persons—the "rational egoists," who live by their own labor, lead a new kind of family life, and disseminate the ideas of socialism in practice. Among Chernyshevskii's characters are Rakhmetov, the first professional revolutionary in Russian literature, and Vera Pavlovna, a progressive Russian woman who devotes her life to socially useful work. The novel popularized the ideas of women's equality and artel production; foretelling the victory of the people's revolution and depicting the coming society, the book was a synthesis of Chernyshevskii's sociopolitical, philosophical, and ethical views and provided a practical plan of action for progressive youth. Published in the *Sovremennik* in 1863 because of careless censorship, the novel had a great effect on Russian society and contributed to the education of many revolutionaries.

While in the Peter and Paul Fortress, Chernyshevskii also wrote the novella *Alfer'ev* (1863), *Tales Within a Tale* (1863–64), and *Brief Stories* (1864). Despite the lack of evidence and his brilliant self-defense, Chernyshevskii in 1864 was found guilty, through false testimony and provocation, of "taking steps to overthrow the existing system of government." He was sentenced to seven years' penal servitude and lifetime residence in Siberia. After the ceremony of "civil execution" in Mytninskaia Square on May 19, 1864, Chernyshevskii was sent to the Nerchinsk hard labor camps (Kadaia mine; transferred to the Aleksandrovskii plant in 1866). In 1871, having completed his term of hard labor, he was sent to jail in Viliuisk.

While serving his sentence, Chernyshevskii wrote the partly autobiographical novel *Prologue* (1867–69; part 1 published abroad 1877), which portrayed the social struggle on the eve of the peasant reform. Of the works he wrote in Siberia, some others that have been preserved are a portion of the novel *Reflected Radiance*, the novella *Story of a Girl*, and the play *Madam Master-Troublemaker*. In these works Chernyshevskii sought to present his revolutionary views in the guise of conversations "on seemingly extraneous matters."

The Russian revolutionaries made some bold attempts to free Chernyshevskii from his Siberian isolation; such an attempt was made by G. A. Lopatin in 1871 and by I. N. Myshkin in 1875. In 1881 the Executive Committee of the People's Will, in its negotiations with the Sviashchennaia Druzhina (Holy Host), made the freeing of Chernyshevskii the first condition for the cessation of terror. It was only in 1883 that Chernyshevskii was transferred to Astrakhan under police supervision, and in June 1889 he was allowed to return to his birthplace.

While in Astrakhan and Saratov, Chernyshevskii wrote the philosophical work *The Nature of Human Knowledge* as well as various reminiscences—for example, about Dobroliubov and Nekrasov; he also prepared his *Materials for a Biography of N. A. Dobroliubov* (published 1890) and translated 11½ volumes of G. Weber's *Universal History*, supplemented by his own articles and commentaries. Chernyshevskii's works remained banned in Russia until the Revolution of 1905–07.

K. Marx and F. Engels studied the works of Chernyshevskii and called him a "great Russian scholar and critic" and a "socialist Lessing" (*Soch.*, 2nd ed., vol. 23, p. 18; vol. 18, p. 522). V. I. Lenin believed that Chernyshevskii had "made a great stride forward as compared with Herzen. Chernyshevskii was a far more consistent and militant democrat, his writings breathing the spirit of the class struggle" (*Poln. sobr. soch.*, 5th ed., vol. 25, p. 94). Compared to the other pre-Marxist thinkers, Chernyshevskii came closer to scientific socialism. Because of the backwardness of Russian life, he was not able to attain the dialectical materialism of Marx and Engels, but according to Lenin he was "the only really great Russian writer who, from the fifties until 1888, was able to keep on the level of an integral philosophical materialism" (*ibid.*, vol. 18, p. 384).

Chernyshevskii's works as well as the image he presented of himself as revolutionary—steady in his convictions and actions—served to educate many generations of Russian progressives. He exerted a great influence on culture and social thought in Russia and among the other peoples of the USSR.

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IU. N. KOROTKOV [29–314–2]

CHERNYSHEVSKII, an urban-type settlement in Mirnyi Raion, Yakut ASSR. The settlement is situated on the Viliui River, a tributary of the Lena. It is linked to the city of Mirnyi by a highway. The Viliui Hydroelectric Power Plant is located in Chernyshevskii, which has a fish nursery. [29–319–1]

CHERNYSHKOVSKII, an urban-type settlement and administrative center of Chernyshkovskii Raion, Volgograd Oblast, RSFSR. The settlement has a railroad station (Chernyshkov) on the Volgograd-Likhaia line, 200 km west of Volgograd. A milk plant and a grain elevator are located in Chernyshkovskii. [29–319–2]

CHEROKEE, an Iroquois-speaking North American Indian tribe.

When the Europeans came to the New World, the Cherokee inhabited southeastern North America. They practiced hoe farming, and social classes were emerging among them. In the 18th century the Cherokee adopted the economic practices of the European settlers: they planted new crops, grew fruit, and raised livestock; they dealt in deerskins and introduced self-government along European lines. In the early 19th century Sequoyah, a mixed-blood, invented a Cherokee alphabet, in which the people received their instruction, a newspaper was published, and Cherokee folklore was recorded.

In 1838 and 1839 the lands of the Cherokee were seized and the tribe forcibly resettled in the west, in Oklahoma. Some hid in the Allegheny Mountains, where in 1842 a reservation was created for them in North Carolina; as a result, there emerged the two groups of Cherokee that exist today: the Eastern and Western Cherokee. The latter are more assimilated, have a more clearly delineated class system, and take an active part in the American Indian movement. According to the 1970 census the Cherokee number more than 66,000, of whom approximately 3,500 live in North Carolina. IU. P. AVERKIEVA [29–617–2]

CHEROKOV, VIKTOR SERGEEVICH. Born Nov. 10 (23), 1907, in the city of Ordubad, in what is now the Nakhichevan ASSR. Soviet military leader; vice admiral (1951). Member of the CPSU since 1938.

Cherokov joined the Soviet Navy in 1926. He graduated from the M. V. Frunze Naval School in 1930, the Naval Academy in 1939, and the K. E. Voroshilov Military Academy of the General Staff in 1950. Serving in the Baltic Fleet, he commanded a brigade of torpedo boats from 1939 to 1941 and fought in the Soviet-Finnish War of 1939–40. During the Great Patriotic War of 1941–45, he took command of the Ladoga Naval Flotilla in October 1941 and was named commander of the Riga Naval District in November 1944. He directed the freighting of supplies across Lake Ladoga during the blockade of Leningrad, the defense of Sukho Island, the Tuloksa Operation of 1944, and the blockading of the enemy's Courland group of forces.

In 1948, Cherokov was named commander of the White Sea Flotilla. He was senior adviser to the Polish Navy from 1950 to 1953 and chief of staff and first deputy commander of the Baltic Fleet from 1953 to 1956. He was named head of a subdepartment at the K. E. Voroshilov Military Academy of the General Staff in 1957 and a department head in 1960. Cherokov has been awarded two Orders of Lenin, three Orders of the Red Banner, the Order of the Red Banner of Labor, the Order of Ushakov Second Class, the Order of the Red Star, and various medals. He has also received orders and medals of the Polish People's Republic. [29–323–1]

CHERSKII, NIKOLAI VASIL'EVICH. Born Jan. 20 (Feb. 2), 1905, in the settlement of Ol'ga, in what is now Primor'e Krai. Soviet scientist; specialist in mechanics and the development of petroleum and gas deposits. Corresponding member of the Academy of Sciences of the USSR (1968); Hero of Socialist Labor (1975). Member of the CPSU since 1942.

Cherskii graduated from the Institute of Water Transport Engineers in Vladivostok in 1931 and from the Academy of the Petroleum Industry in 1951. He became chairman of the Presidium of the Yakutsk Branch of the Academy of Sciences of the USSR in 1964 and has also served as the director of the Institute of Physical and Technical Problems of the North since 1973. Cherskii's chief works deal with the designs of gas wells, the development of methods for calculating the reserves of natural gas deposits and for exploiting gas hydrate deposits, and container-pipeline transportation. He was the codiscoverer of the property of natural gas of forming deposits in the crust in the form of a solid gas hydrate. Cherskii was a deputy to the seventh through ninth convocations of the Supreme Soviet of the USSR. He has been awarded two Orders of Lenin, five other orders, and various medals. [29–323–3]

CHERSKII, an urban-type settlement and administrative center of Nizhnekolymsk Raion, Yakut ASSR. Cherskii is a port on the Kolyma River. The settlement has a fish-processing plant, a meat-dairy combine, and a reindeer-breeding and fur-farming sovkhoz. The floating gas-turbine electric power plant Severnoe Siianie-01 is in Cherskii. The settlement was named in honor of J. Czerski (I. D. Cherskii). [29–324–1]

CHERSKII RANGE, a mountain system in the northeastern part of the USSR, in the Yakut ASSR and Magadan Oblast of the RSFSR. The range was discovered by S. V. Obruchev in 1926 and named in honor of J. Czerski (I. D. Cherskii). It extends from northwest to east-southeast between the Iana-Oimiakon Highland in the southwest and the Moma-Selenniakh intermontane depression in the northeast for a distance of more than 1,500 km.

Numerous ranges stretch in the western part of the Cherskii system, between the Iana and Indigirka rivers, including the Khadaran'ia (to 2,185 m), Tas-Khaiakhtakh (2,356 m), Chemalgin (2,547 m), Kurundia (1,919 m), Dogdo (2,272 m), Chibagalakh (2,449 m), Borong (2,681 m), and Siliap (2,703 m) ranges. In the east, in the vicinity of the upper Kolyma, rise the Ulakhan-Chistai (highest point Mount Pobeda, 3,147 m), Cherge (2,332 m), and other ranges. The Moma-Selenniakh intermontane depression and the Selenniakh, Moma, and Garmychan ranges that rise above it to the north are often included in the Cherskii mountain system, although they actually lie north of the system.

The mountains of the Cherskii Range lie within a zone of Mesozoic folding. They are composed of strongly dislocated and metamorphosed Paleozoic carbonate rocks, with Permian, Triassic, and Jurassic marine and continental strata (shales, sandstones, and siltstones) along the margin. In some places, the carbonate rocks contain intrusions of granitoids, with which are associated deposits of gold, tin, and other minerals.

The principal features of the modern relief have been formed by recent tectonic movements. Typical of the relief is the alternation of horsts, separated by intermontane grabens. Medium-elevation mountains predominate, although some sections rise to 2,000–2,500 m and are characterized by an alpine relief with modern glaciers (the Ulakhan-Chistai, Chibagalakh, and other ranges). More than 350 valley, cirque, and hanging glaciers, with a total area of 156.2 sq km, are known.

The climate is severe and sharply continental. The average January temperatures vary from −34° to −40°C, reaching −60°C in depressions. Summers are short and cool, with frequent frost and snowfalls. The mean July temperature varies from 3°C in the high mountains to 12°–13°C in a number of valleys. Annual precipitation varies between 300 and 600–700 mm a year; as much as 70–75 percent occurs in the summer. Permafrost covers the entire region.

Many rivers, among them the Indigirka and its tributaries, cut across the ranges in narrow, frequently antecedent, valleys. The Moma and Selenniakh rivers flow in intermontane basins through broad, sometimes marshy valleys. The rivers are fed by melting snow and summer rains. More than 60 percent of the annual runoff occurs in the summer. The runoff of the large rivers in the winter is not more than 5 percent of the annual total. Many of the smaller rivers freeze down to the bottom. *Aufeis* is widespread.

The soil and vegetation cover is comparatively uniform. Tall floodplain forests of poplar and *Chosenia* grow on the bottom of the river valleys. Sparse larch forests, usually marshy, grow on the lower part of the slopes to elevations of 250–300 m in the north and to 700–1,100 m in the south. As much as 80 percent of the Cherskii system is covered by vegetation of the high-mountain zone—thickets of dwarf stone pine and alder, and rock, lichen, and shrub tundra. Cold stony deserts are found on the summits of the highest range.

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N. I. MIKHAILOV [29–324–2]

CHERSKII RANGE, a mountain range in Transbaikalia, in Chita Oblast, RSFSR. The Cherskii Range extends for a length of 400 km, from the upper Olengui River to the Olekma River, near the mouth of the Ul'durga River. The Ingoda River cuts across the range near the city of Chita. The mountains rise to elevations of 1,400–1,500 m. They are composed of granites, with effusive and sedimentary rocks in some places. The slopes and summits are covered with pine and larch forests. Spruce-fir-cedar taiga is encountered in deep valleys on the northern slopes. The range is named after J. Czerski (I. D. Cherskii). [29–326–1]

CHERTKOV, VLADIMIR GRIGOR'EVICH. Born Oct. 22 (Nov. 3), 1854, in St. Petersburg; died Nov. 9, 1936, in Moscow. Russian public figure, journalist, and publisher. Close friend of L. N. Tolstoy.

The son of an aristocrat, Chertkov joined the Cavalry Guards Regiment in 1873. He resigned from the regiment in 1881 after undergoing a philosophical crisis; he subsequently conducted educational work among the peasants of Voronezh Province. Chertkov met Tolstoy in October 1883, adopted his teaching, and became a propagandist for Tolstoyism. In 1884 he founded the Posrednik Publishing House with Tolstoy's help.

Chertkov was exiled from Russia in 1897 because of his statements in defense of the Dukhobors. While living in Great Britain, he helped organize the emigration of the Dukhobors to Canada. In addition to works by Tolstoy that the censors had banned, Chertkov published in this period the newspaper *Svobodnoe Slovo* (1901–05) and the anthology *Pages From "Svobodnoe Slovo"* (1898–1902), which contained denunciations of the autocracy. During the Revolution of 1905–07, he advocated the adoption of Christian humility rather than revolutionary methods of struggle. He returned to Russia in 1907.

With money received from the publication of Tolstoy's *Posthumous Literary Works* (vols. 1–3, 1911–12), Chertkov purchased land from Tolstoy's heirs and turned it over to the peasants of Iasnaia Poliana and the village of Grumant. From 1917 to 1920, Chertkov was editor of the journal *Golos Tolstogo i edinenie*. In 1920 he published "A Letter to the British," in which he protested against British interference in Russian affairs. Chertkov collected Tolstoy's diaries, letters, and rough drafts, and on the basis of these materials the publication of Tolstoy's *Complete Collected Works* was begun in 1928; 72 of the edition's 90 volumes were published under Chertkov's editorship.

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CHERTKOVO, an urban-type settlement and administrative center of Chertkovo Raion, Rostov Oblast, RSFSR. Chertkovo is a railroad station on the Millerovo–Georgiu-Dezh line. The settlement has a butter factory, a meat-packing plant, a poultry-packing plant, a food-processing combine, a building-materials combine, and a grain elevator. [29–331–1]

CHERTOK, BORIS EVSEEVICH. Born Mar. 1, 1912, in Łódź, in what is now Poland. Soviet scientist in aircraft and spacecraft control systems. Corresponding member of the Academy of Sciences of the USSR (1968); Hero of Socialist Labor (1961). Member of the CPSU since 1932.

After graduating from the Moscow Power Engineering Institute in 1940, Chertok served on the staffs of a number of research institutes and design offices. He joined the faculty of the N. E. Bauman Moscow Higher Technical School in 1947, becoming a professor in 1966.

Chertok's main works deal with automation, aircraft and spacecraft control systems, and aggregations of complex systems.

Chertok received the Lenin Prize in 1957 and the State Prize of the USSR in 1976. He has been awarded two Orders of Lenin, the Order of the October Revolution, two other orders, and various medals. [29–331–5]

CHERTOMLYK, a Scythian royal barrow of the late fourth century B.C., located 22 km northwest of the city of Nikopol', Dnepropetrovsk Oblast, Ukrainian SSR. It was excavated by I. E. Zabelin in 1862–63. Parts of horse harnesses and other items were found in a mound that stood 19.5 m high and had a circum-

ference of 350 m. Within the mound were four chambers, in which were buried a queen and a king (the burial had been robbed), along with two soldiers and a guard at the entrance to one of the chambers. Among the finds were gold ornaments, pottery, and weapons, including several outstanding examples of applied art: a silver amphora, with depictions in relief of Scythians taming horses, a gold facing for a sword scabbard, with a scene depicting a battle between the Scythians and Amazons, and a gold plate from a gorytus (quiver), with scenes from the life of Achilles. Separate graves yielded the skeletons of 11 horses, with gold and silver harness ornaments, and the burials of two stablemen.

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CHERUSTI, an urban-type settlement in Shatura Raion, Moscow Oblast, RSFSR. Cherusti is a railroad station on the Moscow-Murom line, 156 km east of Moscow. The settlement has railroad transportation enterprises and a machinery-repair plant. [29–332–4]

CHERVEN', a city and administrative center of Cherven' Raion, Minsk Oblast, Byelorussian SSR. Cherven' is located 62 km southeast of Minsk and 30 km from the Pukhovichi railroad station; it is on the Minsk-Mogilev motor highway. The city has a milk plant, a vegetable-dehydration plant, a winery, a bread-baking combine, and a wood-products enterprise. [29–179–1]

CHERVEN (also Cherven'; Polish, Czerwień), an ancient Russian city on the left bank of the Khuchva River, a tributary of the Zapadnyi Bug.

The earliest known reference to Cherven occurs in the Primary Chronicle in the entry for the year 981. The city was the center of the upper Zapadnyi Bug region and gave its name to the Cherven cities. As a result of archaeological excavations in the 1950's and 1960's, scholars have determined that Cherven was located in the vicinity of the present-day village of Czermno, Lublin Województwo, Poland. [29–178–2]

CHERVEN CITIES (Russian, *Chervenskie goroda*), a group of cities that included Cherven, Lutsk, Suteisk, and Brody. The Cherven cities were located on the upper course of the Zapadnyi Bug, on the Zapadnyi Bug's tributaries the Khuchva and Luga, and in the region of the upper course of the Styr'. The cities lay on the border between Rus' and Poland and were often the subject of disputes and armed conflicts.

In the 980's, the Cherven cities became part of the ancient Russian state as a result of campaigns by the prince of Kiev, Vladimir Sviatoslavich. In 1018 the cities were conquered by the prince of Poland, Bolesław I the Brave. The Cherven cities were incorporated into Kievan Rus' in the early 1030's and later became part of the Vladimir-Volyn Principality.

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CHERVIAKOV, ALEKSANDR GRIGOR'EVICH. Born Feb. 25 (Mar. 8), 1892, in the village of Dukorki, in what is now Minsk Oblast; died June 16, 1937. Soviet state and party figure. Member of the Communist Party from May 1917.

The son of a peasant, Cherviakov graduated from an urban school and in 1909 passed the examination to become a rural school teacher. He taught in Vil'na Province. Cherviakov graduated from the Vil'na Teachers Institute in 1915 and was drafted into the army. After the February Revolution of 1917 he helped organize the Byelorussian Social Democratic Labor Party, from which the Byelorussian Section of the RCP(B) was later formed. Between 1918 and 1920 he helped establish the Byelorussian SSR and did political work in the Red Army on the Western Front. In the same period he served as commissar for Byelorussian affairs of the People's Commissariat of Nationalities of the RSFSR and people's commissar for education of the Byelorussian SSR.

In 1920, Cherviakov was chairman of the Minsk and Byelorussian revolutionary committees. He served as chairman of both the Central Executive Committee of the Byelorussian SSR and the Council of People's Commissars of the Byelorussian SSR from 1920 to 1924; beginning in 1924, he was chairman of the Central Executive Committee of the Byelorussian SSR. In 1922 he was made one of the chairmen of the Central Executive Committee of the USSR. Cherviakov was a delegate to the Eleventh through Seventeenth Congresses of the ACP(B) and a member of the Bureau of the Central Committee of the Communist Party (Bolshevik) of Byelorussia.

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Iakutau, U. "A. Charviakou." *Polymia*, 1971, no. 5. [29–183–6]

CHERVIAKOV, EVGENII VENIAMINOVICH. Born Dec. 27, 1899 (?) in the village of Abdulino; died Feb. 17, 1942. Soviet Russian actor, director, and screenwriter.

Cherviakov graduated from an Ufa drama studio in 1918 and from the State Technicum of Cinematography in Moscow in 1927. He acted and directed at the Ufa Theater. He appeared in films while still a student, playing in *Gold Supply* and *The Cross and the Mauser* (both 1925), and was assistant director at the Lenfil'm Studio. He played the role of A. S. Pushkin in the film *The Poet and the Tsar* (1927), on which he collaborated as screenwriter and director with V. R. Gardin.

Cherviakov's films are distinguished by their poetic lyricism, original montage, interest in contemporary topics, and profound character development. They include *The Girl From the Distant River* (1928), *My Son* (1928), *Cities and Years* (1930, based on the novel by K. Fedin), *The Prisoners* (1936), *Honor* (1938), and *Far-off Cossack Village* (1940). He also wrote and filmed the short story "The Old Nurse" (*Boevoi kinosbornik*, no. 2, 1941). In 1929 he made the historical film *The Golden Beak*, based on A. Karavaeva's novella. He wrote the scripts for a number of his films and played roles in films by other directors.

In 1941, Cherviakov volunteered for a partisan detachment and was mortally wounded on Feb. 16, 1942, in a battle near Leningrad.

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CHERVONENKO, STEPAN VASIL'EVICH. Born Sept. 3 (16), 1915, in the village of Okop, in what is now Poltava Oblast. Soviet diplomat and party figure; candidate of philosophy (1949). Member of the CPSU since 1940.

The son of a peasant, Chervonenko graduated from the T. Shevchenko Kiev State University in 1936 and was director of a secondary school from 1937 to 1941. He served in the Soviet Army and fought in the Great Patriotic War from 1941 to 1944. From 1944 to 1948 he was associated with the teachers' institute of the Cherkassy Pedagogical Institute, serving at various times as instructor, head of the subdepartment of Marxism-Leninism, and director.

Chervonenko was on the staff of the Central Committee of the Communist Party of the Ukraine from 1949 to 1956 and was secretary of the Central Committee from 1956 to 1959. He was the USSR's ambassador to the Chinese People's Republic from 1959 to 1965 and to the Czechoslovak Socialist Republic from 1965 to 1973. In 1973 he became ambassador to France. He was made a member of the Central Committee of the CPSU in 1961 and was a deputy to the fifth convocation of the Supreme Soviet of the USSR. Chervonenko has been awarded three Orders of Lenin, the Order of the October Revolution, the Order of the Red Banner of Labor, and various medals. [29–181–1]

CHERVONETS. (1) The general name for gold coins in use in pre-Petrine Russia, for example, ducats and sequins.

(2) A Russian gold coin worth 3 rubles and containing 3.4 g of gold, first issued in 1701; double *chervontsy* were also coined.

(3) A bank note issued by the State Bank of the USSR from 1922 to 1947 in denominations of 1, 2, 3, 5, 10, 25, and 50 *chervontsy*. The value of the *chervonets* was defined as equivalent to 7.74234 g of pure gold, and one *chervonets* was equal to 10 rubles in treasury notes. The monetary reform of 1947 replaced the *chervontsy* with new bank notes in ruble denominations. [29–181–2]

CHERVONIUK, EVGENII IVANOVICH. Born Apr. 21, 1924, in Brusilov, in what is now Zhitomir Oblast. Soviet singer (bass). People's Artist of the USSR (1967). Member of the CPSU since 1960.

In 1950, Chervoniuk graduated from the Kiev Conservatory, where he studied under D. G. Evtushenko and I. S. Patorzhinskii. He was a soloist at the Ukrainian Theater of Opera and Ballet from 1950 to 1952 and has been a soloist at the Kharkov Theater of Opera and Ballet since 1952. His wide repertoire includes the title roles in Glinka's *Ivan Susanin* and Mussorgsky's *Boris Godunov*, Mephistopheles in Gounod's *Faust*, Basilio in Rossini's *The Barber of Seville*, and Taras and the Elected Official in Lysenko's *Taras Bulba* and *Natalka Poltavka*. Chervoniuk also gives concerts. Since 1960 he has taught at the Kharkov Institute of the Arts.

Chervoniuk was a deputy to the sixth through eighth convocations of the Supreme Soviet of the Ukrainian SSR. He has performed abroad. Chervoniuk has been awarded the Order of Lenin.

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CHERVONOARMEISK (until 1940, Radziwiłłów), a city and administrative center of Chervonoarmeisk Raion, Rovno Oblast, Ukrainian SSR. Chervonoarmeisk is located on the L'vov-Rovno highway. It is a railroad station on the Krasne-Zdolbunov line. Industry is represented by a vegetable drier and cannery, a food-processing combine, a cereal-products combine, a mixed-feed plant, a plant that produces accessories, an asphalt plant, the Maiak factory, and a furniture factory. [29–181–5]

CHERVONOARMEISK, an urban-type settlement and administrative center of Chervonoarmeisk Raion, Zhitomir Oblast, Ukrainian SSR. Chervonoarmeisk is situated 45 km northwest of Zhitomir, 7 km from the Kiev-L'vov highway, and 15 km from the Kurnoe station on the Zhitomir–Novograd-Volynskii railroad line. It has a brickyard, a plant for the production of bone meal, a food-processing combine, and a poultry hatchery. The city also has a museum of history and local lore. [29–181–6]

CHERVONOE, an urban-type settlement in Glukhov Raion, Sumy Oblast, Ukrainian SSR. Chervonoe is situated 146 km northwest of the city of Sumy and 6 km from the Esman' railroad station on the Khutor-Mikhailovskii–Vorozhba line. The settlement has a brickyard. [29–182–5]

CHERVONOE, an urban-type settlement in Andrushevka Raion, Zhitomir Onlast, Ukrainian SSR. The settlement is located 18 km from the Andrushevka railroad station, which is the terminus of a branch of the Fastov-Kazatin line. Chervonoe has a sugar refinery and a distilling plant. [29–182–4]

CHERVONOE LAKE (also Chervonoe Poles'e, Kniaz'-ozero), a lake overgrown with vegetation in Gomel' Oblast, Byelorussian SSR. Chervonoe Lake has an area of 43.6 sq km and a maximum depth of 4 m. It is fed by mixed sources. The water level varies by 0.8 m and is highest in March and April. The lake freezes over in November and December, and the ice breaks up in the second half of March or in April. Drainage ditches and the Bobrik River drain the lake into the Priapat' River. European bream, pike, and Eurasian perch (*Perca fluviatilis*) are fished in Chervonoe Lake. [29–182–6]

CHERVONOGRAD (until 1953, Kristanopol'), a city (since 1951) under oblast jurisdiction in L'vov Oblast, Ukrainian SSR. Situated on the Bug River. Population, 53,000 (1977). Chervonograd is a railroad station on the L'vov-Kovel' line. Coal is mined nearby. The city has a plant that produces reinforced-concrete components, a milk plant, a wood-products combine, a garment factory, and a hosiery factory. A branch of the L'vov Polytechnic Institute and a mining technicum are located in Chervonograd. [29–182–2]

CHERVONOGRIGOROVKA, an urban-type settlement in Nikopol' Raion, Dnepropetrovsk Oblast, Ukrainian SSR. The settlement is situated on the shore of the Kakhovka Reservoir, 10 km from the Nikopol' railroad station on the Zaporozh'e-Apostolovo line. The Konservvinprom Production Association is located in Chervonogrigorovka. [29–182–3]

CHERVONOGVARDEISKOE, an urban-type settlement in Voroshilovgrad Oblast, Ukrainian SSR. Chervonogvardeiskoe is under the jurisdiction of the Kirov city soviet. The settlement is situated 10 km from the Sentianovka railroad station on the Rodakovo–Krasnyi Liman line. Coal is mined in the vicinity. A winery is located in Chervonogvardeiskoe. [29–182–1]

CHERVONOPARTIZANSK, a city (since 1960) in Voroshilovgrad Oblast, Ukrainian SSR, under the jurisdiction of the Sverdlovsk city soviet. Railroad station (Krasnaia Mogila) on the Debal'tsevo-Zverevo line. Population, 25,000 (1974). Coal is mined in the area, and the city has a coal-washing plant. A museum of local lore is located in the city. [29–182–8]

CHERVONOZAVODSKOE, a city (since 1977) in Lokhvitsa Raion, Poltava Oblast, Ukrainian SSR; situated on the Sula River, a tributary of the Dnieper. Chervonozavodskoe has a railroad station (Sula) on the Bakhmach-Kremenchug line. Enterprises include sugar-refining and alcohol-distilling combines and plants for the production of butter and dehydrated milk, mixed feeds, and nutrient yeast. The city has a technicum of the food-processing industry. [29–182–7]

CHERVONYI ARKHIV (Red Archive), a supplement to the journal *Arkhivna sprava. Chervonyi arkhiv* was published in Kharkov in 1927, in Ukrainian. Two volumes were issued. Archival materials dealing with the history of the peasant and national liberation movements, revolutionary Populism (*Narodnichestvo*), and the Civil War in the Ukraine were published in *Chervonyi arkhiv*.

PUBLICATION

Arkhivna sprava, 1927, nos. 2–3, 4. [29–183–2]

CHERVONYI DONETS, an urban-type settlement in Balakleia Raion, Kharkov Oblast, Ukrainian SSR. The settlement is situated on the Severskii Donets River, a tributary of the Don, 4 km from the Shebelinka railroad station on the Kharkov-Sviatogorskaia line. The Shebelinka gas deposit is nearby. [29–183–3]

CHESAPEAKE BAY, a bay of the Atlantic Ocean on the coast of the USA. Along with Delaware Bay, the Chesapeake Bay isolates the Delmarva Peninsula. The bay is 315 km long and 5–30 km wide. It reaches a depth of 27 m; the depth of the fairway is more than 11 m. The shoreline is low, swampy, and heavily indented by the mouths of numerous rivers, including the Susquehanna, Potomac, James, and others, which form natural harbors. The tides are semidiurnal, measuring up to 1 m. The chief port on the Chesapeake Bay is Baltimore. [29–338–1]

CHESHA BAY (Cheshskaia Guba), a bay in the eastern part of the Barents Sea, between the Kanin Nos Peninsula and the mainland. Chesha Bay is 110 km long and 55 km wide at its mouth; it reaches a maximum width of 130 km. The shores are low-lying except in the northwest, where they form steep cliffs. The bay is 55 m deep at its mouth. It is subject to semidiurnal tides of up to 4.3 m. Ice covers the bay from November until the end of June. The Vizhas, Oma, Pesha, and Chesha rivers empty into Chesha Bay. [29–524–3]

CHESHIRE, a county in Great Britain. Population, 902,300 (1974). The administrative center of Cheshire is Chester. Cheshire's main industries are chemicals, nonferrous metallurgy, and machine building. Dairy farming is the chief sector of the county's agriculture. Cheshire's industrial centers—Warrington, Widnes, and Runcorn—are situated along the Manchester Canal. Salt is mined in the region. [29–523–2]

CHESKII, IVAN VASIL'EVICH. Born 1777; died June 17 (29), 1848, in St. Petersburg. Russian engraver.

Beginning in 1791, Cheskii studied with I. Klauber at the St. Petersburg Academy of Arts; he enrolled in the academy's landscape class in 1799. He became an academician in 1807.

Cheskii's landscapes, portraits, and illustrations were executed in the technique of line engraving; most were derived from the drawings of other artists. The engravings are characterized by precision and clarity of line. Examples are *Landscape With Hunters* (1807, from the original by G. Dughet), *The Temple of Friendship in Pavlovsk* (from an original by S. F. Shchedrin), *Portrait of V. A. Zhukovskii* (published 1821–22), *Portrait of G. R. Derzhavin* (published 1825), and illustrations to Krylov's fable "The Horse and the Horseman" (1825, based on drawings by A. Sauerweid).

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CHESNOKOV, IURII BORISOVICH. Born Jan. 22, 1933, in Moscow. Soviet athlete. Honored Master of Sport (1960); Honored Coach of the USSR (1976). Member of the CPSU since 1968.

Chesnokov is the son of the oldest figure in the Russian and Soviet physical-fitness and sports movement, B. M. Chesnokov (1891–1979). He graduated from the V. V. Kuibyshev Military Engineering Academy in 1958 and eventually became a colonel. From 1954 to 1964 he was one of the leading players on the USSR volleyball team, and from 1969 to 1977 he served as the team's senior coach. He was USSR champion nine times between 1954 and 1966 as a member of the Central Sports Club of the Army. He was world champion in 1960 and 1962 and Olympic champion in 1964.

Chesnokov has been awarded the Order of the Badge of Honor and several medals. [29–341–1]

CHESNOKOV, PAVEL GRIGOR'EVICH. Born Oct. 12, (24), 1877, near Voskresensk, in what is now Moscow Oblast; died Mar. 14, 1944, in Moscow. Soviet choral conductor, teacher, and composer.

In 1895, Chesnokov graduated from the Synod School as a choral conductor. In 1917 he graduated from the Moscow Conservatory, where he had studied composition under S. N. Vasilenko; he had previously taken lessons from S. I. Taneev and M. M. Ippolitov-Ivanov. He taught at the Synod School (Choral Academy) from 1895 to 1920. From 1920 to 1944, Chesnokov taught choral conducting at the Moscow Conservatory, becoming a professor in 1921. He developed courses in choral conducting and methods of working with choirs. He was the principal conductor of the Moscow State Chorus from 1917 to 1922, led the Moscow Academic Chorus from 1922 to 1928, and served as choral director of the Bolshoi Theater.

Chesnokov was one of the most important masters of Russian choral art, which he raised to a high level through his diverse musical activities. His book *The Chorus and Choral Conducting* (1940; 3rd ed., 1961), which deals with theoretical problems of choral art, was the first solid and detailed study of choir conducting in the Soviet and world literature. Chesnokov composed many musical works, including choral pieces and art songs.

I. M. IAMPOL'SKII [29–340–1]

CHESNOKOVKA, until 1962, the name of the city of Novoaltaisk, Altai Krai, RSFSR. [29–341–2]

CHESS, a game for two played with special men on a board with 64 squares. Chess simulates the actions of combatants contending in accordance with strict rules. Combining the features of an art, a science, and a sport, the game helps develop logic, concentration, and the ability to calculate possible sequences of moves quickly and accurately. It instills in the players a will to win and other moral qualities. Chess can reveal aspects of a person's character and skills with striking accuracy, and it is therefore used in various psychological tests, as well as in cybernetics, to study the potential of computers. Chess theory examines the strategic and tactical principles of the game, the deployment and interaction of the men, typical moves, and patterns of play in openings and endgames. A special art and sport based on chess is chess composition.

Each side in the game plays with 16 men, including eight pieces (one king, one queen, two rooks, two bishops, and two knights) and eight pawns.

Rules of play. Chess moves are made alternately. The capture of the opponent's men is obligatory only when there is no other way of defending a king in check.

The moves of the men on an open board are as follows. The king moves to any square adjacent to his own. The queen moves any distance along a file (vertical row of squares), rank (horizontal row of squares), or diagonal. A rook moves any distance along a rank or file, and a bishop moves any distance along a diagonal. The knight's move is L-shaped: one square along a rank or file and one along a diagonal; the knight is the only piece that can cross a square occupied by another piece or pawn. The pawns only move ahead one square at a time along their file, although they may make a two-square move from the initial position.

If an opponent's pawn or piece stands in the way of a move, it may be captured (removed from the board) and replaced on its square by the piece that captured it. A pawn captures by moving diagonally one square, after which it moves along its new file. A pawn advanced to the last rank may be replaced by any piece its player wishes except a king. If a pawn makes a two-square move over a square that is under attack by an opponent's pawn it may be captured *en passant*; the capturing pawn advances diagonally to the square the captured pawn has passed.

One time in a game each player may move his king and a rook simultaneously provided they have not been moved before, the squares between them are unoccupied, and the king is not in check. This is called castling. The king moves two squares toward the rook (either right or left), and the rook shifts to the adjacent square jumped over by the king.

The object of the game is to put the king in checkmate, an attack against which there is no defense. The game ends in a draw if the correlation of forces on the board is such that checkmate is impossible, if one side has no possible move but its king is not under attack (stalemate), or if one of the kings cannot escape check (perpetual check). The game is divided into three stages: the opening, the middle game, and the endgame.

Historical survey. India is considered the birthplace of chess. By the fifth century, an ancient form of the game called *chaturanga* had evolved there; the object of the game was the capture of the opponent's pieces. Later, presumably in the vicinity of the Kushana kingdom or the Ephthalite state, the object became mate. In Persia, chess was called *chatrang* or *shatrang*, and in the Arab countries of the East it was called *shatranj*. In *shatranj* the bishop (Russian *slon*, Arabic *al-fil*, "elephant") moved diagonally two squares but could jump over pieces as the knight in modern chess can. The queen (Russian *ferz'*, Arabic *firzan*, "counsellor") moved only one square diagonally. In the eighth and ninth centuries *shatranj* spread throughout the countries of the Arabian Caliphate. The first method of recording games was devised, and the first theoretical works were written. Players of *shatranj* were divided into four classes in the caliphate. The highest class consisted of the *al-Aliya*, or grandmasters, many of whom were also famous as the authors of chess treatises, for example, the Tadzhik Abul Fath in the 12th century.

By the seventh and eighth centuries the peoples of Middle Asia were acquainted with chess. The first references to the game in Georgia and Armenia date from the 12th century.

The first reference to chess in Western Europe dates from the early 11th century, although there is evidence that the game was introduced as early as the ninth or tenth century from the Arab countries, chiefly through Spain and possibly Italy. The Vikings

(Normans) introduced chess to Scandinavia and the British Isles. By the 13th and 14th centuries chess had become a popular amusement of the feudal nobility and was mentioned in a number of literary works, including *The Song of Roland* and *Tristan and Iseult*. It was also part of the education of a knight. In Western Europe the chessboard became two-colored, whereas in the East it was of a single color. Special writings on the game, edifying works called moralities, encouraged the playing of chess as a means of moral instruction.

In the mid-15th century, apparently on the Iberian Peninsula, chess was reformed. The queen and bishop acquired their present moves, and the game became quick and dynamic. In the late 15th century the first books on the theory of the new chess appeared in Spain, written by Vicentz (1495) and Lucena (1497). In Rome in 1512 the Portuguese Damiano published a book on chess that was frequently reprinted, contributing greatly to the popularity of chess in Western Europe.

Development of theory. R. López de Segura, the best chess player in 16th-century Spain, must be regarded as the first theorist of modern chess. His *Book of the Liberal Invention and Art of Playing Chess* was published in 1561. In the late 16th and early 17th centuries a new Italian school of chess advocated an immediate attack on the opponent's king, regardless of losses; the principal piece was the queen. The Italian school conceived original combinations and developed the aesthetics of chess. Its most famous players were G. Leonardo, P. Boi, G. Polerio, A. Salvio, P. Carrera, and especially G. Greco (1600–34), whose work was regarded for almost 100 years as the best guide to chess.

In the 18th century, France became the center of the chess world. Algebraic chess notation appeared in a book by P. Stamma (Paris, 1737) and was perfected in the late 19th century. A French school of chess evolved, headed by F. A. Philidor, author of *Analysis of the Game of Chess* (*Analyze du jeu des échecs*, 1749). The basis of Philidor's theory was the leading role of the pawns and pawn arrangement in seizing space, attacking, and defending. Philidor, the first to study the general appraisal of position, analyzed a number of endgame positions and developed their principles of play. In the early 19th century several of his ideas were developed by A. D. Petrov.

In 1836 the first chess journal, *Le Palamède*, was published in Paris. P. Morphy made an important contribution to the theory of open positions in chess. Integrating strategic constructions and tactical strikes, he based his combinations and attacks on a solid study of position. In the 1880's, W. Steinitz developed the general theory of positional play. The plan of a game, according to Steinitz, should stem from a general appraisal of position. The essence of positional play is the accumulation of small advantages; control of the center of the board, open lines, and points; and the attainment of a numerical advantage on the board. The player who has achieved these advantages is obliged to attack. M. I. Chigorin (Tchigorin) opposed certain dogmatic aspects of the theory, proving that general principles are no substitute for the analysis of specific alternatives.

Steinitz's theoretical principles were developed by S. Tarrasch (1862–1934), A. I. Nimzowitsch (1886–1935), A. A. Alekhine, R. Réti (1889–1929), and A. K. Rubinstein (1882–1961).

Competitions. Various medieval sources contain reports of individual encounters between chess players of different countries. The competition between the Spaniards R. López and A. Ceron and the Italians Leonardo and Boi in 1575 at the palace of King Philip II of Spain is sometimes called the first international tournament. In the late 18th and early 19th centuries matches were held in many European countries. Cafés and then clubs were the centers of chess life at that time. For example, beginning in the early 18th century, the Café de la Régence in Paris was France's major chess center.

Outstanding chess players included K. Légal (1702–92), Philidor, A. Deschapelles (1780–1847), L. La Bourdonnais (1795–1840), and P. Saint-Amant (1800–73) in France; A. McDonnell (1798–1835) and H. Staunton (1810–74) in Great Britain; T. Lasa (1818–99), A. Anderssen (1818–79), L. Paulsen (1836–90), and J. Zukertort in Germany; Morphy in the United States; and Steinitz in Austria-Hungary. Anderssen and then Morphy, who defeated him in 1858, were regarded as the strongest players of the mid-19th century. Steinitz was declared the first official world champion after defeating Zukertort in 1886. In 1894, E. Lasker became the champion by defeating Steinitz. In 1921, Lasker was defeated by J. R. Capablanca, who in 1927 lost to Alekhine. In 1935, M. Euwe became champion by defeating Alekhine; however, Alekhine regained the title in 1937 and died undefeated. V. Menchik won the first world chess championship for women, held in 1927.

The first international tournament took place in London in 1851, with Anderssen the winner. The German Chess League held international tournaments every two years from 1879 to 1914. Major chess competitions were also held in connection with the industrial expositions in London (1862), Paris (1867, 1900), Vienna (1873), and Prague (1908). In the 1870's and 1880's, newly formed chess societies and clubs in many cities also organized international tournaments; major contests were held in Vienna (1882, 1903), London (1883, 1899), New York (1889), Hastings, Great Britain (1895), and St. Petersburg (1896, 1909, 1914).

Since the early 20th century a number of competitions have been held at resorts, for example, Monte Carlo (1901–04), Cambridge Springs (1904), Oostende (1905–07), Karlovy Vary (1907, 1911, 1923, 1929), San Sebastián (1911, 1912), and San Remo (1911, 1930). Between 1920 and 1939 approximately 50 major international tournaments were held, including three in Moscow, in 1925, 1935, and 1936. Since 1919 annual tournaments have been a tradition in Hastings, the scene of eight international team tournaments, or Olympiads, between 1927 and 1939. The strongest players to emerge during this period were Euwe, E. Grünfeld, S. M. Flohr, M. M. Botvinnik, S. Reshevsky, R. Fine, P. P. Keres, G. Stahlberg, V. V. Ragozin, G. Ia. Levenfish, P. A. Romanovskii, R. Spielmann, and M. Vidmar. Since World War II, chess has become an integral part of the culture of the socialist countries, and the game is now becoming popular in the countries of Asia and Africa. Chess theory is advancing further, and national chess associations are being reorganized.

In 1948 the five men regarded as the strongest chess players in Europe and America competed in a tournament. The winner, Botvinnik, was declared world champion. World championship competitions have been held regularly every three years since then according to the following system: first zonal and interzonal tournaments are held, followed by a candidates' tournament, and finally a match with the reigning champion. In 1951 and 1954, Botvinnik retained the title in draw matches with D. I. Bronstein (born 1924) and V. V. Smyslov. He lost a second match to Smyslov in 1957 but won a return match in 1958. In 1960, Botvinnik lost to M. N. Tal', but in 1961 he regained the title in a return match. In 1963 he lost to T. V. Petrosian. In that year return matches were eliminated. In 1966, Petrosian defended the title by defeating B. V. Spassky; in 1969, at the next round in the battle for the world championship, Spassky won the title, but in 1972 he lost it to R. Fischer. In 1975, Fischer declined a match with A. E. Karpov of the USSR (born 1951), who became world champion by default.

Since 1950 regular world championships have also been held among women. Champions have included L. V. Rudenko (1950–53), E. I. Bykova (1953–56, 1958–62), and O. N. Rubtsova (1956–58). N. T. Gaprindashvili has been women's champion since 1962.

Major international tournaments include regular world team championships for men and women, world and European individual youth championships, and student team Olympiads (since 1954).

In addition to those in Hastings and in Beverwijk, The Netherlands, tournaments are held in memory of outstanding chess players of the past, including anniversary tournaments. Major tournaments include the 1946 Groningen tournament (first prize, Botvinnik); the Chigorin tournament in Moscow in 1947 (Botvinnik); the Alekhine tournaments in 1956 (Botvinnik and Smyslov), 1971 (Karpov and L. Shtein), and 1975 (E. Geller); the 1967 tournament (Shtein); the tournament in Bled in 1961 (Tal'); the tournaments in Los Angeles in 1963 (Keres and Petrosian) and 1966 (Spassky); the Tournament of the World in Rovinj and Zagreb, Yugoslavia, in 1970 (Fischer); and the tournament in San Antonio in 1972 (Karpov, Petrosian, L. Portisch). From the 1950's to the 1970's, major prizes have been won by B. Larsen of Denmark, Portisch and L. Szabó of Hungary, L. Ljubojević and

S. Gligorić of Yugoslavia, F. Olafsson of Iceland, R. Byrne and L. Kavalek of the USA, V. Hort and J. Smejkal of Czechoslovakia, R. Hübner of the Federal Republic of Germany, and H. Mecking of Brazil.

The International Chess Federation (FIDE), founded in 1924, promotes chess around the world and organizes international competitions. In 1978 it included the national chess federations of more than 100 countries.

In prerevolutionary Russia and the USSR. The Russian names of the chessmen and of the game itself (*shakhmaty*; from Persian *shah mat*, "the king is dead"), as well as archaeological discoveries, indicate that chess entered Russia from the East, probably via Khwarazm and Khazaria, no later than the ninth and tenth centuries. Chessmen have been unearthed in Novgorod, Kiev, Grodno, Minsk, Vyshgorod, and other cities. The game was already widespread in Russia in the 12th and 14th centuries and is mentioned in *byliny* (epic folk songs) about Russian *bogatyri* (warriors). Foreigners visiting Russia in the 16th and 17th centuries reported that chess was popular. The Eastern name for the rook, *rukhkh* ("chariot"), was changed to a word more familiar to Russians, *lad'ia* ("boat").

In the 18th and early 19th centuries chess was primarily a game of the nobility and the intelligentsia. Sources tell of chess being played at assemblies, with Peter I among the players. Well-known references to the game are found in the writings of A. S. Pushkin, N. G. Chernyshevskii, I. S. Turgenev, L. N. Tolstoy, and other outstanding figures of Russian culture. The first chess textbook was published in 1821 by I. Butrimov, and the first chess club was founded in St. Petersburg in 1853. The eminent chess players of the mid-19th century were Petrov, K. A. Ianish, I. S. Shumov, S. S. Urusov, and D. S. Urusov. Chigorin, the founder of the Russian school of chess, was the strongest Russian player of the 1870's, as well as a promoter of the game and organizer of the chess movement.

In the late 19th and early 20th centuries a number of national and international tournaments were held in Russia. Russian players who successfully competed were E. S. Shiffers, S. Z. Alapin, G. S. Sal've, F. I. Duz-Khotimirskii, Rubinstein, O. S. Bernstein, Alekhine, and Nimzowitsch. Chess is very popular in the USSR, where in 1976 there were more than 3 million qualified players.

In 1924, N. V. Krylenko became the first chairman of the newly created All-Union Chess Section, since 1959 the Chess Federation of the USSR. In 1956 the Central Chess Club of the USSR was founded in Moscow. In the 1930's a Soviet school of chess took shape, led in the 1940's and 1950's by M. M. Botvinnik. The characteristic features of the Soviet school of chess are a scientific approach to the game, a thorough development of theory, and a harmonious combination of general appraisals and specific analysis. For its successes from the 1950's to the 1970's the Soviet school of chess is indebted to a number of world champions and repeated winners of international competitions and USSR championships, notably A. A. Kotov, E. P. Geller, Iu. L. Averbakh, M. E. Taimanov, L. A. Polugaevskii, and I. E. Boleslavskii. In the USSR, chess players may receive official ratings (four levels) and the titles candidate for master (over 3,000 in 1976), master (559 men, 69 women), and grandmaster (37 men, 11 women).

National championships have been held for men since 1920, and for women since 1927. There are championships in the Union republics, autonomous republics, oblasts, krais, and cities. Other major competitions include all-Union team championships among republics (since 1948), athletic societies (since 1938), and Pioneer (since 1968), as well as nationwide individual youth championships (since 1934), nationwide rural championships (since 1939), and correspondence championships (since 1948). In 1959 chess was included among the games of the Spartakiad of Peoples of the USSR. As of January 1981, Soviet chess players held the official world championship titles in the men's and women's individual and men's, women's, and juniors' team categories and the European title in the men's team category.

The first Soviet chess periodical was *Listok shakhmatnogo kruzhka Petrogubkommuny* (Leaflet of the Chess Club of the Petrograd Provincial Commune), founded in 1921 and renamed *Shakhmatnyi listok* in 1922; in 1931 it was renamed *Shakhmaty v SSSR*. The journal *Shakhmaty i shashki v rabochem klube* (Chess and Checkers in the Workers' Club) was published from 1927 to 1935. A chess newspaper entitled *64* was issued from 1935 to 1941; from 1968 to 1979, *64* was published as a special supplement to the newspaper *Sovetskii Sport*. Other chess periodicals include *Shakhmatny biulleten'* (since 1955), *Shakhmatnoe obozrenie* (since 1980), the Latvian journal *Šahs*, the Armenian *Shakhmatain Aiastan*, and the Georgian *Chadraki*. Major chess competitions are given wide coverage in the national press and on All-Union Radio and Central Television. A weekly television program on chess, *The Chess School*, has been broadcast since 1968.

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IU. L. AVERBAKH and V. V. SMYSLOV [29–896–1]

CHESS CLOCK, a clock for recording the time spent by each chess player in considering his next move during a game of prescribed duration.

A chess clock usually consists of two clock movements in a single case with two faces and two hands. The two movements are kinematically connected in such a way that at any given moment only one clock is running. Pushing the buttons located in the upper part of the case starts one clock and simultaneously stops the other. After making his move, the player pushes the button, stopping his own clock and starting his opponent's clock. Thus the total playing time is calculated separately for each player. Two to three minutes before the prescribed playing time elapses, the hand of the clock raises a flag. As soon as the hand reaches the numeral 12, the flag falls, signaling that the playing time has expired.

Chess clocks are sometimes equipped to indicate how many times a button has been pushed. Some clocks consist of a single continuously running movement and hands that are switched on and off by pushing a button. Another type of clock has a separate case for each movement. Chess clocks are usually accurate to 60 sec per 24 hr. Digital electronic chess clocks are now being developed (1978).

Mechanical chess clocks were introduced in Great Britain in the mid-19th century, until which time sandglasses were used. They were first used in an international tournament in 1883, in London.

B. M. CHERNIAGIN [29–894–2]

CHESS COMPOSITION, a specialized branch of chess that involves the composition of problems (hypothetical positions with a checkmate possible in a given number of moves) and studies (positions similar to those used in games, in which the player must find the way to victory or stalemate).

The study as an independent branch of chess composition evolved in the mid-19th century. The first collection of studies was compiled by B. Horwitz and J. Kling in 1851. The founder of the modern artistic study was A. A. Troitskii (1866–1942, Honored Art Worker of the RSFSR from 1928), who established the basic principles of study aesthetics between 1894 and 1900 and elaborated them in subsequent years. His immediate followers were I. Zevers, V. N. Platov, M. N. Platov, and L. I. Kubbel' of Russia and H. Rinck of France. Soviet chess composers have continued to play a leading role in the development of study composition.

The first chess problem was composed in the Middle Ages. The modern artistic study criteria (originality and economy) were defi-

ned in the mid-19th century. By the end of the century the principles of the chief schools were formulated by the problemists S. Lloyd (USA), A. Mackenzie (Jamaica), K. Bayer and J. Berger (Germany), J. Dobruský and J. Pospišil (Czechoslovakia), and C. Plank and B. Laws (Great Britain). The best-known Russian problemists of the 19th century were A. D. Petrov, I. S. Shumov, and A. V. Galitskii. Major problemists of the 20th century have included J. Kohtz and W. von Holzhausen (Germany), M. Havel and E. Palkoský (Czechoslovakia), A. White (United States), A. Ellerman (Argentina), and M. M. Barulin and L. A. Isaev (USSR).

International and national competitions in problems and studies are held. In the USSR, individual championships were first organized in 1929 and have been held regularly since 1947; team championships have been conducted since 1956. Sports ranks are awarded on the basis of results in these competitions. Based on the process of elimination in a competition sponsored by the *FIDE Album*, which publishes the official collection of studies and problems of the International Chess Federation, the title of international grandmaster was awarded to the following between 1930 and 1970: E. Wissermann (the Netherlands), C. Mansfield (Great Britain), G. Paros (Hungary), N. Petrović (Yugoslavia), J. Fritz and V. Pachman (Czechoslovakia), and V. A. Bron, G. M. Kasparian, V. A. Korol'kov, and L. I. Loshinskii (USSR).

E. I. UMNOV [29–893–3]

CHESTER, a city in Great Britain; seat of the county of Cheshire. Population, 117,300 (1974). Chester is a commercial center on the Dee River and a transportation junction. Local industry includes machine building and metalworking. [29–343–2]

CHESTER, a city in the eastern USA, in the state of Pennsylvania, on the Delaware River; a southwestern suburb of Philadelphia. Population, 52,000 (1975). Chester, which was founded in 1644, has an iron and steel industry and enterprises of the metalworking, machine-building, oil-refining, and chemical industries. Equipment for power engineering and heavy industry is produced. There are shipyards and automotive assembly plants in Chester. [29–343–3]

CHESTERFIELD, FOURTH EARL OF (Philip Dormer Stanhope). Born Sept. 22, 1694, in London; died there Mar. 24, 1773. English writer and statesman.

Chesterfield attended Cambridge University in 1714 and 1715. In 1715 he became a member of the House of Commons, and in 1726 he entered the House of Lords and headed the opposition to the Whig cabinet of R. Walpole. He was ambassador to Holland from 1728 to 1732, lord lieutenant of Ireland in 1745 and 1746, and secretary of state from 1746 to 1748.

In 1750, Chesterfield began writing essays of manners and satirical essays, which were influenced by the ideas of the Enlightenment. He entered the history of English literature as the author of *Letters to His Son* (published 1774, reprinted several times with additions), which contained an extensive code of admonitions and recommendations in the spirit of the pedagogical ideas of J. Locke. The narrow, practical orientation of the program of upbringing—preparation for high society and a government career—shocked many of Chesterfield's contemporaries, but Voltaire highly praised the work both as a model of 18th-century epistolary prose and as a sincere human document. Chesterfield was also the author of *Maxims* and *Characters* (both published 1777). A number of apocryphal works are attributed to him.

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V. A. KHARITONOV [29–344–1]

CHESTERTON, GILBERT KEITH. Born May 29, 1874, in London; died June 14, 1936, in Beaconsfield. English writer and thinker. A major writer of detective literature.

In 1900, Chesterton began contributing regularly to liberal newspapers and magazines. During his life he published collections of poems, essays, and short stories. Chesterton wrote several short-story collections about the priest-detective Father Brown, including *The Innocence of Father Brown* (1911) and *The Incredulity of Father Brown* (1926). Chesterton wrote six novels, the best known of which were *The Napoleon of Notting Hill* (1904; Russian translation *The Napoleon From the Suburb*, 1925) and *The Man Who Was Thursday* (1908; Russian translation, 1914); several books of literary criticism; and books of a religious character.

An adherent of Catholic orthodoxy, Chesterton based his social and ethical program on the theology of Thomism. *Orthodoxy* (1908) was the title of his best known collection of religious and philosophical thought. Chesterton's utopia depended on the restoration of "merry old England" with its clearly defined hierarchy. The world he created in his books was unusual, romantically transformed. The entertaining plots, eccentricity, and paradoxical judgments in his works made Chesterton popular with broad circles of readers. He strongly influenced Catholic writers and thinkers, as well as authors writing in the detective genre.

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N. L. TRAUBERG [29–343–4]

CHESTNOKOV, VLADIMIR IVANOVICH. Born Mar. 30 (Apr. 12), 1904, in St. Petersburg; died May 15, 1968, in Leningrad. Soviet actor. People's Artist of the USSR (1960). Member of the CPSU from 1941.

Chestnokov graduated from the School of Russian Drama in 1924. He appeared with the Leningrad Pushkin Drama Theater from 1924 to 1936 and rejoined the company in 1954 after performing with the Theater of the Lenin Komsomol, the Theater of the Baltic Fleet, and the Bolshoi Drama Theater, all in Leningrad.

Chestnokov excelled in the title role in Rostand's *Cyrano de Bergerac*, as Aleksei Ivanovich in *The Gambler* (after Dostoevsky's novel), Saburov in *Days and Nights* (after the novella by Simonov), and in the title role in *Don César de Basan* by Dumanoir and Dennery, which was made into a film.

Chestnokov portrayed V. I. Lenin in Kapler's *Year of the Storm*, Mikhailov's *Grim Happiness*, Pogodin's *Living Flowers*, Shtein's *Between Downpours*, and in the film *In the October Days* (1958). He also appeared in the films *The Fourth Periscope* (1939), *Ivan Pavlov* (1949), and *The Green Carriage* (1967). From 1949 to 1953 he taught at the Leningrad Ostrovskii Theatrical Institute.

Chestnokov, a recipient of the State Prize of the USSR in 1950 and 1967, was awarded the Order of Lenin, two other orders, and various medals.

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Kak ia rabotal nad obrazom Lenina. Leningrad-Moscow, 1960.

[29–344–3]

CHET', a river in Tomsk Oblast, and, in its upper course, in Krasnoiarsk Krai, RSFSR; a right tributary of the Kiia River of the Ob' River basin. The Chet' is 432 km long and drains an area of 14,300 sq km. It flows along the southeastern edge of the Western Siberian Plain. It is fed primarily by snow, and high water occurs in May. The mean flow rate is 66 cu m per sec. The river freezes over in late October or November, and the ice breaks up in late April or early May. The Chet' is used for timber flotation. [29–371–3]

CHETAEV, NIKOLAI GUR'EVICH. Born Nov. 23 (Dec. 6), 1902, in the village of Karaduli, in what is now Laishevo Raion, Tatar ASSR; died Oct. 17, 1959, in Moscow. Soviet scientist; specialist in mechanics. Corresponding member of the Academy of Sciences of the USSR (1943).

Chetaev graduated from the University of Kazan in 1924. In 1929, after completing his graduate study, he was sent to Göttingen for advanced study. From 1930 to 1940 he was a professor at the University of Kazan, where he established a school of specialists in theory of the stability of motion. From 1940 he worked at the Institute of Mechanics of the Academy of Sciences of the USSR and was a professor at Moscow State University.

In 1934, Chetaev established the general theorem of the instability of motion, and in 1938 he further developed Lagrange's theorem of dynamic equilibrium; in 1949 he proposed methods for solving problems of the stability of unsteady motion. He also found the sufficient conditions for the stability of rotary motion of artillery shells. A number of his works were devoted to analytical dynamics. He extended the principle of least constraint to the case of a nonholonomic constraint.

Chetaev received the Lenin Prize in 1960. He was awarded the Order of Lenin, the Order of the Red Banner of Labor, and several medals.

WORKS

Ustoichivost' dvizheniia, 3rd ed. Moscow, 1965. [29–346–1]

CHETI (also *chetverti, chetvertnye prikazy*), institutions of the central government in Russia in the second half of the 16th and in the 17th century that fulfilled financial, administrative, and judicial functions involving the part of the population subject to the *tiaglo* (system of state duties) in certain regions of the country.

First mentioned in 1561 and 1562, the *cheti* were created after the abolition of *kormlenie* (system of local administration). In the early 17th century *cheti* were organized for the collection of direct and indirect taxes from the population in designated areas; an exception was the Novaia Chetvert'. The Novgorod Chetvert' (Nizhegorodskaia Chetvert') had jurisdiction over Novgorod, Nizhny Novgorod, Pskov, Vologda, Arkhangel'sk, and their districts. The Vladimir Chetvert' dealt with Vladimir, Tver', Tula, Orel, and their districts. The Kostroma Chetvert' (Yaroslavl Chetvert') handled Kostroma, Yaroslavl, Murom, and their districts. The Galich Chetvert' had authority over Galich, Beloozero, Shuia, and their districts. The Ustiug Chetvert' dealt with Velikii Ustiug, Sol'vychegodsk, and their districts.

Part of the *chetvert'* revenues went to the *prikazy* (government offices); the rest was used to pay the salaries of the upper ranks of the *sluzhilye liudi* (civil service class), including the elite of the provincial nobility, known as the *chetvertchiki*. In the 1670's and 1680's the *cheti* declined in importance, as the Novgorod, Vladimir, Galich, and Ustiug *chetverti* were made subordinate to the Posol'skii Prikaz (Foreign Office), the Kostroma Chetvert' was subordinated to the Streletskii Prikaz (Musketeers' Prikaz), and virtually all tax-collecting responsibilities were transferred to other institutions.

In 1683 and 1684 the *cheti* were to some degree reactivated when they regained the prerogative of collecting most of their former taxes, except for customs duties and taxes on liquor; shortly thereafter the *cheti* and the *prikazy* to which they belonged were abolished when the government was reorganized at the beginning of the 18th century.

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CHETLASSKII KAMEN', a plateaulike upland in the Timan Ridge, between the Mezen' and Pizhma rivers, in Arkhangel'sk Oblast and the Komi ASSR. The upland has elevations to 463 m. It is composed of shales. It has mixed and coniferous forests, as well as swamps. [29–356–2]

CHETNIKS (Russian, *chetniki*; Serbo-Croatian, *četnici*), in the Balkans:

(1) From the 15th to the 19th century, participants (mainly haiduks) in the armed struggle waged by partisan detachments for national liberation from the Ottoman yoke. Prominent members of the Chetnik movement in Bulgaria in the 1860's included G. S. Rakovski, P. Khitov, F. Tot'o, S. T. Karadzha, and Khadzhi Dimitur.

(2) Members of a reactionary organization, participants in the nationalistic Greater Serbia movement (headed by General D. Mihajlović) and other antinationalist groups in Yugoslavia that fought against the forces of people's liberation during World War II. [29–356–3]

CHETVERIK, in Russian and Ukrainian architecture, both wooden and stone, a quadrilateral structure or part of one. The *chetverik*, the basic architectural form of the Russian church before the 18th century, was frequently built with an octagonal superstructure, a *vos'merik*, creating the *vos'merik-na-chetverike* design. [29–346–4]

CHETVERIK, a Russian dry measure. The chetverik came into use in Novgorod the Great in the 15th century. In the Russian state in the early 17th century, the chetvert equalled two osminas, or eight chetveriks; by the end of the 17th century, the size of the chetvert had been changed from four *poods* to eight *poods*. From the 18th century to the early 20th century, the chetverik was the main unit of dry measure used in Russia. As such, the chetverik (one-eighth of a chetvert) equalled eight garnetzes, or 26.24 liters. The use of the chetverik was discontinued when the metric system was introduced in the USSR. [29–346–3]

CHETVERIKOV, SERGEI SERGEEVICH. Born Apr. 24 (May 6), 1880, in Moscow; died July 2, 1959, in Gorky. Soviet biologist.

Chetverikov graduated from Moscow University in 1906. He was a docent at the Women's Higher Educational Institution in Moscow from 1909 to 1917, at the Second Moscow University from 1917 to 1919, and at the First Moscow University from 1919 to 1929. He also headed the genetics department at the Institute of Experimental Biology in Moscow from 1921 to 1929 and the department of genetics at the University of Gorky from 1935 to 1948 (professor from 1938).

Chetverikov's main fields of study were genetics, the theory of evolution, and entomology. He was the first to introduce the concepts of the impregnation of species in nature with emerging mutations, the significance of such genetic processes as mutation, free interbreeding, and selection, and isolation in species formation and evolution. Chetverikov bridged the gap between Darwin's teachings and genetics by laying down the principles of evolutionary genetics. For his work in the development of evolutionary science, the Leopoldina German Academy of Naturalists (German Democratic Republic) awarded Chetverikov the Darwin Plankette in 1959. He was also awarded the Order of the Badge of Honor and several medals.

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CHETVERT', in Rus' and Russia:

(1) A land measure equal to one-half of a *desiatina*. It was mentioned as early as the late 15th century and was in official use until 1766. Depending on the size of the *desiatina*, the *chetvert'* amounted to 1,200, 1,600, or 1,250 square *sazheni*.

(2) A dry measure, used principally for grain, groats, and flour. In certain Russian principalities and states in the 14th and 15th centuries, a *chetvert'* was equal to one-fourth of a *kad'* (or *okov*) with varying weights. The official *chetvert'* in the 16th and early 17th centuries was equal to 4 *poods* of rye grain (1 *pood* equals approximately 16.38 kg), then to 6 *poods*, and, beginning in the last quarter of the 17th century, to 8 *poods*. In several regions, local *chetverti* of various volumes were known in the 17th century. The unit went out of practical use in the mid-18th century.

(3) A liquid measure equal to one-fourth of a *vedro* (bucket). It was first used in the 16th or 17th century. In 1885 the volume of a *chetvert'* was defined as 3.0748 liters. It was used chiefly in the sale of wine and liquor and was equal to 5 vodka *butylki* (bottles) or 4 wine *butylki*.

(4) In the 17th century the *chetvert'* was sometimes used as a measure of weight for certain commodities; for example, 1 *chetvert'* of wax was equal to 12 *poods*.

(5) A measure of length used in the 16th and 17th centuries, equal to one-quarter of a *sazhen'* or, later, one-quarter of an *arshin*. The latter dimension (about 18 cm) was used in rural areas until the October Revolution of 1917.

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CHETVERTAKOV, ERMOLAI VASIL'EVICH. Born 1781 in the village of Nefedovka, Chernigov Province; date and place of death unknown. Hero of the Patriotic War of 1812; soldier.

The son of a serf, Chetvertakov fought in the war against France between 1805 and 1807. In the initial stage of the Patriotic War of 1812, he served in the Kiev Dragoon Regiment of the rear guard commanded by General P. P. Konovnitsyn. After being taken prisoner near Tsarevo Zaimishche on August 19, he escaped, organized a partisan detachment of approximately 50 peasants from Gzhatsk District, Smolensk Province, and conducted raids against small enemy groups.

In the village of Basmany, which had become its base of operations, the detachment grew to 300 men. Chetvertakov taught the men marksmanship, organized patrols and guard duty, and led attacks against enemy troops. Near the village of Skugarevaia, at the head of 4,000 peasants, he defeated a French battalion that was supported by artillery. He subsequently liberated all of Gzhatsk District. After rejoining his regiment in November, he was awarded the Military Order badge and became a noncommissioned officer. Chetvertakov later fought in the foreign campaigns of 1813–14. [29–348–2]

CHETVERT' LANDHOLDING, a form of land tenure in Russia from the 17th to 19th centuries.

Chetvert' holdings, which were hereditary and apportioned by family, were grants made by the state to groups of *sluzhilye liudi* (civil service class) in the 17th century and *odnodvortsy* (a category of state peasants) in the 18th and 19th centuries. Certain families were given a fixed number of *chetverti*, whose size varied according to the total land granted to the group. Especially widespread in the regions of the Belgorod line, *chetvert'* holdings were the property of the state and could not be sold. In the mid-19th century more than 657,000 *odnodvortsy*, of a total of 1,190,000, held lands under *chetvert'* law. Under a reform of 1866 that dealt with state peasants, *chetvert'* holdings were recognized as the individual property of the peasants.

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CHEVAGE, in medieval France, a small annual capitation paid by serfs as a token of their personal subordination. After the liberation of the peasantry in the 13th and 14th centuries, the chevage virtually disappeared. It survived only in a few eastern provinces that retained certain aspects of serfdom and were for the most part economically backward. In August 1789, during the French Revolution, the chevage was officially abolished without compensation. [29–1066–3]

CHEVAKINSKII, SAVVA IVANOVICH. Born in 1713 in the village of Veshki, near Torzhok, in present-day Kalinin Oblast; died sometime between 1774 and 1780 in St. Petersburg (?). Russian architect.

Chevakinskii, a representative of mid-18th-century Russian baroque, studied under I. K. Korobov from 1732 to 1738. He was the chief architect of the Admiralty College from 1741 to 1767. His students included V. I. Bazhenov and I. E. Starov. Chevakinskii blended elements of 17th-century Russian architecture with devices from classical architecture. His works are marked by balanced and precise spatial composition, by sensitivity to the silhouette, and by lavish and colorful ornament.

Chevakinskii participated in the design of the palace and park complex in Tsarskoe Selo (1745–60). His buildings in Leningrad include the palace of P. B. Sheremetev on the Fontanka (1750–55), the palace of I. I. Shuvalov (1753–55), and the Naval Cathedral of St. Nicholas (1753–62). Chevakinskii also redesigned the Kunstkamera (1754–58) and the New Holland Warehouses (1765–80) in Leningrad.

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Borisova, E. A. "S. I. Chevakinskii i arkhitekturnoe obrazovanie pervoi poloviny XVIII v." In the collection *Russkoe iskusstvo XVIII v*. Moscow, 1968. [29–121–4]

CHEVALIER, MAURICE. Born Sept. 12, 1888, in Paris; died there Jan. 1, 1972. French singer, film actor.

From 1912 to 1918, Chevalier worked in music hall comedy productions; he later performed on the stage as a *chanteur*. He became famous in the late 1920's and early 1930's. Chevalier began acting in motion pictures in 1911, appearing in such films as *The Love Parade* (1931), *The Merry Widow* (1934), *Le Silence est d'or* (1947; released in the USA under the title *Man About Town*), *Love in the Afternoon* (1956), *Can-Can* (1962), *Fanny* (1963), and *Captain Grant's Children* (1965, in the role of Paganelle).

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Ma Route et mes chansons. Paris [1950].
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Pagnol, M. and R. Carlès. *Maurice Chevalier*. Paris, 1950. [29–1067–1]

CHEVALIER, PIERRE. Dates of birth and death unknown. French officer and historian.

At the beginning of the War of Liberation of the Ukrainian People of 1648–54, Chevalier was a secretary at the French embassy in Poland. Chevalier's works contain valuable information about the history and ethnography of the Ukraine in the mid-17th century and describe the principal military and political events of the period from 1648 to 1652.

WORKS
Istoriia viiny kozakiv proty Pol'shi. Kiev, 1960. [29–1067–2]

CHEVAU-LÉGERS, horsemen in a type of light cavalry established in France in 1498. Similar units were also used in Austria and Bavaria from the 17th to the 19th century. The *chevau-légers* were armed with sabers, pistols, and carbines. [29–1069–1]

CHEVEREV, ALEKSANDR MIKHAILOVICH. Born 1887, in Orenburg; died Oct. 2, 1921. Hero of the Civil War of 1918–20. Member of the CPSU from 1908.

The son of a worker, and a worker himself, Cheverev was named a member of the Sim Plant soviet after the February Revolution of 1917. He later became a member of the Ufa provincial soviet and served as a delegate to the Seventh (April) Conference of the RSDLP(B). In 1918, Cheverev was a detachment commander in battles with the White Cossacks, White Czechs, and White Guards in the Southern Urals and the Volga Region. In the autumn of the same year, he assumed command of the 4th Combined Regiment of V. M. Azin's 2nd Combined Division, which stormed Sarapul and Izhevsk.

After studying at the Academy of the General Staff of the Workers' and Peasants' Red Army in late 1918 and early 1919, Cheverev commanded a brigade in the Second Army of the Eastern Front and was seriously wounded. In 1919 he headed a food appropriation detachment and commanded a detachment that helped suppress the kulak rebellions in Ufa Province. Over a period beginning in January 1920, Cheverev was commander of the 23rd and 27th brigades and the 67th Rifle Regiment of the interior service forces. He was sent to the Far East Republic in the fall of 1921 as a military representative of the RSFSR but died en route. Cheverev was awarded the Order of the Red Banner.

REFERENCE
Kuchkin, A. P. *A. Cheverev*, 3rd ed. Ufa, 1957. [29–122–1]

CHEVIOT, a breed of semifine-wooled short-haired sheep raised for meat and wool. The breed was developed in the 18th century in Great Britain in the mountainous region of the Cheviot Hills by crossing local sheep with probably the Leicester breed. The rams weigh about 80 kg, and the ewes 60 kg. The white wool is 10 cm long and of 48–56 quality. A clipping yields 1.8–2.3 kg. The wool is used for soft woven fabrics and high-quality knitwear. One hundred ewes produce from 120 to 150 lambs. Cheviots are used for commercial crossing with other breeds. The animals can be acclimatized easily. They are distributed in many European countries, as well as in Canada, the USA, and Australia. In the USSR they were used in the development of the Estonian Whitehead breed. [29–1068–5]

CHEVIOT, one of the common names for wool and part-wool worsted and fine-felted suiting produced by a serge interweaving resulting in small diagonal ribs on the surface. Cheviot is manufactured from simple and twisted woolen yarn; frequently cotton yarn is used as the warp or weft. Sometimes the fabric is made from blended wool and cotton yarn. Cheviot is produced in solid, usually dark, colors for making suits and various types of uniforms. [29–1068–6]

CHEVIOT HILLS, low mountains in Great Britain, situated between the Southern Uplands and the Pennines. The Cheviot, at 816 m tall, is the highest peak. The mountains are composed of granite, tuffs, limestones, and sandstones. There are heathlands, meadows, and peat bogs. Sheep are raised here. [29–122–2]

CHEVKINITE (named after K. V. Chevkin [1802–75], chief of staff of the Corps of Mining Engineers in St. Petersburg), also tscheffkinite, a mineral.

Chevkinite, a diorthosilicate with the chemical composition $Ce_4Ti_4O_8[Si_2O_7]_2$, contains admixtures of Nb, Th, Ca, Sr, and Zr. It crystallizes in the monoclinic system, forming lamellar and tabular crystals. With respect to chemical composition and structure, chevkinite resembles its polymorphic modifications: orthohombic orthochevkinite and monoclinic perrierite. It is often metamict, and the crystal structure is restored after roasting. Chevkinite is pitch black in color and has a hardness of 5.5 on Mohs' scale and a density of 4,400–4,930 kg/m^3. It occurs together with ilmenite, sphene, and zircon in alkali granites, syenites, and granitic and syenite pegmatites. [29–122–3]

CHEVREUL, MICHEL ÉUGÈNE. Born Aug. 31, 1786, in Angers; died Apr. 9, 1889, in Paris. French organic chemist. Member of the Paris Academy of Sciences (1826). Professor at the Lycée Charlemagne (from 1813) and the natural history museum in Paris (from 1830).

Chevreul's main works deal with the chemistry of fats (1810–23). Chevreul established the chemical composition of fats and, by saponification, isolated stearic, oleic, palmitic, and other acids. He gave the name "glycerin" to the "sweet principle of oils and fats" discovered by K. Scheele. Chevreul derived a number of dyes from plants, including hematoxylin (1811), quercitrin (1831), morin (1831), and luteolin (1833); he also derived creatine from meat extract (1835). Chevreul proposed an efficient system of color classification. His research has found applications in the manufacture of soap, stearin, and certain dyes.

Chevreul was a foreign corresponding member of the St. Petersburg Academy of Sciences (1853).

WORKS
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Recherches chimiques sur les corps gras d'origine animale. Paris, 1889.

REFERENCE
Manolov, K. *Velikie khimiki*, vol. 1. [Moscow] 1976. Pages 294–313. (Translated from Bulgarian.) [29–1069–2]

CHEVRON, a badge consisting primarily of angular stripes of galloon, braid, or cord and worn in many armies on various parts of the uniform—usually the sleeve—to indicate rank. Chevrons are also used to designate the number of years of extended service, the level of study of a cadet, and the receipt of a wound.

Gold gallooned chevrons to be worn on the left sleeve of the greatcoat and the pea jacket were introduced in the Soviet Navy in February 1941 to indicate extended service. Chevrons of silver or gold galloon, also indicating extended service, were introduced in the Soviet Army in November 1945. They were worn on the left sleeve of the greatcoat, dress jacket, and service shirt. After January 1958, chevrons were no longer used. [29–1069–5]

CHEYENNE, an Algonquian-speaking Indian tribe of North America (*see* ALGONQUIAN LANGUAGES). Until the late 17th century the Cheyenne lived in settlements along the Minnesota River, in what is now Minnesota, and engaged in land cultivation. They were subsequently pushed by Sioux tribes to the South Dakota prairie. By the late 18th century the Cheyenne had become nomadic hunters of bison; their society was a military democracy. In 1832 the tribe split up into the Northern and Southern Cheyenne. In 1851 settlers began seizing the lands of the Cheyenne; despite stubborn resistance the tribe was overcome and was resettled on reservations in Montana, Wyoming, and Oklahoma. Today the Cheyenne, who according to the 1970 census number approximately 6,900, mainly work as hired laborers. Their religion combines Christian dogma and rituals with tribal cults. [29–125–3]

CHEYENNE, a city in the western USA; capital of Wyoming. Population, 44,000 (1975). Cheyenne is a railroad and highway junction and the center of a large agricultural region. Industry in Cheyenne includes meat processing, oil refining, and the production of chemicals. Crude oil is produced and lignites and uranium ore are mined in the area. [29–809–3]

CHIANG MAI (also Chieng Mai), a medieval Laotian kingdom in what is now northern Thailand. Chiang Mai took its name from the city of Chiang Mai, which had been founded by Meng Rai, a Laotian ruler of the Chiang Rai principality, after he had conquered Haripunchaya.

Over a period beginning in the late 14th century, Chiang Mai waged frequent wars against the Siamese kingdom of Ayutthaya. For most of the 16th, 17th, and 18th centuries, Chiang Mai was controlled by either the Burmese or the Siamese. The kingdom was a vassal of Burma from 1556 until 1595, when it became a vassal of Ayutthaya. Burma conquered the territory in 1615 and held it until 1662, when the Siamese captured it. The Burmese reconquered the territory in 1664. Chiang Mai enjoyed independence from 1727 until 1764, when it was once again conquered by Burma. In 1775, Chiang Mai was conquered by Taksin and incorporated into Siam. [29–544–1]

CHIANG MAI (also Chieng Mai), a city in Thailand; situated on the Ping River, a tributary of the Chao Phraya. Population, 65,700 (1960). Chiang Mai is the capital of Chiang Mai Province. It is the terminus of a railroad from Bangkok. The city's industries include logging (mainly the procurement of teak), timber flotation, sawmilling, and the manufacture of food products, including tobacco products. From the 13th to the 18th century, Chiang Mai was the capital of a kingdom that was also called Chiang Mai. [29–544–2]

CH'IANGT'ANG (also Chang Tang), the northern part of the Tibetan Highlands in China. The Ch'iangt'ang is dominated by hilly plains, at an elevation of approximately 5,000 m, that are separated by ranges rising 500–1,500 m above the plains. There are stony deserts, salt bottoms, and lakes. [29–39–1]

CHIANTAR, a glacier in the Hindu Kush and the largest glacier in the mountains of Hindu Raj, lowering from 6,400 to 3,660 m. Chiantar is 32 km long and covers an area of 260 sq km. It is a compound valley glacier with numerous tributaries; its meltwater flows into the Kunar River of the Indus River basin. [29–544–4]

CHIANURI, a Georgian bowed instrument. The *chianuri* has a round, cup-shaped body over the top of which is stretched a membrane of animal bladder; among the Svans a gourd is often used for the body of the instrument. The quadrihedral neck often passes through the body, emerging at the bottom as a kind of supporting leg. The two or three twisted horsehair strings are stretched between pegs at the top of the instrument and a metal ring of the tailpiece, which is secured to the supporting leg. The strings are tuned to a second or third, and the bow resembles an arc. The *chianuri*, which is held vertically against the knee, is used as an accompanying instrument. Once popular among such peoples as the Khevsurs and Gurians, the *chianuri* is now rarely encountered.

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Vertkov, K., G. Blagodatov, and E. Iazovitskaia. *Atlas muzykal'nykh instrumentov narodov SSSR*, 2nd ed. Moscow, 1975. Pages 130–31. [29–544–5]

CHIAPAS, a state in southeastern Mexico. Area, 73,900 sq km. Population, 1,933,000 (1976). The capital of Chiapas in Tuxtla Gutiérrez. In the Indian communities, maize and beans are cultivated by the slash-and-burn method. Coffee plantations are located in the foothills. In the 1970's, Chiapas began producing sizable quantities of petroleum. [29–782–4]

CHIATURA, a city (since 1921) under republic jurisdiction in the Georgian SSR. Population, 26,000 (1974). The city is situated in the gorge of the Kvirila River, a tributary of the Rioni, and on the adjacent plateau; all the outlying districts of the city are connected with its center by passenger aerial tramways. Chiatura is a railroad station on the Zestafoni-Sachkhere branch of the Samtredia-Khashuri line. Industry includes the extraction and concentration of manganese ore and quartzose sand and the quarrying of marble. The city contains a plant that makes silica bricks, a tea factory, and a garment factory. Chiatura has a museum of local lore and a drama theater. [29–545–1]

CHIAURELI, MIKHAIL EDISHEROVICH. Born Jan. 25 (Feb. 6), 1894, in Tiflis; died Oct. 31, 1974, in Tbilisi. Soviet motion-picture director. People's Artist of the USSR (1948). Member of the CPSU from 1940.

Chiaureli graduated from the Tbilisi School of Painting and Sculpture. He worked as an actor, designer, and director in the theater. In 1921 he organized the Theater of Revolutionary Satire in Georgia and portrayed the title role in the film *Arsen Dzhordzhiashvili*. Subsequently he worked mainly as a director. His first films were *First Cornet Streshnev* (1928, together with E. L. Dzigan), *Saba* (1929), and *Khabarda* (1931). His film *The Last Masquerade* (1934) was the first in a series of historical revolutionary films characteristic of Chiaureli's work. His films included *Arsen* (1937), *The Great Glow* (1938), *Georgii Saakadze* (1942, 1943), *The Vow* (1946), *The Fall of Berlin* (1950), *Otar's Widow* (1958), and *The General and the Daisies* (1964).

Chiaureli was awarded the State Prize of the USSR in 1941, 1943, 1946, 1947, and 1950. He was awarded three orders of Lenin, two other orders, and various medals.

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CHIBAGALAKH, a mountain range in the Cherskii mountain system, in the Yakut ASSR. The Chibagalakh Range extends 250 km from the Tuostakh River valley in the Iana River basin. The range has a maximum elevation of 2,449 m. The mountains are composed primarily of metamorphic rocks and sandstones. Larch forests grow on the mountain slopes. At higher elevations, a belt of dwarf stone pine and tundra is encountered. [29–545–3]

CHIBCHAN LANGUAGES, a language family of the Chibcha Indian tribes. The Chibchan languages are spoken in northeastern South America and southern Central America—in Peru, Ecuador, Colombia, Venezuela, Panama, and Costa Rica. They comprise the following language groups: Western Chibchan (subgroups Talamanca, Barbacoa, Guatuso, and Cuna); Pacific Chibchan (Isthmian and Colombian Chibcha); Inter-Andean Chibchan (Paez, Coconuco, and Popayanense); and Eastern Chibchan (Cundinamarca, Arhuaco, Central-American Chibcha). Some scholars combine the Chibchan languages with the Misumalpan languages (Miskito, Sumo, Matagalpa) and other languages to form a Macro-Chibchan family.

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CHIBISOV, KONSTANTIN VLADIMIROVICH. Born Feb. 17 (Mar. 1), 1897, in Moscow. Soviet physical chemist. Corresponding member of the Academy of Sciences of the USSR (1946).

Chibisov graduated from Moscow State University in 1922. He worked at the Air Force Scientific and Testing Institute from 1918 to 1930, the All-Union Scientific Research Institute of Motion Pictures and Photography from 1930 to 1966, and the State Scientific Research and Design Institute of the Chemico-photographic Industry from 1966 to 1977. He gained a professorship at Moscow State University in 1950 and became chairman of the Commission on the Chemistry of Photographic Processes of the Academy of Sciences of the USSR in 1948. He was made honorary president of the International Committee on Scientific Photography in 1974.

Chibisov's major work is devoted to the theory of the light sensitivity of photographic emulsions and the chemistry of the photographic process. He received the USSR State Prize in 1950. He has been awarded four Orders of Lenin, six other orders, and several medals.

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Khimiia fotograficheskikh emul'sii. Moscow, 1975. [29–546–1]

CHIBISOV, NIKANDR EVLAMPIEVICH. Born Oct. 24 (Nov. 5), 1892, in the *stanitsa* (large Cossack village) of Romanovskaia, in what is now Tsimliansk Raion, Rostov Oblast; died Sept. 20, 1959, in Minsk. Soviet military leader; colonel general (1943). Hero of the Soviet Union (Oct. 20, 1943). Member of the CPSU from 1939.

Chibisov graduated from the Petergof School for Ensigns in 1915 and served as a company commander in World War I with the rank of staff captain. He joined the Red Army in 1918 and fought in the Civil War of 1918–20 as a battalion commander, regimental commander, and chief of staff of a rifle brigade. After graduating from the M. V. Frunze Military Academy in 1935, Chibisov fought in the Soviet-Finnish War of 1939–40 and became chief of staff of the Seventh Army in 1940. He was appointed deputy commander of troops for the Leningrad Military District in July 1940 and for the Odessa Military District in January 1941. During the Great Patriotic War of 1941–45, Chibisov was appointed deputy commander of troops for the Briansk Front in July 1942. He was commander of troops of the Thirty-eighth Shock Army from August 1942 to October 1943 and of the Third and First Shock armies from November 1943 to May 1944, serving on the Southern, Briansk, Voronezh, and Second Baltic fronts. He was director of the M. V. Frunze Military Academy from 1944 to January 1948. Chibisov later served as deputy chairman of the Central Committee of the Voluntary Society for Cooperation with the Army, Air Force, and Navy and assistant commander of troops of the Byelorussian Military District. In May 1954 he was transferred to the reserves.

Chibisov was awarded three Orders of Lenin, three Orders of the Red Banner, the Order of Suvorov First Class, and various medals. [29–546–2]

CHIBIZHEK, an urban-type settlement in Kuragino Raion, Krasnoiarsk Krai, RSFSR. Chibizhek is located 27 km northeast of the Koshurnikovo railroad station on the Abakan-Taishet line. Gold is mined nearby. [29–545–4]

CHIBONI, an Adzhar wind reed instrument. A type of bagpipe, the *chiboni* has two melody pipes with five and three finger holes, respectively. It can perform two-part melodies in sharp and loud shrills and is used at festivals as a solo instrument and to accompany dancing—particularly dancing involving large numbers of people—and singing. Sometimes rhythmic folk tunes are performed on the instrument as an accompaniment to work. The *chiboni* is played by men, called *mechibone*.

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Vertkov, K., G. Blagodatov, and E. Iazovitskaia. *Atlas muzykal'nykh instrumentov narodov SSSR*, 2nd ed. Moscow, 1975. Pages 135–36. [29–546–3]

CHICAGO, a city in the USA, in the state of Illinois. Second among US cities in economic importance and population and the largest center of industry, commerce, transport, and finance west of the Appalachian Mountains. Situated on the southwestern end of Lake Michigan where the Chicago River meets the lake, at the beginning of the canalized waterway that extends from the Great Lakes to the Mississippi River. Area, 575 sq km. Population, 3.2 million (1975), 33 percent of whom are Negroes.

Chicago forms part of one of the largest conurbations in the USA. Called the Chicago-Northwestern Indiana Standard Consolidated Area, the metropolitan area includes Chicago and various cities in Illinois and Indiana, such as Gary, Hammond, and East Chicago. It covers an area of 9,000 sq km and has a population of 7.7 million (1975). In 1974 the economically active population totaled 3.3 million; 31 percent were employed in industry, 5 percent in construction, 7 percent in transport, 6 percent in finance, 39 percent in commerce and the service sector, and 12 percent in the civil service. Approximately two-thirds of those working in industry are employed in heavy industry, and more than one-tenth, in the food-processing industry.

Chicago's location on the principal east-west arteries of the USA and at the junction of land and water routes has made it an important transportation center of the USA (more than 30 railroad lines converge at the city) and a major center of domestic air traffic. The Port of Chicago, which includes piers on Lake Michigan, is the largest port on the inland waterways of the USA, and it handled more than 50 million tons of freight in 1974.

Chicago is the center of US ferrous metallurgy; its steel-melting furnaces have a capacity of approximately 30 million tons. Leading products of the city include communication facilities, electronic equipment, electrical machinery, transportation equipment, agricultural machinery, and various types of equipment for industry, construction, and road building. The printing, chemical, petroleum-refining, garment, and furniture industries are well developed, as is the food-processing industry, which is dominated by flour milling and the production of canned meat. Heavy machine building and the metallurgical, petroleum-refining, and chemical industries are located primarily along Lake Michigan in southeast Chicago (near the port) and in the adjacent suburbs of Indian Harbor, Gary, and East Chicago. Machine building is most highly developed in the western section of the industrial complex, in such areas as Cicero.

Chicago is the most important market in the USA for wheat, maize, soybeans, and livestock, and its stock exchange is second in importance only to the New York Stock Exchange. The Chicago financial group is one of the major groups of finance capital in the USA. Capitalist monopolies dominate the city's industry and commerce, with the firms International Harvester and Pullman playing a major role in machine building and the General Foods Corporation occupying a leading position in the food-processing industry. The country's largest grain exchange is located in Chicago.

For a long period the area that is now Chicago belonged to the Indians. The city developed on the site of Fort Dearborn, a military post established in the early 19th century. In 1833 the settlement that grew up around the fort was incorporated as a city. The city's rapid population growth, which was particularly marked after the completion of the Illinois-Michigan Canal in 1848 and a railroad line to the Atlantic Ocean in 1852, made Chicago the country's largest city after New York by the end of the 19th century; it had 550 inhabitants in 1830, 4,500 in 1840, 109,000 in 1860, and 1,100,000 in 1890. In the 1840's industry began to expand rapidly, and in 1893 an international fair, the World's Columbian Exposition, was held in the city.

Chicago was an important center of the working-class and democratic movements. In 1870, sections of the First International were formed in the city. Notable events involving the Chicago proletariat in the late 19th century included the Haymarket Square Riot of 1886 and the Pullman strike of 1894. The trade union organization Industrial Workers of the World was founded in Chicago in 1905, and the Communist Party of the USA was founded in 1919. In 1937 police, in an incident known as the Memorial Day Massacre, fired on workers demonstrating against Republic Steel. In the 1960's and 1970's Chicago became a center of the civil rights movement, and during the American aggression in Vietnam (Vietnam War) massive antiwar demonstrations were held in the city.

Chicago, a city of sharp social contradictions and contrasts, is noted for its elegant lakefront; for its business center of huge skyscrapers, called the Loop, which is located near the place where the Chicago River meets Lake Michigan; and for its area of private residential buildings north of the Loop, known as the Gold Coast. The city is also renowned for its parks, its wide boulevards, and its drive that runs along the lakeshore. Alongside these attractions, however, are neglected slum areas and the ethnic ghettos of Chinatown and the Negro districts; in the west and southeast lie the industrial areas.

After the fire of 1871, which virtually destroyed the city, Chicago was completely rebuilt, and skyscrapers with metal skeletons were erected. The Chicago school of architecture, a precursor of the rational architecture of the 20th century, produced such structures as the second Leiter Building (now Sears and Roebuck; 1889–91, architect W. Le Baron Jenney), the Reliance Building (1890–94, architects D. H. Burnham and J. W. Root, assisted by C. B. Atwood), and the Carson Pirie Scott department store (1899–1900, architect L. Sullivan).

In the 20th century, rebuilding has been restricted to the construction of skyscrapers in the Loop, such as the Tribune Tower

(1923–25, architects J. M. Howells and R. Hood); elegant complexes, such as the Civic Center (1963–65, architect J. Brownson); and expressways that are incongruous with the city's layout.

Chicago remains an important center of architectural design. Among its notable structures are F. L. Wright's Robie House (1909), now part of the University of Chicago, and numerous buildings by L. Mies van der Rohe—including the Illinois Institute of Technology (1942–58), high-rise apartment buildings on Lake Shore Drive (1950–51), and the Commonwealth Promenade Apartments (1957). B. Goldberg designed the Marina City high-rise apartment buildings (1964), and the architectural firm of Skidmore, Owings, and Merrill designed the 100-story Hancock Building (1971) and the 109-story Sears Tower (1970–74), which, with a height of 442 m, is the world's tallest building.

A major scientific and cultural center of the USA, Chicago is the location of such nationally important universities as the University of Chicago, Northwestern University, De Paul University, and the Illinois Institute of Technology. Museums include the Field Museum of Natural History and the Museum of Science and Industry. Other cultural and educational institutions include the Art Institute of Chicago, the John G. Shedd Aquarium, the Chicago Public Library, and the Shubert and Blackstone theaters.

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Chicago's Famous Buildings, 2nd ed. Edited by A. Siegel. Chicago–London, 1969. [29–553–5]

CHICAGO, ART INSTITUTE OF, a major art museum of the USA. Founded in 1879, the museum houses collections of primitive art, Oriental art, traditional art of America, Africa, and Oceania, and Western European art of the 13th to 20th centuries. [29–561–3]

CHICAGO, UNIVERSITY OF, a major higher educational institution of the USA, located in the state of Illinois. Founded in 1857, the university suspended operations from 1886 to 1889 but reopened in 1890 with the financial support of J. D. Rockefeller; regular instruction began in 1892. In the late 19th century the University of Chicago became one of the first American universities to admit women. The university's medical school was founded in 1927.

The payment of tuition is required for study at the university, which comprises 12 subdivisions: graduate divisions of biological sciences, humanities, physical sciences, and social sciences; graduate professional schools of theology, business administration, library science, education, social service administration, medicine, and law; and an undergraduate college. The University of Chicago has 8,000 students and more than 1,000 faculty members. The Oriental Institute and a university press are attached to the university. The university library, founded in 1892, contains more than 3.3 million volumes. [29–561–2]

CHICAGO FINANCIAL GROUP, one of the largest groups in the US financial oligarchy. It is a coalition of industrial and finance monopolies and the richest families in Chicago and the state of Illinois. A united group of influential families and the Crown-Hilton group are the most prominent members.

The group represented by the Stuart, Blair, Block, Percy, McCormick, and Swift families holds the leading position in the Chicago financial group. The assets of the corporations and credit and finance institutions it controls amounted to more than $50 billion in the mid-1970's. As a result of changes in the industrial development in the US Midwest after World War II, the industrial base of the group expanded (previously it had been connected mainly with the development of the food-processing industry and of trade). The group seized control over the retail concern Montgomery Ward and several railroad companies and filled important positions in Standard Oil of Indiana, pushing out the Rockefellers. The group has a ramified network of credit and finance institutions with more than $20 billion in assets. The institutions are mainly banks that finance industry, transportation, and trade in Illinois and adjoining regions. In the mid-1970's the city of Chicago became the third financial center of the country, after New York City and Boston.

The assets controlled by the Crown-Hilton group amounted to more than $2 billion in the mid-1970's. Before World War II the nucleus of the group consisted of the Crown family and the First National Bank of Chicago. During the war the two merged their interests with the Hilton family, owners of hotels and other real estate. After the war the Crowns established control over the war-industry concern General Dynamics Corporation.

The Chicago financial group has vast financial and economic interests outside the USA, with numerous divisions and branches abroad.

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Men'shikov, S. M. *Millionery i menedzhery*. Moscow, 1965. Pages 431–33. E. F. ZHUKOV [29–555–3]

CHICAGO SCHOOL, in bourgeois political economy, a school of economic theory founded on liberalism. The ideological and theoretical views of the Chicago school began to take shape in the 1930's and reached their final form as a fully elaborated doctrine in the 1960's and 1970's. The school's principal representatives are American scholars and economists associated, for the most part, with the University of Chicago and include F. Knight, H. Simons, L. Mints, M. Friedman, J. Viner, P. Cagan, D. Meiselman, R. Selden, and A. Schwartz. The theories and practical recommendations of the Chicago school are reflected most fully in the works of Knight and, especially, Friedman.

Adherents of the Chicago school, who belong to the neoclassical school of contemporary bourgeois political economy, take an anti-Keynesian position on such issues as the forms and methods of government regulation of the capitalist economy, monetary theory, demand, pricing, economic cycles, and employment. The school's methodology is based on the principles of marginalism, on the subjective and psychological marginal utility theory, and on the apologetic concept of the marginal productivity of factors of production (*see* PRODUCTIVITY, THEORIES OF).

Economists of the Chicago school, who reject the view of J. M. Keynes that a capitalist economy cannot ensure normal expanded reproduction without the intervention of the bourgeois state, argue that the state has a destabilizing influence on the development of a capitalist economy. Idealizing the natural mechanisms of the market, they maintain that effective management and economic efficiency can be achieved only under a system of private ownership and free enterprise.

The Chicago school uses its defense of the mechanisms of the marketplace and free competition to sharply attack the working class, whose demands for higher wages are regarded as a constraint on the free play of market forces. The school's theorists do not consider unemployment a major socioeconomic problem of modern capitalism, whose ills, they believe, must be ameliorated through the "automatic" mechanisms of the market and through free competition.

Economists of the Chicago school oppose restrictions on the economic expansion of monopolies and have spoken out against the progressive income tax, taxes on corporations and savings, and government price controls. The Chicago school, which expresses the ideology and interests of the most conservative circles of the monopolistic and middle bourgeoisie, is one of the most ardent defenders of private ownership as the basis of a capitalist society.

For the Chicago school, monetary theory constitutes the central problem in economics. In the 1950's, Friedman and his supporters began working on a modern variant of the quantity theory of money, a variant that has come to be known as monetarism. According to monetarist theory, money plays a key role in the economic development of capitalist society, and quantitative changes in the money supply generate changes in other economic areas. Like such bourgeois economists as K. Wicksell and I. Fisher, then, the adherents of the Chicago school take a monetary approach to the analysis of economic crises. They reject the notion that such crises are regularly recurring phenomena inherent in capitalism, maintaining that the cyclical development of a capitalist economy results from disruptions in the

money supply. According to Friedman, the destructive economic crises of 1929–33 could have been ended in the USA by 1931 if the Federal Reserve System had not resorted to a reduction in the money supply.

An important place in monetarist theory belongs to the notion of a regular income, which presupposes the existence of a constant component of consumer expenditure. A central element in monetarist doctrine is the money demand function, which underlies the conclusion that there is a proportional relation between growth in the money supply and a change in price level. The monetarists believe that inflation occurs when deficit financing based on Keynesian methods of regulating the economy results in an excessive money supply. The monetarists criticize such methods, believing that only the growth of the money supply requires regulation. Friedman asserts that a regular, steady increase in the money supply of 3–5 percent annually will ensure the smooth functioning of a capitalist economy. The implementation of the recommendations of the Chicago school cannot, however, eliminate the cyclical nature of the development of a capitalist economy. Economic cycles stem from the basic contradiction of capitalism—the contradiction between the social nature of production and the private, capitalist form of appropriation.

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A. A. KHANDRUEV [29–559–1]

CHICAGO TRIBUNE, a daily newspaper in the USA. The Chicago *Tribune*, founded in 1847, is published in Chicago by the Tribune Company. It is closely connected with influential monopolistic groups of the Midwest. Circulation, more than 750,000; Sunday edition, 1.1 million (1977). [29–555–1]

CHICHAGOV, PAVEL VASIL'EVICH. Born June 27 (July 8), 1767, in St. Petersburg; died Aug. 20 (Sept. 1), 1849, in Paris. Russian military figure; admiral (1807). Son of V. Ia. Chichagov.

Chichagov joined the navy in 1782 and served as his father's adjutant; he commanded a ship of the line in the Russo-Swedish War of 1788–90. He studied in England in 1791 and 1792 and retired in 1797.

In 1799, Chichagov commanded a landing expedition to Holland. He joined Alexander I's retinue in 1801 and became a deputy minister of the navy in 1802. He served as minister of the navy from December 1802 to 1809 (although he officially held the post until 1811) and introduced a series of measures to improve the fleet. From 1805 to 1809 and again from 1811 to 1834 he was a member of the State Council. In April 1812, Chichagov was named commander in chief of the Army of the Danube, chief of the Black Sea Fleet, and governor general of Moldavia and Walachia.

During the Patriotic War of 1812, the Army of the Danube and the Third Army were united in September 1812 under the general command of Chichagov, who was ordered to attack the rear of Napoleon's forces. According to the plan put forward by M. I. Kutuzov, Chichagov's army, together with a corps under P. Kh. Vitgenshtein, was to cut off Napoleon's escape routes to the west across the Berezina River. However, because of a lack of cooperation on the part of several groups of forces and mistakes by Chichagov and Vitgenshtein, the plan was not carried out. Russian public opinion laid the entire blame for the failure on Chichagov. In late 1812 and early 1813, Chichagov, commanding the Third Army, directed the pursuit of the enemy. In February 1813 he was forced to retire. Insulted at being suspected of treason, Chichagov emigrated in 1814 to live in Italy and France. His memoirs were published in the historical journals *Russkii arkhiv* (Russian Archive; 1869–70) and *Russkaia starina* (Russian Antiquity; 1883, 1886–88, vols. 38, 50–52, 55, 58–60).

WORKS
Arkhiv admirala P. V. Chichagova, fasc. 1. St. Petersburg, 1885.
[29–662–3]

CHICHAGOV, VASILII IAKOVLEVICH. Born Feb. 28 (Mar. 11), 1726; died Apr. 4 (16), 1809, in St. Petersburg. Russian navigator; admiral (1782).

Chichagov studied at a school for navigation and continued his education in England. He joined the Russian Navy in 1742. In 1764 he was appointed leader of an expedition to find a sea route from Arkhangel'sk to North America via the Arctic Ocean; the expedition was then to proceed west across the Bering Strait to Kamchatka and join up with P. K. Krenitsyn's detachment. In 1765 the expedition reached 80°26′ N lat., northwest of Spitsbergen, but it was forced to return to Arkhangel'sk because of heavy ice. During a second attempt in 1766 the expedition managed to reach 80°30′ N lat. During the Russo-Turkish War of 1768–74, Chichagov commanded a detachment of the Don Military Flotilla from 1772 to 1774 and fought in the defense of the Kerch' Strait. He became a member of the Admiralty College in 1775. During the Russo-Swedish War of 1788–90 he commanded the Baltic Fleet, which fought in the battles of Oland Island, Revel' (now Talinn), and Vyborg. Chichagov retired in 1797.

Several geographical features have been named in honor of Chichagov, including islands in the Novaia Zemlia Archipelago, an island in the Alexander Archipelago off the coast of North America, a gulf and cape on the island of Nuku Hiva in southern Polynesia, a cape on the island of Kyushu, and a mountain on the island of Vestspitsbergen.

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[29–662–2]

CHICHÉN ITZÁ, a political and cultural center of the Maya, located in the northern part of the Yucatán peninsula, in Mexico. Chichén Itzá was probably founded in the eighth century A.D. Captured by the Toltecs in the tenth century, it became the capital of the Toltec empire in the mid-11th century. In 1178 it was destroyed by the forces of three city-states—Mayapán, Uxmal, and Izamal. By the time of the Spanish conquest (mid-16th century), Chichén Itzá was in ruins.

Numerous excavations conducted at Chichén Itzá led to the discovery of large Maya-Toltec architectural monuments, including the Temple of Kukulcán, a pyramid with nine stages (24 m high) and a wide stairway on each of the four sides, the Temple of the Warriors, atop a low pyramid (four stages), and the Temple of the Jaguars; the last two were decorated with wall paintings. Also discovered were the Caracol observatory, seven ball courts, and the ruins of four colonnades forming a gigantic rectangle (the Thousand Columns). Stylized statues of deities, reliefs rich in floral and geometric ornamentation, small sculptures, and artistic hand-crafted works were unearthed.

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Chichén-Itzá: Guía oficial. Mexico City, 1955. [29–663–1]

CHICHERIN, BORIS NIKOLAEVICH. Born May 26 (June 7), 1828, in Tambov; died Feb. 3 (16), 1904, in the village of Karaul, Tambov Province. Russian philosopher, historian, publicist, and public figure.

Chicherin was of noble birth. He studied under T. N. Granovskii and graduated from the law faculty of the University of Moscow in 1849. In 1853 he successfully defended his master's thesis, *Regional Institutions of Russia in the 17th Century* (published 1856); he was retained at the university, where he was named professor of Russian law in 1861. In 1866 he defended his doctoral dissertation, *On Popular Representation*, which was published in book form (1866). In 1868, Chicherin was one of a group of professors who resigned in protest against violation of the university statute; he then lived in the village of Karaul, where he carried on his research work and participated in *zemstvo* activities. In 1882–83 he was mayor of Moscow; he was

forced to resign by order of the emperor Alexander III because of a speech at the coronation in which the tsar misinterpreted an allusion made by Chicherin to the demand for a constitution.

From the mid-1850's, Chicherin was a leader of the liberal Westernizers' wing of the Russian social movement. Chicherin and K. D. Kavelin's joint "Letter to the Editor" (published in *Voices From Russia*, vol. 1) was the first document to appear in print as a program of Russian liberalism. In September 1858, Chicherin traveled to London to talk with A. I. Herzen about changing the line of propaganda of the Free Russian Printing House. His attempt to persuade Herzen to make concessions to the liberals ended in complete rupture, thus initiating the separation of liberalism and democracy that marked Russian social thought in the second half of the 19th century.

Chicherin described the Peasant Reform of 1861 as "the greatest monument of Russian legislation," and he took an extremely negative view of the revolutionary democrats' activities; in the fall of 1861 he spoke out against the student movement, and he supported the government's reactionary policy on Poland and the Polish Uprising of 1863–64. The political principle formulated by Chicherin—"liberal measures and strong rule"—was supported in governmental circles. In his works he developed the idea of gradual transition, through reforms, from autocracy to constitutional monarchy, which he considered the ideal form of government for Russia.

Chicherin was the most prominent theoretician of the current known as the state school of Russian historiography; he was the originator of the theory of "enslavement and emancipation of the estates," which held that in the 16th and 17th centuries the government had created the estates and subordinated them to state interests; in the subsequent course of historical development, when the need for the "forcible lifelong service of the estates" had passed, the government supposedly began to emancipate them. This notion was the theoretical basis of the bourgeoisie's and nobility's liberalism, which was grounded in the idea of reforms "from the top."

As a philosopher, Chicherin was the most notable representative of right-wing Hegelianism in Russia. In his later years he wrote various works on the natural sciences (chemistry, zoology, and descriptive geometry). His *Memoirs* (parts 1–4, Moscow, 1929–34) are a valuable source of historical information on social life and social movement in the second half of the 19th century.

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CHICHERIN, GEORGII VASIL'EVICH. Born Nov. 12 (24), 1872, in the village of Karaul, in Kirsanov District, Tambov Province; died July 7, 1936, in Moscow. Soviet state figure and diplomat. Joined the revolutionary movement in 1904. Member of the Communist Party from 1918. Nephew of B. N. Chicherin.

Of noble birth, G. V. Chicherin graduated from the faculty of history and philology at the University of St. Petersburg in 1896 and took up a position in the Ministry of Foreign Affairs in 1897. In 1904 he emigrated to Germany, where the following year he joined the RSDLP. After the Fourth Congress of the RSDLP in 1906 he joined the Mensheviks. In 1908 he began working with the French Socialist Party.

During World War I, Chicherin was an internationalist. In 1917 he was arrested in Great Britain as the secretary of a "delegate commission" dealing with the return of political exiles to Russia; the Soviet government obtained his release from prison. In 1918, on returning to Soviet Russia, he was appointed deputy people's commissar for foreign affairs.

On Mar. 3, 1918, as part of the Soviet delegation, Chicherin signed the Brest-Litovsk Treaty of 1918 with Germany. He became acting people's commissar for foreign affairs of the RSFSR on March 13, people's commissar for foreign affairs on May 30, and people's commissar for foreign affairs of the USSR in 1923, a post he held until 1930. In 1921 he signed Soviet-Iranian, Soviet-Afghan, and Soviet-Turkish treaties of friendship, the first treaties, signed on an equitable basis, between the countries of the East and Soviet Russia.

Chicherin led the Soviet delegation at the Genoa Conference of 1922 and the Lausanne Conference of 1922–23; he signed the Treaty of Rapallo with Germany in 1922 and treaties of neutrality with Turkey in 1925 and Iran in 1927. At the Fourteenth and Fifteenth Congresses of the ACP(B) he was elected a member of the Central Committee. Chicherin was a member of the All-Russian Central Executive Committee and the Central Executive Committee of the USSR. He became a personal pensioner in 1930.

Chicherin made an important contribution to the protection of Soviet interests, and his work was highly regarded by V. I. Lenin (see *Poln. sobr. soch.*, 5th ed., vol. 50, p. 111). Chicherin was the author of numerous works on a variety of subjects, including international relations, culture, and the history of the revolutionary movement.

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Zarnitskii, S. V. and A. N. Sergeev. *Chicherin*, 2nd ed. Moscow, 1975. [29–665–1]

CHICHEROV, VLADIMIR IVANOVICH. Born May 29 (June 11), 1907, in Viazniki, in what is now Vladimir Oblast; died May 11, 1957, in Moscow. Soviet folklorist.

Chicherov graduated from Moscow State University in 1928 and became a professor there in 1953. His doctoral dissertation, *The Winter Period of the Russian Agricultural Calendar in the 16th to 19th Centuries* (1948; published 1957), was devoted to poetry connected with calendar rituals.

Chicherov's book *Questions of the Theory and History of Folk Works* (1959) dealt with historical songs. He also wrote on the theory of folklore, Russian epic poetry, and the various schools of *skaziteli* (singers of epic folk songs or historical songs) of the Russian north. His ideas about folklore reflected a Marxist conception of the role of the people in history and culture. Chicherov wrote the textbook *Russian Folk Works* (1959; German translation, 1968).

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CHICHIBABIN, ALEKSEI EVGEN'EVICH. Born Mar. 17 (29), 1871, in Kuzemin, in what is now Poltava Oblast; died Aug. 15, 1945, in Paris. Russian organic chemist. Academician of the Academy of Sciences of the USSR (1928; corresponding member, 1926).

Chichibabin graduated from Moscow University in 1892. In 1909 he became a professor at the Moscow Higher Technical School. From 1930 to the end of his life he worked in France.

Chichibabin's main works are devoted to the chemistry of nitrogen-containing heterocyclic compounds, primarily pyridine. He developed a method of obtaining pyridine derivatives by the condensation of aldehydes and ketones with ammonia. He was the first to produce α-aminopyridine, by the action of sodium amide on pyridine (Chichibabin reaction). He investigated its properties and studied the tautomerism of aminopyridine and hydroxypyridine. He also determined the structure of many alka-

loids and other plant substances, such as pilocarpine, santonine, and bergenin, and synthesized them. Chichibabin is also known for his work on free aromatic radicals and his method of synthesizing aldehydes by means of organomagnesium compounds.

Chichibabin contributed a great deal to the creation of the Soviet chemical-pharmaceutical industry. He was the author of the textbook *Basic Principles of Organic Chemistry* (1925; 7th ed., vol. 1, 1963). Chichibabin was awarded the V. I. Lenin Prize (1926).

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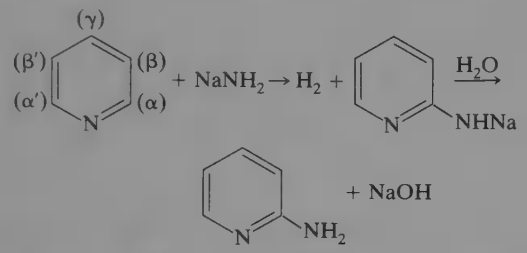
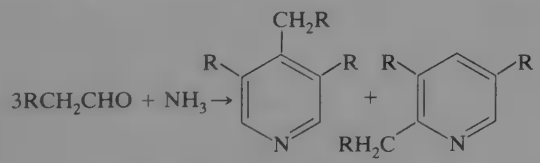
CHICHIBABIN REACTION, the interaction of nitrogen-containing heterocyclic compounds, mainly pyridine, quinoline, and isoquinoline, with sodium amide, $NaNH_2$, that leads to the formation of α-amino derivatives. For example, α-aminopyridine is obtained from pyridine:



The Chichibabin reaction (or Chichibabin amination reaction) is usually carried out at boiling temperatures in an aromatic hydrocarbon or in dialkyl aniline or at room temperature in liquid ammonia. If there is an excess of $NaNH_2$, the principal product is α,α′-diaminopyridine. If both α-positions are occupied in the ring, the amino group attacks the γ-position. The reaction, used in preparative organic chemistry, was discovered by A. E. Chichibabin in 1914.

Also known as the Chichibabin reaction is the condensation of aldehydes or ketones with ammonia, leading to the formation of substituted pyridines, for example,



This reaction (also called Chichibabin pyridine synthesis) is carried out in the gaseous phase at temperatures of 300°–350°C with various catalysts of the Al_2O_3 type or in an autoclave at temperatures of 200°–250°C in the presence of concentrated aqueous ammonia. The reaction was carefully investigated by A. E. Chichibabin beginning in 1905; isolated syntheses were carried out by A. Baeyer in 1870 and P. Waage in 1882. [29–666–3]

CHICHIKLEIA, a river in Odessa and Nikolaev oblasts, Ukrainian SSR; a right tributary of the Iuzhnyi Bug. The Chichikleia is 156 km long and drains an area of 2,120 sq km. It is fed by snow. High water occurs between late February and early April. The mean flow rate 46 km from the mouth is 1.9 cu m per sec, and the maximum flow rate is 318 cu m per sec. The Chichikleia dries up for seven or eight months a year. There is ice on the Chichikleia from November through February. [29–667–1]

CHICHINADZE, KONSTANTIN ARCHILOVICH. Born May 6 (18), 1891, in the village of Khimshi, in what is now Ambrolauri Raion, Georgian SSR; died June 21, 1960, in Tbilisi. Soviet Georgian poet and translator.

Chichinadze was educated at the University of Tiflis. His poetry was first published in 1908. He translated *The Tale of Igor's Campaign, David of Sasun, Das Nibelungenlied*, Dante's *The Divine Comedy*, and works by 19th-century Russian and Western European poets. Chichinadze's research on Rustaveli is well known; in 1934 he published a critical edition of Rustaveli's narrative poem *The Man in the Panther's Skin.*

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CHICHKAIUL (also Chichke-Iul), a river in Tomsk Oblast, RSFSR; a right tributary of the Chulym River in the basin of the Ob'. The Chichkaiul is 450 km long and drains an area of 6,150 sq km. It flows across the Chulym Plain. It is fed by mixed sources, predominantly by snow. The mean flow rate is 28.2 cu m per sec. The river freezes over in late October or November, and the ice breaks up in April or early May. The Chichkaiul is navigable 192 km from the mouth. [29–667–3]

CHICLAYO, a city in northeastern Peru; the capital of Lambayeque Department. Located on the Pan-American Highway. Population, 189,700 (1972).

Chiclayo is connected by railroad with the ports of Pimentel and Puerto Eten. The city's food-processing industries manufacture dry and condensed milk, sugar, and processed rice. The city also has leather and textile industries and enterprises for the production of building materials. It is the center of an agricultural region that produces rice and sugarcane. A university is located in Chiclayo. [29–561–5]

CHICOPEE, a city in the USA, in Massachusetts; situated on the Connecticut River. Population, 63,000 (1975). Chicopee is a northern suburb of Springfield. Industry includes machine building and the manufacture of rubber products and chemicals. [29–565–1]

CHICOUTIMI AND JONQUIÈRE, two cities in eastern Canada, in Quebec. Combined population, 136,000 (1973, including suburbs). Chicoutimi is situated on the Saguenay River. The two cities constitute a major center of the chemical, pulp and paper, and metallurgical industries. Chicoutimi has a ferroalloy foundry. [29–1184–2]

CHIGANAK, an urban-type settlement in Moiynkumskii Raion, Dzhambul Oblast, Kazakh SSR. Chiganak is situated on the southwestern shore of Lake Balkhash. The settlement has a railroad station on the Mointy-Chu line. [29–547–3]

CHIGIRIN, a city and administrative center of Chigirin Raion, Cherkassy Oblast, Ukrainian SSR. Chigirin is situated on the Tiasmin River, a tributary of the Dnieper, 36 km from the railroad station of Fundukleevka on the Znamenka–Imeni Tarasa Shevchenko line, and 63 km southeast of Cherkass. It has enterprises for the production of leather clothing accessories, furs, furniture, accessories, bricks, and foodstuffs. The city has a museum of local lore.

Chigirin has been known since the first half of the 16th century, when it was a fortified cossack wintering site. From 1648 to 1657 it was the seat of the Ukrainian hetman B. Khmel'nitskii. Chigirin was destroyed by Turkish and Tatar invaders during the Chigirin Campaigns of 1677–78. In 1795 it became a district capital in Voznesensk Province, and in 1797, a district capital in Kiev Province. In 1876–77 Chigirin District was the scene of an attempted peasant uprising under the leadership of the Narodniki (Populists). [29–547–4]

CHIGIRIN CAMPAIGNS OF 1677–78, campaigns of the Russian Army and Ukrainian cossacks during the concluding period of the Russo-Turkish War of 1676–81, when Turkish troops undertook two sieges of the city of Chigirin, the most important political and strategic center of the southern Ukraine.

In the first Chigirin campaign, the Turkish Army, commanded by Ibrahim Paşa, advanced from the Danube in late June 1677 and on August 3 laid siege to Chigirin, where it was joined by more than 40,000 Crimean Tatars. The city garrison withstood a number of attacks and undertook several sorties. The joint Russian-Ukrainian forces, led by Prince G. G. Romodanovskii and the hetman I. Samoilovich, crossed to the right bank of the Dnieper on the night of August 26 and crushed the Turkish Army in a decisive battle.

In the second campaign, the Turkish Army, led by the vizier Kara Mustafa, approached Chigirin on July 9, 1678, and began constructing siege works. The Russian Army, having crossed the Dnieper, won a major battle on July 12. In bitter fighting from August 1 to August 3, the Russian Army repulsed the Turkish Army beyond the Tisman River. However, because Romodanovskii missed the opportunity of completely surrounding the Turkish troops, the Turks seized Nizhnii Gorod, and on the night of August 11, the Russian garrison abandoned the fortress. A new battle on August 19 ended in a Russian victory. On August 20, the Turkish troops began retreating. The reverses suffered by the Turks near Chigirin presaged the failure of the aggressive plans of the Ottoman Empire with respect to the Ukraine.

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[29–547–5]

CHIGIRIN CONSPIRACY OF 1877 (also Chigirin affair), an unsuccessful attempt by a group of revolutionary Narodniki (Populists) to raise a peasant rebellion in Chigirin District of Kiev Province.

In 1875 disturbances broke out among the state peasants in Chigirin District; ten *volosts* (small rural districts), with a total population of more than 50,000, were affected. Members of the Southern Rebels circle sought to use the disturbances as the basis for a local rebellion that would spread to neighboring districts. The organizers of the Chigirin conspiracy were Ia. V. Stefanovich, L. G. Deutsch, I. V. Bokhanovskii, and S. F. Chubarov.

In the winter of 1876, Stefanovich made contact with the peasants of Chigirin District by posing as Dmitrii Naida, a messenger sent by peasants of Kherson Province to the tsar. At the end of that year Stefanovich presented the Chigirin peasants with what he claimed were a secret *gramota* (document) from the tsar, a charter for a peasant organization called the Secret Druzhina, and the text of a solemn oath. The peasants were told that all the documents had the tsar's approval; in actuality the documents had been written by Stefanovich and his comrades and printed by Bokhanovskii.

In the forged *gramota*, the tsar acknowledged his inability to help the peasants in their struggle against the *pomeshchiki* (landowners) and directed them to form secret organizations with the purpose of rebelling against the *dvoriane* (nobles) and government officials and seizing the land.

In February 1877 at secret meetings in the village of Shabel'niki, the solemn oath was taken by peasants joining the Secret Druzhina; they agreed to not pay taxes and to fight for the redistribution of land on a per capita basis. By mid-1877 approximately 2,000 peasants had joined the Secret Druzhina. E. A. Oleinik, a retired noncommissioned officer, served as the organization's ataman; he was subordinate to Naida (Stefanovich), who claimed to have been appointed "commissar" by the tsar. The uprising was planned for Oct. 1, 1877. The authorities learned of the conspiracy, however, before the rebellion could take place.

The ensuing investigation involved approximately 1,000 peasants. The Kiev Sudebnaia Palata (high court tribunal) tried 44 of the peasants in June 1879. In 1880 the Senate reviewed the case and lengthened the term of confinement for most of the convicted peasants. Stefanovich, Deutsch, and Bokhanovskii faced death sentences, but in May 1878, before their trial, they escaped from Kiev Prison with the help of M. F. Frolenko and V. A. Osinskii.

The Secret Druzhina was the only mass peasant organization to arise from the Populist movement, but the unscrupulous nature of the means employed to organize the Secret Druzhina greatly diminished its significance. The abuse of the peasantry's illusions about the tsar was condemned in revolutionary circles as alien to the Populist program. By having to invoke the tsar's authority to induce the peasants to rebel, the Southern Rebels proved the falsity of their theories about the revolutionary character of the peasantry.

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IU. N. KOROTKOV [29–548–1]

CHIGORIN, MIKHAIL IVANOVICH (also spelled Tchigorin). Born Oct. 31 (Nov. 12), 1850, in Gatchina; died Jan. 12 (25), 1908, in Lublin, now in Poland. Russian chess player and organizer of the chess movement in Russia.

Chigorin, the son of a master worker at the Okhta Gunpowder Mill, studied at the Gatchina Orphans' Institute. In the 1880's and 1890's he was universally recognized as the chief contender for the chess championship of the world, but in 1889 and 1892 he was defeated by the world champion, W. Steinitz. From 1899 to 1903 he won the first three all-Russian chess tournaments. Victorious in international tournaments in New York (1889), Budapest (1896), and Vienna (1903), Chigorin ranked second in Hastings in 1895, ahead of the world champion E. Lasker. He won a number of two-game telegraph matches: St. Petersburg–London (1886–87) and one with Steinitz (1890–91). He also won a match with Lasker in 1903.

Chigorin pioneered the formation of chess organizations in many cities in Russia. He edited and published the St. Petersburg journals *Shakhmatnyi listok* (1876–81), *Shakhmatnyi vestnik* (1885–87), and *Shakhmaty* (1891–92) and wrote chess columns for the weekly *Vsemirnaia illiustratsiia* (1881–90) and the newspaper *Novoe vremia* (1890–1907). He was the author of many theoretical works on openings and endgames.

In 1909, an international tournament was held in memory of Chigorin in St. Petersburg, and tournaments were held in his memory in the USSR between 1947 and 1980.

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G. B. ANTONOV [29–549–2]

CHIGRINOV, IVAN GAVRILOVICH. Born Dec. 21, 1934, in the village of Velikii Bor, Kostiukovichi Raion, Mogilev Oblast. Soviet Byelorussian writer. Member of the CPSU since 1973.

Chigrinov graduated from the philology department of Byelorussian University in 1957. He was first published in 1961. He is the author of the short story collections *The Birds Fly to Freedom* (1965), *The Happiest Man* (1967), and *A Man Went to War* (1973), which deal with the life and labor of Soviet people and with the heroism of the past war and its consequences. His pair of novels *The Quail's Cry* (1972) and *Blood Acquittal* (1977) depict the dramatic nature of events and the fates of individuals at the beginning of the Great Patriotic War of 1941–45. Chigrinov is a coauthor of a television screenplay about the Minsk party underground entitled *The Ruins Are Firing* (1973; State Prize of the Byelorussian SSR, 1974).

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Iurevich, V. "Ispytanie obstoiatel'stvami." *Ibid.*, 1977, no. 8.
[29–550–1]

CHIHLI CLIQUE, a group of the Peiyang Militarists in China that was formed after the death of Yüan Shih-k'ai in 1916. The clique took its name from Chihli Province, the home of several of the group's leaders, including Wu P'ei-fu and Ts'ao K'un. Its main territorial base comprised Chihli, Honan, Hupei, and Hunan. The clique, which received financial support from British and American imperialists, controlled the government in Peking from 1920 to 1924; in 1920 and 1921 it shared control with the Fengtien clique. After the National Revolutionary Army defeated Wu P'ei-fu during the Northern Campaign of 1926–27, the Chihli clique vanished from the political scene. [29–536–1]

CHIHUAHUA, a state in northern Mexico. Area, 247,000 sq km. Population, 2 million (1976). The capital is the city of Chihuahua. The eastern part of the state is a semidesert upland plain with elevations of mainly 1,000–2,000 m. The Sierra Madre Occidental, which reach an elevation of 2,591 m, occupy the western part. Cattle raising is extensive, and irrigated land is cultivated, mainly for cotton. The mining of complex ores and nonferrous metallurgy are centered in and around Chihuahua, Hidalgo del Parral, and San Francisco del Oro. Timber is procured in the Sierra Madre Occidental. [29–660–4]

CHIHUAHUA, a city in northern Mexico; capital of Chihuahua State. A major industrial, transportation, and commercial center of northern Mexico. Population, 364,000 (1975). Chihuahua is a railroad and highway junction. The city's main industry is nonferrous metallurgy, that is, the smelting of lead and other nonferrous metals. Chihuahua also has light industry, as well as food processing, chemical production, and metalworking. [29–660–5]

CHIHUAHUA, a breed of pet dog developed in the state of Chihuahua, Mexico. The Chihuahua is a small dog, standing 17–22 cm high. It is a delicate breed, with a long body, a rounded head, a small pointed muzzle, slightly bulging eyes, and large erect or pendant ears. The breed has two varieties: the long-coated, which has a long wavy coat with fringed ears, a ruff, and feathering on the legs, and the smooth-coated, which has a short, thick, shiny coat. Coat colors include brown, white, cream, black, and various shades of red. The Chihuahua is common throughout the world. [29–662–1]

CHIILI, an urban-type settlement and administrative center of Chiili Raion, Kzyl-Orda Oblast, Kazakh SSR. Chiili is a railroad station on the Kzyl-Orda–Arys' line, 128 km southeast of Kzyl-Orda. The settlement has a butter factory and enterprises serving railroad transportation. An experimental forestry station of the Kazakh Scientific Research Institute of Forestry and Land and Forest Reclamation is located in Chiili. [29–553–1]

CHII-SAN, a mountain massif in Korea constituting the southern end of the Sobaek Range. Chii-san measures approximately 50 km in length and rises to a maximum elevation of 1,915 m at the mountain Chii-san, the highest peak on the Korean peninsula. The slopes have deciduous (oak, ash) and mixed forests to an elevation of 1,400 m and coniferous forests (spruce, pine) at higher elevations. [29–616–2]

CHIK, an urban-type settlement in Kochenev Raion, Novosibirsk Oblast, RSFSR. Chik is situated on the Chik River (Ob' basin). It has a railroad station on the Barabinsk-Novosibirsk line, 30 km west of Novosibirsk. [29–553–3]

CHIKA (real name Ivan Nikiforovich Zarubin). Born 1736; died Jan. 24 (Feb. 4), 1775, in Ufa. Iaik cossack; associate of E. I. Pugachev.

Chika took part in the Iaik cossack uprising of 1772. During the Peasant War of 1773–75 under the leadership of E. I. Pugachev, Chika led the insurgent movement in the Central Urals, Bashkiria, and the Ural Region. A detachment led by Chika and A. A. Ovchinnikov routed the forces of General V. A. Kar on Nov. 7–9, 1773, and besieged Ufa in late 1773. After stubborn fighting against punitive troops, Chika's main forces were defeated near Ufa on Mar. 24, 1774, by a detachment under the command of Lieutenant Colonel I. I. Mikhel'son. On March 26, Chika was captured in Tabynsk as a result of treachery; during his interrogation he manifested unusual courage and steadfastness. Chika was executed in Ufa.

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[29–553–4]

CHIKHACHEV, PETR ALEKSANDROVICH. Born Aug. 16 (28), 1808, in Gatchina; died Oct. 1 (13), 1890, in Florence. Russian geographer and geologist. Honorary member of the Imperial St. Petersburg Academy of Sciences (1876) and of the Russian Geographical Society (1890).

Chikhachev spent most of his life outside Russia, mainly in Paris and Florence. As a result of his travels through Italy and southern France between 1839 and 1841, he compiled a geological map of the Italian Peninsula. In 1842 he journeyed through the Altai and Northwest China; in 1845 he used the information gathered during his travels to compile a geographic and geological description of the Altai, Northwest China, and the Kuznetsk Coal Basin. From 1847 to 1863, he undertook a number of expeditions through Asia Minor. In 1877 and 1878, he traveled through Spain, Algeria, and Tunisia.

Chikhachev's main works dealt with the geology and geography of Asia Minor, the Altai, Italy, southern France, Spain, Algeria, and Tunisia. Chikhachev wrote several works devoted to the political life and economy of the Ottoman Empire and to the policies of the European powers regarding the Eastern Question.

A range in the Altai is named after Chikhachev.

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Tsybul'skii, V. V. *P. A. Chikhachev—issledovatel', puteshestvennik*. Moscow, 1961. V. V. TSYBUL'SKII [29–661–3]

CHIKHACHEV BAY (until 1952, De-Kastri Gulf), an inlet of the Sea of Japan off the western coast of the Tatar Strait. Chikhachev Bay measures approximately 12.5 km in length and width at the entrance. It has depths to 9 m. The bay is covered with ice in winter; in summer the water temperature at the surface reaches 14°C. Tides are semidiurnal, with an approximate range of 1 m. The port of De-Kastri is situated on the bay. [29–661–4]

CHIKHACHEV RANGE, a mountain range in the southeastern Altai, in Altai Krai, Tuva ASSR, and also along the USSR-Mongolia border. The Chikhachev Range measures approximately 100 km in length and has elevations to 4,029 m. It is composed of sandstones, limestones, schists, and quartzites and has small glaciers. Grass and wormwood steppes and rocky tundras are found on the slopes. The range was named in honor of P. A. Chikhachev. [29–661–5]

CHIKOBAVA, ARNOL'D STEPANOVICH. Born Mar. 14 (26), 1898, in the village of Sachikobao, in what is now Tskhakaia

Raion. Soviet linguist. Academician of the Academy of Sciences of the Georgian SSR (1941).

Chikobava graduated in 1922 from the University of Tiflis, where he became a professor in 1933. His major works are devoted to general linguistics, the history and structure of the Caucasian languages, and ergative sentence construction. He compiled the *Chan-Mingrelian-Georgian Dictionary* (1938) and edited the *Defining Dictionary of the Georgian Language* (vols. 1–8, 1950–64) and numerous publications devoted to Caucasian studies. Chikobava has been awarded three Orders of Lenin and two other orders.

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CHIKOI, an urban-type settlement in Kiakhta Raion, Buriat ASSR. Chikoi is a landing on the left bank of the Chikoi River, 80 km southeast of the Naushki railroad station. It has a tannery. [29–564–2]

CHIKOI, a river in Chita Oblast, RSFSR, in the Buriat ASSR, and partially along the border of the Mongolian People's Republic; a right tributary of the Selenga River. The Chikoi is 769 km long and drains an area of 46,200 sq km. It rises on the eastern slope of the Chikokonskii Range and flows westward along the southern slope of the Malkhanskii Range; it divides into branches in the lower course. It is fed primarily by rain; freshets occur in summer and fall. The mean flow rate is 265 cu m per sec. The Chikoi freezes over in late October or November, freezing through in the shallows in the upper course; the ice breaks up in April or early May. The largest tributary on the left is the Menza. The Chikoi is used for irrigation. The health resort of Iamarovka is located in the Chikoi valley. [29–564–1]

CHIKOIDZE, MIKHAIL NIKOLAEVICH. Born 1853, in the village of Patara-Medzhruskhe, Tiflis Province; died Nov. 24 (Dec. 6), 1897, in Kurgan. Narodnik (Populist) revolutionary.

The son of a nobleman, Chikoidze entered the Mikhail Artillery School in 1872, but he fell ill and was unable to complete the course of study. In 1874 he went abroad. In Switzerland he joined the Georgian student organization known as the Kavkaztsy, one of whose founders was I. S. Dzhabadari.

In December 1874, Chikoidze returned to Russia, where he helped draft the charter of the All-Russian Social Revolutionary Organization. Arrested in Moscow on Apr. 4, 1875, he was a defendant in the Trial of the 50. He was exiled to Kirensk, in Irkutsk Province. In May 1881, Chikoidze escaped from his place of exile and joined the People's Will. He was arrested again in 1882, however, and was sentenced in December 1883 to three years at hard labor for having escaped from Kirensk. He served the sentence in the Kara Penal Colony. From 1885, Chikoidze was required to live in a remote area of the country.

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CHIKOLEV, VLADIMIR NIKOLAEVICH. Born July 23 (Aug. 4), 1845, in the village of Peski, Gzhatsk District, in what is now Smolensk Oblast; died Feb. 22 (Mar. 5), 1898, in St. Petersburg. Russian scientist, specialist in electrical engineering.

After graduating from Moscow University in 1867, Chikolev joined the staff of the Petrovskoe Farming and Forestry Academy (now called the K. A. Timiriazev Moscow Agricultural Academy). In 1870 he joined the faculty of the Moscow Technical School (now known as the Moscow Higher Technical School). He helped organize the Moscow Industrial Exhibition in 1872 and helped found the Polytechnical Museum. In 1876 he moved to St. Petersburg and joined the staff of the Main Artillery Directorate.

Chikolev was a founder of the electrical engineering section of the Russian Technical Society and became the first editor of the journal *Elektrichestvo* (Electricity). His main works dealt with illuminating engineering.

In 1869, Chikolev proposed for the first time that the principle of differential control be used in arc lamps. Subsequently, he developed a number of designs for differential regulators. The first industrial model of an arc lamp with a regulating mechanism powered by an electric motor appeared in 1877.

In 1876, Chikolev initiated a series of original studies in projector illumination. Between 1892 and 1895, the results of the studies were summarized in *The Illuminance of Electric Light Projectors*, which was written by Chikolev, V. A. Tiurin, and R. E. Klasson. Chikolev's original technique for plotting the luminous-intensity curve of a projector was first presented in the book. His technique was used to develop a theory of projector-beam analysis. Chikolev proposed a system for the "optical breakup of light" by means of tubular and plane mirrors.

In 1895 and 1896, Chikolev designed the lighting of the Liteinyi Bridge in St. Petersburg and, together with Klasson, modernized the lighting of the Okhta powder mill. Chikolev was one of the first to use electrical illumination for military purposes.

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G. K. Tsverava [29–564–3]

CHIKOVANI, GRIGOL SAMSONOVICH. Born Mar. 2 (15), 1910, in the village of Khobi, in what is now Khobi Raion, Georgian SSR. Soviet Georgian writer.

The son of a civil servant, Chikovani graduated from the department of law at the University of Tbilisi in 1936 and from the screenwriting department of the Moscow Institute of Cinematography in 1939. He was first published in 1932. During the Great Patriotic War of 1941–45, Chikovani wrote stories about the exploits of Soviet servicemen and workers. His most important postwar works are contained in the cycle *Odishi Stories*, in which critical social conflicts unfold against a background of the colorful Western Georgian landscape and sketches of peasant life. Chikovani proves himself a master of social satire in such works as the short story "Staircase." In his historical novel about revolution entitled *February Is Here* (1971; Russian translation, 1973), he describes the revolutionary struggle of Georgian workers under the leadership of the Bolsheviks. The novel is noteworthy for the profound historical knowledge it displays of the period. Chikovani has also written plays and screenplays.

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B. Zhgenti [29–562–2]

CHIKOVANI, MIKHAIL IASONOVICH. Born Mar. 25 (Apr. 7), 1909, in the village of Lechkhumi. Soviet Georgian folklorist and literary scholar. Doctor of philology (1945); Honored Scientist (1961).

Chikovani graduated from the University of Tiflis in 1932. In 1947 he published *Amirani Bound*, a study of the Georgian heroic epic *Amiraniani*. He has dealt with theoretical problems of folk poetry. In 1971 he published *Problems in Greek and Georgian Mythology*. Chikovani has also written textbooks for higher educational institutions.

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CHIKOVANI, SIMON IVANOVICH. Born Dec. 27, 1902 (Jan. 9, 1903), in the village of Naesakovo, in what is now Gegechkori Raion, Georgian SSR; died Apr. 24, 1966, in Tbilisi. Soviet Georgian poet. Member of the CPSU from 1941.

The descendant of a noble family, Chikovani was a student in the department of philology of the University of Tiflis. He was first published in 1924. After a period of experimentation, Chikovani turned to vivid and expressive forms of realistic writing in the 1930's. He became recognized as a master of gracefully constructed and picturesque images in such works as his cycles and verse collections *The Gates of Nature, Let Me Pass, Mountain*, and *Colchis Evenings* (1933.)

Chikovani's collection *Victory* (1942) comprises his poems from the war years. His lyrical epic poem *Song About David Guramishvili* (1942–46; State Prize of the USSR, 1947) is devoted to the age-old ties and historical sources of friendship and brotherhood between the Georgian, Russian, and Ukrainian peoples. In such works as the cycle *Giandzha Notebook*, which deals with the fate of N. Baratashvili, and the cycle *Autumn in Adzharia*, the poet expressed his philosophical and social optimism and his love of life in psychologically profound meditations and controlled yet passionately lyrical dramatic monologues. Chikovani also wrote critical works dealing with Georgian, Russian, Ukrainian, and Armenian literatures.

Chikovani was head of the Writers' Union of Georgia from 1944 to 1951, and he was a deputy to the third convocation of the Supreme Soviet of the USSR. Chikovani was awarded the Order of Lenin and three other orders as well as various medals.

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G. G. MARGVELASHVILI [29–563–2]

CHIKURACHKI, an active volcano on Paramushir in the Kuril Islands, USSR. It has an elevation of 1,816 m. The cherry red lava cone is situated in a volcanic chain system that was formed in the Pleistocene. The crater has a maximum diameter of 450 m. Thickets of dwarf alder (*Pinus alnifolia*) and dwarf stone pine (*Pinus pumila*) are found on the slopes. Chikurachki erupted between 1853 and 1859 and in 1958, 1961, 1964, and 1973.

[29–565–2]

CHILADZE, TAMAZ IVANOVICH. Born Mar. 5, 1931, in the city of Signakhi. Soviet Georgian writer. Member of the CPSU since 1967.

Chiladze graduated from the department of philology of the University of Tbilisi in 1954. He was first published in 1951. His works deal with contemporary problems, and his hero is usually a young man of the 1950's or 1960's seeking a place in life. Chiladze became editor of the journal *Sabchota khelovnebi* (Soviet Art) in 1973.

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CHILAIA, SERGEI EVSTAF'EVICH. Born Oct. 29 (Nov. 11), 1912, in the village of Sergieti, in what is now Gegechkori Raion. Soviet Georgian writer, critic, and literary scholar. Honored Scientist of the Georgian SSR (1971). Member of the CPSU since 1939.

The son of a peasant, Chilaia was first published in 1932. He was secretary of the Writers' Union of Georgia from 1951 to 1974. Chilaia's works deal with Georgian writers of the 19th and 20th centuries and the development of Soviet Georgian literature. He is the author of the chronicle-like novel *Ekaterina Chavchavadze* (parts 1–2, 1966–67; Russian translation, 1969). Chilaia has been awarded two orders and various medals.

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[29–565–4]

CHILD, CHARLES MANNING. Born Feb. 2, 1869, in Ypsilanti, Mich., died Dec. 19, 1954, in Palo Alto, Calif. American biologist.

Child graduated from Wesleyan University (Connecticut) in 1890. He worked at the University of Chicago from 1895 to 1934, receiving a professorship there in 1916. He became a professor at Stanford University (California) in 1937.

Child's work was primarily in cytology and embryology. His physiological gradient theory attempted to explain the process of embryonic development in vertebrates and the phenomena of differentiation and integration in developing multicellular animals. The theory maintains that the different parts of an elongated body (for example, that of flatworms) vary in metabolic rate and sensitivity to injurious agents, for example, oxygen insufficiency and poisons. As a result, physiological properties

gradually weaken or intensify from one end of the body to another or from an end of the body to the center. Child's theory accounts for objective phenomena but does not explain the individual development of the organism as a whole.

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CHILDE, VERE GORDON. Born Apr. 14, 1892, in Sydney, Australia; died Oct. 19, 1957. British archaeologist. Fellow of the British Academy (from 1940). Director of the Institute of Archaeology of the University of London (1946–56).

Childe conducted excavations in Scotland and Northern Ireland and on the Orkney Islands, at Skara Brae. His main works dealt with the prehistory of Europe and the East, in which, guided by the works of Soviet researchers, he proposed a materialistic basis for historical processes. He opposed the theory of migrationism, which explains changes in culture through migrations of peoples, advancing instead the theory of the independence of cultural development. Childe studied the origin and development of farming—the Neolithic revolution, the transition from the hunting and gathering economy of the Paleolithic to the producing economy of the Neolithic. Although he regarded the evolution of the economy as the primary factor in social progress, he reduced the problem of the rise of a state system to a question of the origin of cities (the urban revolution), not devoting proper attention to social relations.

Childe was accidentally killed in the mountains near Sydney.

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CHILE (República de Chile).

GENERAL INFORMATION
CONSTITUTION AND GOVERNMENT
NATURAL FEATURES
POPULATION
HISTORICAL SURVEY
POLITICAL PARTIES AND TRADE UNIONS
ECONOMIC GEOGRAPHY
ARMED FORCES
HEALTH AND SOCIAL WELFARE
EDUCATION
SCIENTIFIC INSTITUTIONS
PRESS, RADIO, AND TELEVISION
LITERATURE
ARCHITECTURE AND ART
MUSIC
DANCE AND BALLET
THEATER
MOTION PICTURES

General information

A state in the southwestern part of South America, Chile is bounded by Peru on the north, by Argentina and Bolivia on the east, and by the Pacific on the west. Its territory includes the coastal islands of the Chilean Archipelago (Chiloé, Wellington, Santa Inés), the western portion of the island of Tierra del Fuego, and the Pacific islands of San Ambrosio, San Félix, Juan Fernández, Sala-y-Gómez, and Easter Island. Area, 756,900 sq km (UN data). Population, 10.45 million (1976). The capital is Santiago. For administrative purposes, Chile is divided into 12 regions, which are subdivided into 40 provinces (see Table 1). Santiago and its suburbs constitute the 13th region.

Table 1. Administrative divisions of Chile (1977)

Regions	*Provinces*	*Provincial capitals*
First	Arica	Arica
	Iquique	Iquique
Second	Tocopilla	Tocopilla
	Antofagasta	Antofagasta
	El Loa	Calama
Third	Chañaral	Chañaral
	Copiapó	Copiapó
	Huasco	Valenar
Fourth	Elqui	La Serena
	Limarí	Ovalle
	Choapa	Illapel
Fifth	Valparaíso	Valparaíso
	San Antonio	San Antonio
	Quillota	Quillota
	Petorca	La Ligua
	San Felipe	San Felipe
	Los Andes	Los Andes
	Isla de Pascua	Hanga Roa
Sixth	Cachapoal	Rancagua
	Colchagua	San Fernando
Seventh	Curicó	Curicó
	Talca	Talca
	Linares	Linares
Eighth	Ñuble	Chillán
	Concepción	Concepción
	Arauco	Curanilahue
	Bío-Bío	Los Angeles
Ninth	Malleco	Angol
	Cautín	Temuco
Tenth	Valdivia	Valdivia
	Osorno	Osorno
	Llanquihue	Puerto Montt
	Chiloé	Castro
Eleventh	Aisén	Puerto Aisén
	General Carrera	Chile Chico
	Capitán Prat	Tortel
Twelfth	Ultima Esperanza	Puerto Natales
	Magallanes	Punta Arenas
	Tierra de Fuego	Porvenir
	Antárctica Chilena	Puerto Williams
Capital	Santiago	Santiago

Constitution and government

After the military coup of Sept. 11, 1973, a military fascist regime was established in the country that upheld the openly terroristic dictatorship of the big Chilean capitalists and the foreign monopolies allied with them. All democratic practices and the country's constitutional form of government were abolished. The state and the government are headed by a military junta composed of the commanders of the three branches of the armed forces and the *carabineros* (security forces). A decree issued on Dec. 17, 1974, made the head of the junta, General A. Pinochet Ugarte, president of the republic. Pinochet wields executive power, and the junta as a whole exercises legislative authority. Established in July 1976 as the highest advisory body to the president, the Council of State prepares recommendations on the more important political and economic problems.

Natural features

Chile stretches from north to south for a distance of 4,300 km, forming a narrow band 15 to 355 km wide between the Pacific coast and the high Andes Mountains.

Topography. There are three distinct north-south belts: the Principal Cordillera of the Andes in the east, the Coastal Cordillera in the west, and the intermontane depression known as the Longitudinal Valley. Over most of its length the Coastal Cordillera, with elevations of up to 3,200 m, drops sharply to a straight

abrasion coast indented with bays. South of 41° 30′ S lat. the mountains form a transition to the island of Chiloé and other islands of southern Chile. Lying at an elevation of 1,200 m in the north, in the Pampa del Tamarugal and Atacama Desert, the Longitudinal Valley gradually descends to the Ancud Gulf and then dips beneath the ocean, forming a system of straits.

Inasmuch as the national boundary generally follows the watershed, it is primarily the western slopes of the Principal Cordillera of the Andes that face Chile, soaring to 6,880 m on Mount Ojos del Salado. In northeastern Chile is found the southwestern continuation of the Central Andes high plateaus, descending to 2,000–3,500 m in the Puna de Atacama and framed on the west by the Cordillera Domeyko. The southern and southeastern parts of Chile are occupied by the eastern slopes of the Andes and sections of the Patagonia and Tierra del Fuego plains near the Strait of Magellan.

As far as 35°S lat. the Andes peaks, frequently exceeding 6,000 m, are for the most part the cones of extinct or active volcanoes (Guallatiri, San Pedro, Tupungato, Maipo). Further south, the elevation of the Andes decreases (Mount San Valentín, 4,058 m); volcanoes arise along the foot of the western slopes (a large number of active ones are found between 37° and 43°S lat.); and there is more glaciation. Southern Chile has a typically fjord coast. The entire country is subject to frequent earthquakes.

Geological structure and mineral resources. Chile lies within the Andes (Cordillera) geosynclinal belt, which has a basement of weakly metamorphosed Paleozoic rocks in the east and possibly late Precambrian and Paleozoic metamorphic rocks in the west. These rocks are overlain by Jurassic-Cretaceous sedimentary strata in the east and by andesites in the west, as well as by Cretaceous-Paleogene vulcanites. Cretaceous-Paleogene granitoids are also widely found. Pliocene-Quaternary volcanoes crown the mountain ranges in the east. The Patagonian Andes, composed of Late Jurassic and Early Cretaceous spilite-diabase and flysch strata and late Cretaceous-Paleogene molasse, differ from the Central Andes in their more complex structure, marked by folds thrust over the slightly deformed strata of the Magallanes Foredeep.

Chile is rich in many kinds of minerals. Its copper reserves, estimated at 94 million tons, and its saltpeter reserves are the largest in the capitalist world. Moreover, it ranks second in molybdenum reserves (2 million tons) and third in native sulfur reserves (100 million tons). The country has deposits of iron, manganese, lead, zinc, barite, and other ores, as well as petroleum, natural gas, and coal. Among the ore deposits are the world's largest porphyry copper deposits (Chuquicamata, El Salvador, and El Teniente), associated with a Cretaceous-Paleogene volcanic-plutonic complex. In processing the copper ores, significant quantities of molybdenum, silver, gold, and rare and trace elements are obtained. Deposits of saltpeter (chiefly sodium nitrate), salt, gypsum, and borates are found in the salt flats (*salares*) of the Longitudinal Valley. Sulfur deposits, volcanic in origin, are found at El Tacora, Concola, and other places along the Bolivian and Argentine border. Deposits of petroleum and natural gas are associated with the late Jurassic deposits of the Magallanes Foredeep (Tierra del Fuego).

Climate. North Chile, down to 28° S lat., has a tropical desert climate. The precipitation averages less than 50 mm of rain annually, and some places receive no rainfall for several consecutive years. Washed by the cold Peru Current, the northern coast is marked by considerable relative humidity, cloudiness in winter and spring, heavy fogs and mists (*camanchaca* and *garúa*), and average monthly temperatures ranging from 12°–16° to 18°–22°C. In the Atacama Desert the average monthly temperature varies from 11°–15° to 21°–23°C, and in the Puna de Atacama (at an elevation of 3,700 m) the temperature range is 2°–10°C; in both areas daily temperatures fluctuate by as much as 25°C, and the humidity falls to 30 percent.

In subtropical Central Chile (as far as 42° S lat.) the northern regions (to 32° S lat.) have a dry climate with an annual precipitation of 100–200 mm; the central parts (to 38° S lat.) have a Mediterranean climate with winter rains (351 mm annually in Santiago); and the southern regions have a humid subtropical climate with an annual precipitation of 2,000–2,500 mm. Correspondingly, the average monthly temperatures in the northern parts of Central Chile range from 12°–16°C in July to 18°–22°C in January; in the central regions they range seasonally, from 8° to 20°C in Santiago and from 11.4° to 17.8°C on the coast in Valparaíso; and in the southern areas they vary from 8° to 15°C.

South Chile has a temperate maritime climate with heavy rainfall. The western slopes of the Andes receive as much as 3,000–7,000 mm annually, brought by cyclones and westerly winds. Temperatures are relatively low and even, varying from 3°–5° to 8°–14°C. In the eastern plains the temperature ranges are somewhat greater, and the amount of precipitation decreases toward the Atlantic Ocean to a minimum of 250 mm a year.

Rivers and lakes. Almost all the country's rivers are short and drain into the Pacific Ocean. Except for the Loa River, North Chile has no permanent streams or drainage into the ocean. In the depressions of the Puna de Atacama there are large salt flats (*salares*). Among the largest of Central Chile's many rivers are the Huasco, Limarí, and Maule. Whereas the rivers in the northern part of Central Chile have winter high water, the rivers of the central regions have two high-water periods, one in winter (rains) and the other in summer (melting snow and ice). In the southern parts of Central Chile and in South Chile the rivers are high throughout the year; the largest rivers here are the Bío-Bío and the Baker. South of 39° S lat. there are many large, primarily terminal glacial lakes (Ranco, Llanquihue), including the western portions of several Patagonian lakes (Buenos Aires, San Martín). Only the lower reaches of the rivers in the southern part of Central Chile and the large lakes are navigable.

Largely owing to the increased precipitation as one moves southward, the snow line descends abruptly from 6,000 m to 500 m, and below 46° 30′ S lat. the glaciers reach sea level. Two ice fields covering 15,000 sq km lie between 46° 30′ and 51° 30′.

Soils and flora. In North Chile a soil and vegetative cover scarcely exists except along the coast, where a characteristic desert formation called *lomas* appears during periods of heavy fog. In Central Chile the northern regions are semideserts. The central regions support xerophytic scrub (*matorrales, espinales*), growing on gray and cinnamon-colored or cinnamon-colored soils; on the middle slopes of the Andes there are beech forests (*Nothofagus oblequa*), yielding at higher elevations to mountain steppes. In the Longitudinal Valley, with its pockets of vertisols (dark soils with faint horizonation), the natural vegetation has not survived. In the southern part of Central Chile dense rain forests (*hemihylaea*) grow on brown forest volcanic (*andosols, trumao*) and marshy soils; here the Andes are clothed with beech and coniferous forests and alpine meadows. South of 46° S lat. there are sub-Antarctic mixed forests. On the eastern plains are found steppes with chernozem-like chestnut soils, and the extreme south is covered with meadows and peat bogs.

Fauna. The deserts of North Chile are inhabited by *aguarachay* foxes, pumas, and reptiles. In South Chile there are pudu and guemal deer, skunks, otters, nutrias, and culpeo foxes, as well as many birds. Typical Patagonian species include guanacos, rodents, and ostriches.

Preserves. Wilflife and flora are protected in the Villarrica, Los Paraguas, Pérez Rosales, Puyehue, and Juan Fernández national parks and in the Nahuelbuta Preserve.

E. N. LUKASHOVA (physical geography)
and V. D. CHEKHOVICH (geological structure
and mineral resources)

Population

More than 90 percent of Chile's population is composed of Chileans, most of them mestizos of Spanish and Indian descent. The Indian population comprises Araucanians (Mapuche), inhabiting the central part of the country, small groups of Quechua and Aymara in the north, and Fuegians in the extreme south. Easter Island is settled by Polynesians (Rapanui). Spanish is the official language, and most of the population is Roman Catholic, although the Indians have to some extent preserved their languages and traditional beliefs. The official calendar is the Gregorian.

Between 1971 and 1976 the population grew at an average annual rate of 1.8 percent. In 1970 the country's work force totaled 3.3 million persons, of whom 21 percent were engaged in agricul-

ture, lumbering, fishing, and hunting (compared to 28 percent in 1960), 16 percent were employed in manufacturing (18 percent), 3 percent worked in the mining industry (4 percent), 6 percent were employed in transportation (5 percent), and 54 percent worked in the service sector (45 percent), including trade (12 percent, up from 10 percent in 1960). The average population density is approximately 14 persons per sq km (1976), but the overall distribution is extremely uneven. More than 50 percent of the population lives in the central provinces, where the density reaches 180 persons per sq km. The most sparsely settled are the southern provinces, with less than one person per sq km. The northern provinces average two to three persons per sq km. Urban dwellers account for 80.5 percent of the population (1975); 75 percent of them live in the central regions. The cities with populations of more than 100,000 (1976) are Santiago (3.4 million; the metropolitan area accounts for about 30 percent of the country's population), Valparaíso, Viña del Mar, Concepción, Talcahuano, Antofagasta, and Temuco.

Historical survey

Precolonial period (to the early 16th century). From remote times Chile was inhabited by Indian tribes, notably the Araucanians, Aymara, Chon, Chango, and Atacameño. The Chon and the Chango were essentially fishermen and hunters; the Atacameño herded llamas and alpacas, raised crops using irrigation, and worked gold, silver, and copper; and the Araucanians cultivated potatoes and corn and raised sheep. The tribes inhabiting northern Chile were subjugated by the Incas in the 15th century. By the beginning of the 16th century the indigenous peoples were organized into clans whose members owned land in common. Among the Araucanians, the most advanced and warlike of the Chilean tribes, a matriarchal clan system was giving way to a patriarchal one. The total Indian population numbered about 1 million.

Spanish colonial rule (16th to early 19th centuries). During the 1530's Chile was invaded by Spanish conquistadors. Under the leadership of D. de Almagro and P. de Valdivia the conquerors dealt cruelly with the indigenous population. The Araucanians put up a stiff resistance, inflicting a resounding defeat on the colonialists in 1553. Subsequently, there were many Araucanian uprisings, the largest ones occurring in 1571, 1655, and 1723. In the mid-16th century Chile was included in the Viceroyalty of Peru, and in 1778 it was designated a separate captaincy general.

The Spanish colonialists introduced such forms of feudal exploitation as the *encomienda* and the *repartimiento*, distributing the land together with the Indians living on it and using Indian labor in farming and in mining gold, silver, and copper. In the mid-16th century the Spaniards founded several towns, among them Santiago (1541), Concepción (1550), and Valdivia (1552). Livestock raising developed, and artisan workshops and manufacturers (*see* MANUFACTURE) were established. To prevent competition with the motherland, however, the Spanish authorities restrained the development of Chile's economy. It was not until the end of the 18th century that Chile was permitted to trade with Spain and its colonies. The creole bourgeoisie, demanding greater liberty, began to oppose colonial domination. The struggle for independence, which gathered momentum under the influence of the victory of the French Revolution, was led by J. A. Rojas, M. de Salas, and B. O'Higgins.

War of Independence (1810–18). The outbreak of a popular uprising against Spanish colonial oppression in Santiago in July 1810 was followed by the formation of a national governing junta on September 18, subsequently celebrated as National Independence Day. In 1811 a national congress was established, but inasmuch as it was dominated by pro-Spanish elements, J. M. Carrera, one of the leaders of the War of Independence, dissolved the congress and took control of the government, instituting measures to strengthen the country's independence. Nevertheless, Carrera's dictatorial regime provoked feuding that weakened the patriots' camp. The liberation army was defeated by Spanish troops, and after the battle of Rancagua (October 1814) the patriots had to flee to Argentina. A new phase of the liberation struggle began in 1817. Led by O'Higgins, the commander in chief of the patriots, and supported by the army of the Argentine general J. San Martín, the Chileans defeated the Spaniards at the battle of Chacabuco (February 1817) and entered Santiago. O'Higgins became the supreme ruler of Chile. The country's independence was proclaimed on Feb. 12, 1818, and achieved after the battle of Maipú (Apr. 5, 1818).

The development of an independent Chilean state (1818–1917). Under the constitution adopted in 1818, a republican form of government was established. The constitution guaranteed bourgeois liberties and placed all executive power in the hands of O'Higgins, the supreme ruler. Chile established diplomatic relations with other countries. In 1822, Great Britain granted Chile a loan of 5 million pesos, thereby inaugurating the flow of British capital into the Chilean economy and strengthening British influence on the country's political life. O'Higgins' struggle against the privileges of the landed oligarchy and the Catholic Church, along with his efforts to implement progressive reforms and restrict the church's influence, provoked dissatisfaction among the feudal-clerical circles. The promulgation of a new constitution in October 1822, aimed at democratizing the political system and limiting the privileges of the aristocracy, exacerbated the tense situation. Under pressure from the reactionary forces, O'Higgins resigned and emigrated.

General R. Freire, who became president in 1823, sought to continue O'Higgins' policies. The ensuing struggle for power among the various factions culminated in 1830 in the victory of the Conservatives, who represented the interests of the landowning oligarchy and the church and who relied on the support of foreign capitalists. The Constitution of 1833 strengthened the Conservatives, who remained in power until 1875. During the 1830's and 1840's many new domestic and foreign enterprises were founded. With the expansion of crafts and industry, chiefly mining, the number of workers increased. The second half of the 19th century saw an awakening of class consciousness among the workers, who began to resort to organized struggle. Marxism attracted a large following, and the first workers' newspaper, *El proletario*, began publication in 1875.

In 1879, Great Britain incited Chile to declare war on Peru and Bolivia in order to appropriate the large deposits of saltpeter on their territory. As a result of the War of the Pacific (1879–83), the Peruvian province of Tarapacá and the Bolivian province of Antofagasta were ceded to Chile. The seizure of the saltpeter deposits gave impetus to the development of capitalism in Chile and accelerated the inflow of British capital. The accession to power in 1886 of the Liberal J. M. Balmaceda—an advocate of independent economic and political development—was unpalatable to the oligarchy, which was supported by the foreign monopolies, the church, and the upper ranks of the military. After losing the civil war unleashed by his opponents, Balmaceda resigned as president in 1891. Power passed to the financial and landowning elite, which facilitated the country's subjugation to British capital and, from the early 20th century, to US capital.

The miserable living conditions of the workers gave rise to a strike movement that reached its peak between 1905 and 1907 in the towns of Iquique, Antofagasta, and Concepción. The working class became more organized: the Chilean Workers' Federation was founded in 1909 and the Socialist Workers' Party in 1912. During World War I, in which Chile remained neutral, US monopolies increased their investments in Chile's industry, particularly its copper industry, thereby strengthening their economic and political influence in the country.

Since 1918. After the war, a decline in saltpeter mining and the deterioration of the country's economy gave fresh impetus to the struggle of the toiling masses, who were certainly influenced by the October Socialist Revolution in Russia. In 1922 the Socialist Workers' Party was transformed into the Communist Party of Chile. The mid-1920's were marked by political instability. In September 1924 the government of A. Alessandri Palma was overthrown by a military junta, and in January 1925 military men led by C. Ibáñez del Campo staged another coup. The constitution that was adopted in September 1925 reflected a political alliance between the big bourgeoisie and the landed oligarchy against the working class and the toiling masses. In 1927, Ibáñez, now the defense minister, ousted the president and established a dictatorship. The Communist Party, the Workers' Federation, and the country's anarchosyndicalist organizations were outlawed.

In the early 1930's there were demonstrations protesting against the dictatorship. A mutiny in the navy in 1931 was followed in June 1932 by a military coup led by Colonel M. Grove Vallejo, who proclaimed Chile a "socialist republic." Councils of workers' and soldiers' deputies were formed in a number of cities. Yet another military putsch soon toppled the republic. In October 1932, Alessandri returned to power and pursued a policy of strengthening the position of foreign capital.

In March 1936 a Popular Front was created by the Communist, Radical, and Socialist parties. The 1938 presidential election was won by the Popular Front candidate, the radical P. Aguirre Cerda, whose government promulgated some progressive measures, notably a labor law and a law providing bank credit for peasants, but under pressure from the reactionaries it backed away from agrarian reform. The treachery of right-wing socialists caused the Popular Front to collapse in 1941. On the initiative of the Communist Party, the Democratic Alliance, a coalition of the Communist, Radical, and Democratic parties, was formed in 1942. Chile did not take part in World War II, although it declared war on Germany in February 1945 and on Japan two months later.

In 1946 the presidency was won by the Radical G. González Videla, the candidate of the Democratic Alliance, who included Communists in his government. However, with the onset of the cold war, unleashed by US reactionary circles, González Videla in 1947 expelled the Communists from his government and broke off diplomatic relations with the USSR, established in 1944. In 1948 the national Congress adopted a "law for the defense of democracy," banning the Communist Party, progressive trade unions, and other democratic organizations. US monopolies came to dominate the Chilean economy.

On the Communists' initiative the People's Front was founded in 1951, the Single Center of Chilean Workers in 1953, and the Popular Action Front (FRAP) in 1956. The FRAP coalition included not only Communists and Socialists but members of other parties as well. The strike movement that developed in 1954–55 encompassed more than 1 million persons. Under pressure from the growing FRAP movement, the law for the defense of democracy was repealed in 1958, and the Communist Party was legalized. In the 1958 presidential elections the FRAP candidate, the Socialist S. Allende Gossens, received only 30,000 votes less than the candidate of the right-wing forces and the puppet of big capital, J. Alessandri. The Alessandri government (1958–64) pursued a policy of involving the country in the plots of foreign capitalists and suppressing the labor movement.

On coming to power in 1964, E. Frei Montalva, the leader of the right wing of the Christian Democratic Party, resumed diplomatic relations with the USSR (1964) and announced a national reformist program of "revolution in liberty," providing for a number of bourgeois democratic reforms. However, the government's "Chileanization" of copper through the gradual buying up of the stock owned by American monopolies did not limit the profits of the US companies. The agrarian reform announced in 1967 was carried out extremely slowly. All this provoked discontent among the masses and strengthened the influence of the Communist Party and the FRAP.

In December 1969 the Communist, Socialist, Social Democratic, and Radical parties, the Movement for United Popular Action (MAPU), and the Independent Popular Action formed the coalition known as Unidad Popular (Popular Unity), which on the eve of the 1970 presidential elections put forward a program of radical social and economic change. The victory of the Unidad Popular candidate, S. Allende, led to the creation in November 1970 of a popular government that included representatives of all the coalition parties. The Allende government introduced far-reaching anti-imperialist and anti-oligarchic reforms; copper mines belonging to US monopolies were nationalized, restrictions were placed on the activity of the Chilean industrial, landowning, and financial oligarchy, and an agrarian reform was carried out that effectively abolished the latifundia system. Measures were adopted to raise the living conditions of workers and office employees, to improve the pension system, and to stimulate housing construction.

The Allende government strongly advocated peace and international security, supported peaceful coexistence and the cooperation of states with different social systems, and opposed colonialism and neo-colonialism. Chile's ties with the Soviet Union and other socialist countries changed materially. The government revived diplomatic relations with Cuba and established diplomatic relations with other socialist countries. The revolutionary process encountered fierce opposition from domestic reactionaries, supported by foreign imperialism: the government's efforts were deliberately undermined, economic difficulties were artificially created, and acts of terrorism and sabotage were carried out.

In September 1973 the popular government was overthrown by a military revolt planned by domestic and foreign reactionaries. President Allende was killed during an attack on the presidential palace. A military-fascist junta headed by the army commander General A. Pinochet Ugarte came to power. The junta suspended the constitution, dissolved the National Congress, and banned all political parties and mass organizations. In the subsequent reign of terror unleashed by the junta some 30,000 Chilean patriots perished in the junta's torture chambers, and another 2,500 persons "disappeared." The junta nullified the economic gains of the people, returning the land to the *latifundistas* and enterprises to their former owners and paying compensation to foreign monopolies. Diplomatic relations with thé USSR and other socialist countries were broken off. In December 1974, A. Pinochet was proclaimed president of Chile.

The junta's antinational and antipopular policies caused an abrupt deterioration of the situation in the country, the impoverishment of the working people, and a considerable rise in the cost of living. By 1976 about 20 percent of the work force was unemployed. In order to prop up the military fascist regime, the USA (and the international economic organizations associated with it) granted Chile loans and credits amounting to some $2.5 billion. Despite this assistance, Chile's financial situation has remained precarious. The junta is militarizing the economy and strengthening the country's ties with the imperialist states. In foreign policy the military fascist government is guided by the USA. In 1979 a number of trade union federations resumed their activities under government control. In 1980, the constitution, approved by referendum, confirmed Pinochet's presidency to the end of the 20th century.

Chilean patriots continue to resist the reactionary regime. The Communist Party has appealed to all the country's democratic, antifascist forces to unite firmly and broaden the struggle to overthrow the Pinochet dictatorship. The junta's domestic isolation has been reinforced by international isolation.

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Political parties and trade unions

All the parties that belonged to the Unidad Popular coalition prior to the 1973 coup have been outlawed, notably the Radical

Party of Chile (Partido Radical de Chile), formed at the end of the 1850's and officially founded in 1883; the Socialist Party of Chile (Partido Socialista de Chile), established in 1933; the Communist Party of Chile (Partido Comunista de Chile), founded in 1922; and the Movement for United Popular Action (Movimiento de Acción Popular Unitaria), organized in 1969. All these parties now operate under illegal conditions. The Christian Democratic Party (Partido Demócrata Cristiano), a bourgeois-reformist party founded in 1957, has been indefinitely suspended by the junta. Since January 1977 limited activity has been permitted to the National Party (Partido Nacional), which was created in 1966 through a merger of the Conservative and Liberal parties and which drew its support from the landowning and financial-industrial oligarchy.

The Single Center of Chilean Workers (Central Unica de Trabajandores de Chile), founded in 1953, has been banned but continues to operate illegally.

Economic geography

General characteristics. Economically, Chile is one of the relatively well-developed countries of Latin America. A large role in the economy is played by foreign, chiefly US, capital, the investment of which has been especially encouraged since the military junta seized power in 1973. The leading branch of the economy is industry, whose most highly developed sectors are mining and nonferrous metallurgy, both export oriented. In 1976, Chile ranked first in the capitalist world in the mining and export of saltpeter, second (after the USA) in the production and export of copper, and third (after the USA and Canada) in the output and export of molybdenum. In 1975 the per capita gross national product amounted to $691 (in current prices), putting Chile in tenth place among the Latin American countries. In 1974 agriculture, lumbering, fishing, and hunting accounted for 6.9 percent of the GNP, the mining industry for 13.5 percent, manufacturing for 29.2 percent, and construction for 3.9 percent.

During the years when the Unidad Popular government was in power the state sector in industry was strengthened, a radical agrarian reform was promulgated, and cooperation with the socialist countries was expanded. By September 1973 more than 500 state-owned or state-controlled enterprises were providing about 50 percent of the total industrial output. Moreover, the state owned 85 percent of the rail network, as well as most of the air and maritime transport facilities. Some 3,500 large estates, totaling 5.4 million hectares (ha), were expropriated and distributed among the landless and land-poor peasants. About 70 percent of foreign trade operations were under state control.

Since the military junta has taken power there has been a sharp decline in industrial production, chiefly in consumer goods. The slowdown has affected small-scale and artisan industries, as well as large enterprises. In 1977 only 23 industrial enterprises remained under state management. Approximately 3 million ha of land have been returned to the large landowners, for the most part in provinces with fertile soils. A law enacted in 1974 gave foreign monopolies the right to import capital and transfer profits abroad without any restrictions. At the end of 1973 foreign private capital investments amounted to $1.2 billion. The workers' share in the national income fell from 65 percent in 1972 to 35 percent in 1974. In 1975 the country was struck by a severe economic crisis. The workers' standard of living declined, the GNP was reduced by 13 percent, and the output of consumer goods and food crops fell sharply.

Industry. An important branch of industry, mining is dominated by foreign companies, who own almost all the mining enterprises. Although the copper mines are still owned by the state, they are worked and managed by US monopolies. The state oil company ENAP is responsible for the exploration, extraction, and refining of petroleum. The export-oriented copper industry accounts for more than 80 percent of the country's metallic mineral output. Iron ore mining ranks second in both production and export. The largest copper-molybdenum mines are Chuquicamata in El Loa Province, El Salvador in Chañaral Province, and El Teniente in Cachapoal Province; together with the Rio Blanco and Exótica mines in Santiago Province, these three deposits yield 85 percent of Chile's copper output. The largest iron mines are El Romeral in Elqui Province and Algarrobo and Boquerón Chañar in Huasco Province.

Chile's saltpeter deposits, the world's largest, are located in the north, in the western part of the Atacama Desert. The largest output comes from the María Elena and Pedro de Valdivia mines in Tocopilla Province. In the early 20th century Chile's saltpeter mines supplied almost three-fourths of the world demand for nitrogen fertilizers. Owing to the increased production of cheap artificial nitrogen fertilizers, by the early 1960's saltpeter production had fallen to almost one-fourth of the 1929 output.

Petroleum and gas exploitation is carried out by ENAP in the southern part of the country—on Tierra del Fuego and along the northern coast of the Magellan Strait. Most of the coal mines are found around Lota and Coronel in Concepción Province. In 1975, the country's electric power plants had an installed capacity of 2.6 gigawatts, with hydroelectric power plants accounting for 1.5 gigawatts. Hydroelectric power plants supplied 70 percent of the electricity generated in 1975. The largest hydroelectric power plant (capacity, 350 megawatts) is located at Rapel, and the largest thermoelectric power plant (170 megawatts) operates at Tocopilla.

Chile's manufacturing industry, ranking fifth in Latin America in production volume, is dominated by branches producing consumer goods. The food-processing, textile, and leather-footwear branches account for two-thirds of the employees and three-fifths of the output, by value, of the manufacturing industry. Small enterprises, most of them artisan workshops, employ 50 percent of the manufacturing work force and contribute about 30 percent of the output by value. Large factories and plants, constituting 3 percent of the total number of enterprises, provide 59 percent of the value of the industrial output and employ 44 percent of the workers in manufacturing. After World War II manufacturing expanded rapidly, notably ferrous and nonferrous metallurgy, chemicals, metalworking, and the paper and pulp industry.

Nonferrous metallurgy works are found in Chuquicamata, Paipote, Potrerillos, Las Ventanas, Chagres, and Coletones, and there are machine-building and metalworking enterprises in Santiago, Valparaíso, Concepción, Arica, and Talcahuano. Most of the output of the copper-ore and copper-smelting industry is exported; in 1974 such exports totaled 702,000 tons of blister and refined copper and 156,000 tons of copper concentrates. A ferrous metallurgy works has been built at Huachipato in Concepción Province. Petroleum refineries and petrochemical plants are located for the most part in Concepción, Concón, and Manantiales, and the chemical industry is largely confined to Valparaíso, Santiago, and Antofagasta. Textiles are manufactured in Valparaíso, Santiago, and Concepción and leather footwear in Valparaíso and Santiago. Food-processing enterprises, found in almost all cities, are especially numerous in Santiago, Valparaíso, and Valdivia. About 80 percent of the country's industrial output comes from enterprises in the provinces of Santiago, Valparaíso, and Concepción; more than 50 percent of these enterprises are in the city of Santiago. See Table 2 for the output of the major industrial products.

Table 2. Output of leading industrial products
(thousand tons)

	1950	1960	1976
Copper ore[1]	363	532	1,005
Refined copper	156	147	571
Iron ore	2,953	6,041	10,380
Molybdenum ore[1]	—	1.8	9.8[2]
Saltpeter	1,607	930	726[2]
Iodine	0.5	1.8	2[2]
Petroleum	82	943	1,092
Hard coal	1,993	1,297	1,199
Electric power (million kW-hrs)	2,943	4,592	9,432
Steel	85	450	508
Cast iron and ferroalloys	110	266	400
Cement	513	835	963
Paper	41	92	243
White sugar	5[3]	73	210

[1]Metal content [2]1975 [3]1953

Table 3. Sown area and yield of chief crops

	Area (hectares)			Yield (tons)		
	1961-65[1]	1970	1976	1961-65[1]	1970	1976
Wheat	753,000	740,000	698,000	1,082,000	1,307,000	850,000
Corn	86,000	74,000	107,000	204,000	239,000	273,000
Oats	77,000	73,000	65,000	89,000	111,000	77,000
Barley	41,000	47,000	56,000	74,000	97,000	78,000
Rice	31,000	25,000	23,000[2]	85,000	76,000	76,000[2]
Sugar beets	15,000	42,000	42,000[2]	543,000	1,655,000	1,617,000[2]
Rape	42,000	54,000	60,000	48,000	70,000	64,000
Potatoes	90,000	72,000	95,000	793,000	684,000	725,000

[1]Annual average [2]1975

Agriculture. Of Chile's 17.3 million hectares (ha) of agricultural land, 5.7 million ha are arable land and 11.6 million ha are meadows and pastures (1974). Some 1.2 million ha are irrigated. Crop farming contributes about 60 percent of the value of agricultural output, and livestock raising, about 40 percent. The principal crop-growing areas are the slopes of the Coastal Cordillera and the Longitudinal Valley in Central Chile. The chief crops are wheat, corn, barley, oats, potatoes, sugar beets, rice, and rape. Rye, beans, sunflowers, and flax are also cultivated. (See Table 3 for the sown area and yield of the principal crops.) Orchards (apples, citrus fruits, peaches) and vineyards are also found, primarily in Central Chile, from Santiago Province to Linares Province.

Livestock raising, extensive rather than intensive, is carried on throughout the country. In 1975 the livestock numbered 3.6 million head of cattle, 5.9 million sheep, 800,000 goats, and 900,000 pigs. Cattle are raised primarily in Central Chile and sheep in the south. Dairy farming is thriving around the major cities. In 1976 raw wool production amounted to 19,200 tons.

Chile's timber reserves are estimated at 1.2 billion cu m. Some 8.2 million cu m of round timber, chiefly coniferous, were produced in 1975.

The country's fish catch of 1.1 million tons in 1975 was exceeded only by that of Peru in Latin America. Crabs, lobsters, and shellfish are also caught.

Transportation. Motor vehicles are the chief means of transport within the country. Of the roughly 92,000 km of roads, 11,000 km are paved and 25,400 km have a gravel surface (1974). The railroad network totals 9,800 km. The main railroad, running from Pisagua in the north to Puerto Montt in the south, has branch lines to seaports and mineral deposits. At the end of 1975 the country had 393,000 motor vehicles, including 236,800 passenger cars. Some 90 percent of all foreign trade cargo is handled by maritime shipping. The merchant marine, ships exceeding 100 gross registered tons, totaled 459,000 gross registered tons in 1975. The 1972 cargo turnover of the largest ports (in million tons) was as follows: Huasco (4.2), Valparaíso (4), Caldera (1.4), Coquimbo (1.3), and Tocopilla (1). Other major ports are Talcahuano and Chañaral. Air transport is well developed.

Foreign trade. In 1974, Chile's exports totaled $2.481 billion and its imports, $1.910 billion. Copper accounted for 71.7 percent of the total value of 1974 exports, iron ore for 5.3 percent, saltpeter and iodine for 2.2 percent, pulp and paper for 4.4 percent, and agricultural and fishery products for 4.2 percent. The leading imports in 1974 were foodstuffs (33.1 percent of the total value of imports), machinery and transport equipment (23 percent), fuel (14.3 percent), and chemical products (11.8 percent). Chile's principal trading partners are Japan (accounting for 11.2 percent of its exports and 3.7 percent of its imports), the Federal Republic of Germany (14.4 percent and 7.1 percent), the USA (8.8 percent and 29.2 percent), Great Britain (8.2 percent and 2.8 percent), Argentina (6.8 percent and 17 percent, in 1974), Brazil (5.8 percent and 4.3 percent), Italy (6.5 percent of exports), and Ecuador (4 percent of imports). The monetary unit is the peso, whose value has been falling; the exchange rate was US $1 = 6.4 pesos on Sept. 30, 1975, and US $1 = 19.82 pesos on May 31, 1977.

Economic regions. The Northern Economic Region, encompassing the First through Fourth regions, is a mining region producing copper, iron ore, and saltpeter. Agriculture is confined to the oases. Most of the agricultural output is provided by the region's southern provinces, where wheat, corn, vegetables, grapes, hemp, and tobacco are grown. Most of the country's llamas and alpacas are raised in the provinces of Arica and Iquique.

The Central Economic Region, comprising the Fifth, Sixth, and Seventh regions and Nüble and Concepción provinces in the Eighth Region, is the most highly developed economic region and the principal manufacturing and agricultural region. The leading branches of industry—food processing, textiles, clothing and footwear, and chemicals—are concentrated in Santiago, Valparaíso, and Concepción provinces. Farming is oriented toward grain growing and beef and dairy cattle raising. A substantial area is planted to orchards (plums, cherries, peaches, citrus fruits) and vineyards. Dry farming is done on the slopes of the Coastal Cordillera, and irrigation is used in the Longitudinal Valley and the river basins. The economic region produces all of the country's rice, 85 percent of its corn, 75 percent of its barley, 50 percent of its wheat, and 40 percent of its potatoes.

The agricultural South-Central Economic Region includes Arauco and Bío-Bío provinces of the Eighth Region and the Ninth and Tenth regions, excluding Chiloé Province. The main economic activities are livestock raising for meat and milk and the cultivation of grain crops. The region accounts for 60 percent of the country's cattle, 55 percent of the pigs, 30 percent of the goats, 45 percent of the wheat harvest, 85 percent of the rye, and more than 90 percent of the rape. The principal branches of industry are food processing, paper and pulp production, and coal mining.

The Southern Economic Region, consisting of the Eleventh and Twelfth regions and Chiloé Province, is an underdeveloped agricultural region. Sheep raising, the main branch of agriculture, accounts for about 70 percent of the total head of sheep in the country. The major industries are petroleum and natural gas extraction, food processing (chiefly fish), and woodworking.

Table 4. Basic indexes of economic regions (1970)
(percent)

	Northern	Central	South-Central	Southern
Area	40	14	13	33
Population	10	70	17	3
Value of GNP	17	70	10	3
Value of mining output	68	25	1	6
Value of manufacturing output	6	85	8	1
Value of agricultural output	5	55	30	10

(See Table 4 for the basic indexes of these regions.)

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La economica chilena en 1972. Santiago, 1973. M. S. NIKITIN

Armed forces

Chile's armed forces consist of an army, an air force, and a navy, totaling more than 85,000 men in 1978. The supreme commander in chief is the president, and the military junta exercises direct leadership. There are also internal security forces, the Carabineros, numbering 30,000 men. The armed forces are recruited by conscription, and the term of active military service is 12 months. Officers are trained at various military schools, in three academies (one for each branch of the armed forces), and at a military polytechnical academy. The army of about 50,000 men is organized into five infantry divisions, two tank regiments, three cavalry regiments, one airborne regiment, and several antiaircraft and service units. The air force of 11,000 men is equipped with 50 combat, 60 transport, and about 75 training aircraft, as well as 30 helicopters. The navy of about 24,000 men (3,800 marines) has three cruisers, 12 destroyers, six submarines, two frigates, four torpedo boats, six patrol boats, and six landing craft. Naval subdivisions include an air force of about 20 airplanes and ten helicopters, a marine brigade, and a coastal artillery. The armaments are mainly of US manufacture.

Health and social welfare

In 1974 the country had a birth rate of 25.4 and a mortality rate of 7.4 per 1,000 inhabitants. Infant mortality was 63.3 per 1,000 live births. The average life expectancy was 62.6 years.

There is a high incidence of infectious and cardiovascular diseases and malignant tumors. Among the more common infectious or parasitic diseases are children's infections, syphilis, gastrointestinal infectious diseases, infectious hepatitis, and helminthiases.

The central public health agency is the Ministry of Health. The new National Health Service, introduced in 1975, has reduced the number of people eligible to receive state medical care. About 70 percent of the population is not covered, including industrial workers, peasants, members of their families, and children under 15 years of age. Private practice is on the rise.

In 1974 there were 295 hospitals with 37,200 beds (3.6 beds per 1,000 inhabitants), of which 256 were state hospitals with 35,400 beds. That year the country had 4,300 practicing physicians (one for every 2,400 inhabitants), as well as 1,400 dentists and more than 22,000 secondary medical personnel. Approximately 60 percent of the physicians are located in the central province of Santiago. Physicians are trained at six university medical faculties.

Z. A. BELOVA

Veterinary services. Among the more common diseases that afflict domestic animals are tuberculosis, brucellosis, malignant anthrax, blackleg, salmonellosis, leptospirosis, foot-and-mouth disease, fascioliasis, echinococcosis, and trichinosis. Among swine, erysipelas, hog cholera and infectious atrophic rhinitis have been recorded; among poultry, Newcastle disease, infectious bronchitis, infectious laryngotracheitis, mycoplasmosis, Marek's disease, pullorosis, leukosis, and fowl cholera and pox; among sheep, infectious enterotoxemia, ecthyma contagiosum, and mange; among rabbits, myxomatosis and coccidiosis; and among horses, strangles, horse influenza, and lymphagitis ulcerosa pseudofarcinosa. These diseases are less frequently encountered in the south; since 1973 no cases of foot-and-mouth disease have been reported in Magallanes, Aisén, and Chiloé provinces. Veterinary specialists are trained at the veterinary faculty of the University of Chile and at the veterinary school of the private Southern University of Chile. In 1976 the country had 1,157 veterinarians; this figure includes only veterinarians working for the Ministry of Agriculture.

S. I. KARTUSHIN

Education

Under the Unidad Popular government the education system was democratized. The period of compulsory education was extended from six to eight years, and the number of pupils attending all schools increased sharply. Compared to 1970 figures, the enrollment in primary schools rose by 13.5 percent, in general-education secondary schools by 33.7 percent, in vocational-technical schools by 51.9 percent, in higher educational institutions by 82.4 percent, and in the adult education system by 96.8 percent. Moreover, three times as many schools were built in 1972 as in 1970. After the 1973 military coup the number of students and teachers dropped sharply, and all schools were militarized.

According to 1975 data, 5 percent of the urban population and 10 percent of the rural population are illiterate. Children are required by law to attend school between the ages of six and 15. Upon completing the compulsory eight-year primary school, students may enroll in a four-year general-education secondary school, a four-year vocational-technical school, or a four-year teacher-training school. In the 1977–78 school year the primary schools had an enrollment of 2.2 million pupils, and in the 1977–78 school year the various secondary schools were attended by more than 487,200 students.

The country's eight universities, six of them private, had a total enrollment of more than 132,000 students in the 1977–78 academic year. The largest universities are the University of Chile, the State Technical University in Santiago (founded 1947), and the Catholic University of Chile (1888). In addition, there are three colleges, a conservatory, and the School of Applied Arts. The largest of the country's 18 major libraries is the National Library, founded in 1813 and containing 1.2 million volumes in 1977. The most important museums, all located in the capital, are the National Historical Museum, the National Museum of Fine Arts, the National Museum of Natural History, and museums of education, contemporary art, and folk art of the American peoples.

L. IA. BELOVA

Scientific institutions

Most of the country's research institutions are located in Santiago. The National Commission for Scientific and Technological Research, a state agency founded in 1966 and reorganized in 1969, is responsible for planning scientific and technical policy. The leading state-financed research institutions are the Meteorological Bureau (1884) with its network of observatories and scientific stations, the Chilean Bacteriological Institute (1929), the Military Geographical Institute (1922, the country's official cartographic institution), the National Geographical, Geodetic, and Geophysical Committee (1955), the Hydrographic Institute of the Navy (1874, Valparaíso), the Geological Institute (1957), the Chilean Antarctic Institute (1963, with scientific stations in Antarctica), and the Chilean Nuclear Energy Commission.

Among the many private research institutes and learned societies are the Valparaíso Oceanographic Institute (1945), the Lebu Scientific Institute (1945), which studies the history of the Araucanians, the Chilean Academy (1885, philological studies), the Chilean Academy of Natural Sciences (1926), the Chilean Academy of History (1940), and the Chilean Academy of Sciences (1964). Several industrial firms have their own research departments. A considerable amount of scientific work is also done by the universities, notably the University of Chile and the Catholic University of Chile. The establishment of the military fascist dictatorship in 1973, followed by mass repressions, the emigration of hundreds of scientific workers, and reduced allocations for scientific research, greatly weakened Chile's scientific potential.

Press, radio, and television

In 1980, Chile had about 100 daily newspapers. After the military fascist junta came to power in September 1973, all progressive newspapers and magazines were banned. A law enacted in December 1975 permitted the government to shut down newspapers and radio stations whose news was deemed antipatriotic.

One of the most influential Santiago dailies is *El Mercurio*, founded in 1900 and having a circulation of 300,000. The proprietors of *El Mercurio* publish newspapers of the same name in Valparaíso (since 1827), Antofagasta (since 1906), and other cities, as well as the Santiago tabloid *Las Ultimas Noticias* (since 1902, circulation 85,000). The daily *La Tercera de la Hora*, an air force organ issued in Santiago since 1950, has a circulation of 450,000. The daily *La Nación* (since 1917), banned since 1973, began appearing as the official organ of the military junta on June 2, 1980. The most popular illustrated weekly magazines are *Vea* (since 1939, circulation 180,000) and *Ercilla* (since 1934, circula-

tion 300,000). Other major periodicals are the Catholic weekly *Que Pasa* and the monthly *Mensaje* (since 1944, circulation 20,000–30,000). Illegal publications include the newspaper *El Siglo*, the organ of the Communist Party of Chile, and the journal *Los Principios*, the party's theoretical organ.

The Orbe News Agency, a private agency founded in 1953, supplies news to the capital's newspapers and radio and television stations. Radio broadcasting was begun in the 1920's. In 1980 there were 134 radio stations. The government-controlled Radio Nacional de Chile broadcasts in Spanish and five other languages. Television broadcasting was initiated in 1959, and by 1978 there were 22 stations and the government-controlled company Television Nacional de Chile. M. A. SHLENOVA

Literature

A Spanish-language literature has been developing in Chile since the beginning of colonial rule in the 16th century, when the Spaniard A. de Ercilla y Zúñiga (1553–94) wrote the famous epic *La Araucana* (parts 1–3, 1569–89), describing the Araucanians' heroic resistance to the colonialists. Transplanted to the colonies, Spanish folk poetry was transformed into a distinctive Creole folklore. During the War of Independence of the Spanish-American Colonies (1810–26), when publicistic writing became the leading genre, the journalist C. Henríquez (1769–1825) founded the first Chilean newspaper, *Aurora de Chile*. The first national plays were written in the 1820's by M. Magallanes (1812–73). After independence (1818), the relative stability of Chile's political life made it a haven for literary men from other Latin American countries. One such émigré was the Venezuelan poet and scholar A. Bello (1781–1865), who played an important cultural role in Chile.

Addressing the first gathering of the Literary Society of Chile in 1842, the public figure, scholar, and prose writer J. V. Lastarria (1817–88) defined the task of creating a national literature. The poetry of S. Sanfuentes (1817–60) and E. Lillo (1826–1910) and the plays of C. Bello developed within the mainstream of romanticism. In prose there was a predilection for *costumbrismo*, colorful description of daily life. The style was initiated by J. Vallejo (1811–58), whose short stories give a satirical picture of Chilean society. *Costumbrismo* also influenced the autobiographical and memoir literature of the period.

The social and historical development of Chile, which embarked on capitalism earlier than the other Latin American countries, stimulated the appearance of critical realism in the mid-19th century. The leading exponent of critical realism, A. Blest Gana (1830–1920), won renown for his cycle of novels entitled *Human Comedy of Chile*, portraying Chilean society at mid-century. The central theme of his works, including the novel *Martín Rivas* (1862), is the moral conflict engendered by the power of money. Social conditions were also depicted critically by D. Barros Grez (1834–1904) and L. Orrego Luco (1886–1948), whose novel *The Big House* (1908) showed the degeneration of the landowning aristocracy.

At the turn of the century, under the influence of the Nicaraguan R. Darío, a number of poets experimented with new verse forms and imagery, among them Jorge González Bastias (1863–1905) and M. Jara (born 1886). The country's natural beauty was celebrated in the collections *From the Sea to the Mountains* (1903) by D. Dublé Urrutia (born 1878) and *The Chilean Soul* (published in 1912) by C. Pezoa Veliz (1879–1908), whose poems are imbued with a folk spirit and social protest.

The prose of the early 20th century mirrored Chile's severe social problems. *Underground* (1904; Russian title *Post No. 12*, 1962), a collection of short stories by B. Lillo (1867–1923), mercilessly exposed the exploitation of miners by foreign companies. The "urban novel" criticized bourgeois society from a social and moral perspective. Its leading exponents—A. d'Halmar (1882–1950), best known for his novel *Juana Lucero* (1902), and J. Edwards Bello (1877?–1968)—were attracted to the aesthetics of naturalism. The writers known as Creolists drew their inspiration from nature and rural life. The theoretical principles of Creolism were followed most consistently by M. Latorre (1886–1955), the movement's leader, who believed that national character was shaped by the natural environment. Other major Creolists were F. Gana (1867–1926), R. Maluenda (born 1885), F. Santiván (born 1886), and L. Durand (1895–1954).

From the 1920's poetry emerged as the leading genre. The mature, highly lyrical verse of Gabriela Mistral (1889–1957) presented a sharp contrast to the overly refined style of the epigones of modernism. The collections *Desolation* (1922), *Tala* (1938), and *Winepress* (1954), while recording the poet's individual feelings, also reflect the collective consciousness of the Latin American peoples. International avant-garde trends influenced the poetry of V. Huidobro (1893–1948), the theoretician and leader of Chilean *creacionismo* (from the Spanish *crear*, "to create"). The work of Chile's greatest poet, P. Neruda (1904–73), underwent a profound evolution during the 1930's. The intimate lyrics and subjective verse of *Residence on Earth* (vols. 1–2, 1925–35), imbued with a despairing rejection of the world, gave way to the civic poetry of *Spain in My Heart* (1937) and then to *General Song* (1950), an epic about the land and people of Latin America. A desire to give philosophical meaning to reality is reflected in his *Elementary Odes* (1954–57) and the lyrical and grotesque poems of *Estravagario* (1958). Neruda's poems of the 1960's and 1970's, published in 1974 in the collections *Bells and the Sea* and *Elegies*, attest to the breadth of his lyrical world.

After the first Popular Front government came to power in 1938, there was a heightened interest in social issues. Basic problems of national life were examined in several outstanding novels about the life of the proletariat: *Blood and Hope* (1943) by N. Guzmán (1914–64), *Coal* (1953) by D. Muñoz (born 1903), *The Big North* (1944) by A. Sabella (born 1912), and *Saltpeter* (1954) and *Pampas Dwellers* (1956) by L. González Zenteno (1912–62). An optimistic portrayal of the workers' struggle and political and spiritual evolution may be found in the novels *Son of Saltpeter* (1952) and *Seed in the Sand* (1957) by V. Teitelboim (born 1916) and the novels *The Cell* (1958; Russian translation, *Olga*, 1962) and *Wind of Wrath* (1961) by E. Délano (born 1910). In his books *Cape Horn* (1941), *Tierra del Fuego* (1956), and *Route of the Whales* (1962), F. Coloane depicts the inhabitants of Chile's maritime regions struggling against the natural elements and social evils. Another fine novel, *Prize Horse* (1957) by F. Alegría (born 1918), portrays a man's search for his identity in a hostile bourgeois society. In the novels of M. Rojas' (1896–1973)—*Son of a Thief* (1951), *Better Than Wine* (1958), and *Shadows on the Wall* (1964)—social problems are refracted through the prism of the hero's inner world.

New narrative techniques and psychological probing distinguish the prose of the 1950's and 1960's, notably the works of C. Droguett (born 1915) and J. Donoso (born 1926). The class struggle that shook Chile during the years that the Unidad Popular government was in power is evoked in G. Atías' novels *And the Money Flowed* (1972) and *Against the Current* (1978). A documentary prose style became popular in the 1970's. The fascist putsch of September 1973, by bringing on the persecution of progressive writers and publishers, interrupted the natural development of Chilean literature. Many writers who have emigrated are re-creating in their fictional works the tragic events of recent history. An outstanding example of such a work is A. Skarmeta's novel *I Dreamed of Burning Snow* (1975).

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Architecture and art

The ancient art of the Chilean Indians, notably those living in the north, was associated with the advanced cultures of Peru. There are ruins of pre-Hispanic fortresses and settlements (one- or two-storey houses), often enclosed by high stone walls. Excavations have unearthed metal ornaments and painted figural pottery adorned with animal representations and geometric designs. Petroglyphs depicting peoples, llamas, and hunting scenes have been discovered. The pre-Hispanic traditions have to some extent been kept alive in Chilean folk art: the wooden grave posts with schematic figures made by the Araucanians, weaving, silverwork, pottery, painting, and wood carving. (*See* OCEANIA for the ancient culture of Easter Island.)

In the 16th century the Spaniards built forts, towns laid out in grid patterns, churches, and single-storey adobe houses with patios. Religious painting and sculpture made its appearance. The 18th and early 19th centuries saw the construction of town houses with inner courtyards, portals, and grillwork. Baroque and classical churches and palaces were designed by the architects J. Toesca y Richi and M. de Jara. Decorative painting and sculpture flourished, as well as portraiture and engraving (A. Santelices).

Eclecticism prevailed in architecture throughout the 19th century, to be replaced in the early 20th century by the *art nouveau* style. The leading artists of the mid-19th century were the portraitists F. J. Mandiola and A. Gana. In the second half of the 19th century P. Lira and M. A. Caro produced historical paintings on national subjects, portraits, and landscapes. Realism was strengthened at the turn of the century through the paintings of A. Valenzuela Llanos, E. Plaza, J. F. González, and A. Gordon and the sculpture of N. Plaza and V. Arias.

In the 20th century much attention has been given to town planning, particularly the rebuilding of the center of Santiago, and to adapting the traditions of folk architecture. Since about 1950 the principles of modern architecture have been employed by the architects S. Larrain, E. Duhart, R. Dávila, and J. Martínez in designing large industrial and public complexes, high-rise buildings, and residential districts on the outskirts of Santiago, Arica, and other cities. In painting and the graphic arts, along with the Montparnasse modernist group (headed by the cubist C. Mori), surrealism (R. Matta), and abstract art (N. Antúñez), there emerged the socially oriented realistic art of C. Hermosilla Alvarez, G. Nuñez, J. Venturelli, P. Lobos, and J. Escamez. Intimate lyrical images distinguish the paintings of E. Barreda and M. Lozano. Twentieth-century Chilean sculpture shows a predilection for monumental forms and the revival of ancient traditions (L. Dominguez, S. Roman Rojas).

The military fascist coup of 1973 arrested the development of Chile's art.

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Music

The country's ancient musical culture has been preserved by the descendants of the Chilean aborigines, primarily the Araucanians, who have a remarkable variety of songs and dances, both solo and group. Among the favourite musical instruments of the Araucanians are the *cultrung* drum, the *huada* rattle, and the wind instruments called *trutruka, lolkin*, and *pifilka*. The Creole folk music of Chile is similar to that of Argentina. The most popular songs and song-and-dance forms are the *tonada*, the *zamacueca* (commonly called the *cueca*), and the *cuando*, performed to the accompaniment of a guitar, a harp, or a *guitarrón*.

Professional music arose at the time of the struggle for independence and the proclamation of the republic. A philharmonic society was founded in Santiago in 1827, and a music school was opened there in 1849, becoming a conservatory in 1851. The Teatro Municipal, founded in 1857, staged musical plays. Touring foreign companies figured prominently in the country's musical life; the first operatic performances were given by an Italian company that visited the country in 1830. The most important 19th-century composers were M. Robles, J. Zapiola, and E. Ortiz de Zárate, who wrote the first Chilean opera, *Flower Girl From Lugano* (1895).

During the first half of the 20th century two main schools of composition emerged. A national style was championed by the composers C. Lavín, P. H. Allende Sarón, C. Isamitt Alarcón, R. Acevedo, and J. Urrutia Blondel, whereas European musical trends were closely followed by the composers E. Soro, D. Santa Cruz (Wilson), A. Letelier Llona, J. Orrego Salas (who moved to the USA in 1961), and G. Becerra.

Prominent musicians include the conductors A. Carvajal and V. Tevah, the pianists C. Arrau, J. Reyes, and F. Guerra, the violinist P. d'Andurain, and the folklorists and folk singers V. Parra and M. Loyola. The foremost musical groups and institutions, all located in Santiago, are the Symphony Orchestra of Chile (founded 1941), the Municipal Symphony Orchestra (1955), the Chorus of the University of Chile (1945), the Santiago String Quartet (1954), the National Conservatory, and the Institute for the Advancement of the Musical Arts (1940). The journal *Revista Musical Chilena*, founded in 1945 as *Revista Musical*, has appeared since 1946.

The military junta that seized power has ruthlessly persecuted the country's progressive cultural figures. V. Jara, a performer of revolutionary songs, was brutally murdered in 1973. Many musicians have left the country.

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Dance and ballet

As an independent art form Chilean ballet began to emerge during the 1940's. Prior to that time ballet performances had been given by foreign, chiefly European, companies. In 1917–18 A. P. Pavlova's company performed in Santiago for two seasons. One of the company's male dancers, Ia. Kaevskii, opened a school in Santiago in 1921, serving as its director until 1938. In 1940 a German company headed by K. Jooss performed in Santiago. The next year the company's dancers organized the School of Ballet, headed by E. Uthoff, which trained performers for the future national ballet. When a Chilean ballet company was formed in 1945, Uthoff was appointed its artistic director. The company, which made its debut in May 1945 with L. Delibes's *Coppélia*, was named the Chilean National Ballet in 1957. After Uthoff, who retained his post until 1965, the company was directed by D. Carey, V. Roncal, and P. Bunster.

Among Uthoff's most successful productions were *The Legend of Joseph*, based on music by R. Strauss (1947), *Don Juan* by C. W. Gluck (1950), and *The Prodigal Son* by S. S. Prokofiev (1955). In 1948, under the direction of Jooss, the company gave fine performances of *The Green Table* by F. Cohen, *Big City*, based on music by A. Tansman, and *Youth*, based on music by G. F. Handel as arranged by J. Orrego Salas. In 1951, M. Solari staged the first national ballet, Orrego Salas' *The Threshold of a Dream*, which incorporated folk music. During the 1950's and 1960's, a growing interest in Latin American themes led to the production of *Calaucan* by the Mexican composer C. Chávez (1959, choreographer P. Bunster), A. Ginastera's *Suraso* (1962, choreographer P. Bunster), and Orrego Salas' *Street Jugglers* (1962, choreographer Uthoff). The eminent choreographers J. Taras (USA) and B. Cullberg (Sweden) have worked with the company. From the outset two trends coexisted in the Chilean ballet—the expressionist, including modern dance, and the classical, whose leading exponent was Solari.

During the 1950's, the Chilean dancers V. Roncal, Bunster, O. Cintolesi, H. Baldrich, and Solari studied in Europe. On Solari's initiative, the Soviet choreographer and teacher E. P. Valukin was invited in 1969 to teach in the ballet school attached to the University of Chile. Valukin remained there until 1972, training teachers and performers of classical dance and introducing improved teaching methods.

In 1949 a ballet company was formed at Santiago's Teatro Municipal under the direction of V. Sulima. The company staged both expressionist and classical ballets, although showing a de-

cided preference for the latter. From 1959, when it was named the Ballet of Modern Art, until 1966, the ballet was headed by Cintolesi. Upon receiving a municipal subsidy in 1965, the company was renamed the Municipal Ballet and subsequently became the country's foremost dance company. Among its finest productions were *Tender Youth* by L. Bernstein (choreographer C. Reyes), *Don Juan* by Gluck (choreographer R. Adam), *Can-Can*, based on music by J. Offenbach (choreographer Hermannsen), and *Chopiniana*, based on music by F. Chopin (choreographer M. Fokine, revised by Cintolesi). From the 1950's through the 1970's the company's soloists have included V. Roncal, Cintolesi, I. Milovan, H. Poll, J. Poldrig, E. Harli, and R. Galgillos.

The Teatro Municipal operates a school of ballet, founded in 1949 and headed by O. Montesino, and it sponsors the Pucara folklore ensemble. In 1969 the Ministry of Education founded the Young Ballet, a school and company headed by the choreographer and teacher H. Baldrich. The next year the Ballet Folklorico Nacional was established under the direction of R. Reys. Ballet companies have also been formed in Arica, Valdivia, Concepción, and Valparaíso. After the military fascist coup many progressive ballet dancers and choreographers emigrated.

E. P. VALUKIN

Theater

The dances and rituals of the indigenous Indians, containing elements of dramatic action, may be regarded as the germ of Chile's national theater. During the 17th and 18th centuries the Jesuits staged plays on religious subjects (incorporating folklore), chiefly during church holidays. The first such play was performed in 1646. In 1693 the comedy *A Chilean Hercules* by an unknown Chilean author was presented in Santiago during a festival. Along with religious productions, Spanish theatrical companies and local amateurs staged plays by Spanish playwrights. In 1709 the first theater building was erected in Santiago, and in 1791 a small theater was built in Valparaíso. The country's first professional company was formed by J. Rubio in the latter half of the 18th century. The Coliseo Theater opened in Santiago in 1815.

Founded after Chile's independence was proclaimed in 1818, the Ramadas Theater staged national plays, among them *The Daughter of the South, or The Independence of Chile* (1823) and *The Chilean Girl* (1827) by M. Magallanes. A theater founded at the University of Chile in 1842 was reorganized in 1857 as the Teatro Municipal. Throughout the 19th century theaters, including private ones, were established in many towns. An important contribution to the development of 19th-century Chilean theater was made by famous actors and directors from other Latin American countries, notably C. Aguilar, J. Casacuberta, F. Cáceres, and H. Morales. The plays of J. Egaña, S. Sanfuentes, C. W. Martínez, J. R. Allende, and D. Izquierdo enjoyed great popularity. The leading playwright of the second half of the 19th century was D. Barros Grez, whose best works include *As in Santiago* (1875), *Birds of a Feather Flock Together* (1879), *Almost a Wedding* (1881), and *Rehearsal of a Comedy* (1889).

The founding of the Association of Dramatists in 1912 was followed three years later by the establishment of the Association of Theater Actors, headed by the actor and playwright C. Cariola. The Syndicate of Theater Actors, founded in the 1920's, merged with the Association of Theater Actors in 1954. The theatrical revival that occurred in the 1920's owed much to the fine plays of V. D. Silva, E. Barrios, A. Moock, and particularly A. Acevedo Hernández, who wrote highly original social dramas drawn from the life of various strata of working people. Of great importance for the subsequent development of the country's theater was the activity of the National Drama Company (founded 1913) and the Báguena-Bührle Troupe (formed 1917), which attracted the outstanding actors and directors A. Bührle, L. Cordoba, A. Flores, and R. Frontaura. A major event was the establishment in 1941 of the Experimental Theater of the University of Chile, headed by the director P. de la Barra; in 1959 the theater was reorganized as the Theater Institute of the University of Chile. Drama groups were also formed at the Catholic University of Chile (1943) and at the university in Concepción. In 1946 a group of professional and amateur actors created the Independent Theater, which adopted the Stanislavsky method.

During the 1950's and 1960's theater festivals were held regularly, and works by the Chilean playwrights J. Díaz, L. A. Heiremans, and I. Aguirre were frequently performed. Famous actors and directors included E. Gajardo, M. Frank, M. Maluenda, A. Siré, S. Piñeiro, O. Escámez, and M. González. Under the Unidad Popular government amateur theater groups were organized by professional actors. About 500 such groups, composed of workers, peasants, and students, put on productions in schools, factory trade union centers, and rural settlements. Theater festivals of amateur and professional groups were held. The military fascist coup of 1973 put an abrupt end to the flowering of Chile's theater arts; many persons connected with the theater have suffered persecution.

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V. B. OVODOV

Motion pictures

The birth of Chile's national cinema dates from 1902, when an anonymous cameraman filmed a fire being put out in Valparaíso. In 1907 the first documentary, called *The President's Funeral*, was released. The gifted directors P. Sienna and N. de la Sotta began making films after 1910. In the 1920's several film companies were founded in Santiago and Valparaíso: Giambastini Films, Chile Films, and Andes Films. From 1916 to 1932 more than 80 full-length films were made, among the best of which were Sienna's *The Clowns Depart* (1921), *The Wrench of Race* (1922), and *The Hussar of Death* (1925, a historical film about the struggle for national independence); de la Sotta's *The Swallow* (1924) and *Youth, Love, and Sin* (1926); M. Derval's *Why Did This Woman Commit a Crime?* (1924); and J. Délano's *Light and Shadow* (1926) and *Dream Street* (1929). These socially conscious films are notable for their humanitarian message.

The first sound film, *North and South*, was made by Délano in 1934. In the second half of the 1930's two or three full-length motion pictures were released annually, as well as short films, newsreels, and documentaries. The director M. Frank made the outstanding film *Dawn of Hope* in 1941. Among the few exceptions to the commercial, pseudofolkloric films that were churned out in the 1940's were Délano's sociopolitical comedies *The Girl From Crillón* (1941) and *This Is Hollywood* (1944). The general economic crisis of the late 1940's brought the motion-picture industry virtually to a standstill. By 1949 only one or two feature films were being produced annually, and the country's screens were filled with American motion pictures.

A new era in film-making began in the late 1950's. A film institute established in 1957 by the University of Chile in Santiago produced documentaries. An experimental motion-picture center and a film library were founded in 1960. Young film-makers revived social themes and dealt with political events (*Return to Silence*, 1966, directed by N. Kramarenco). The political struggle of the late 1960's was reflected in such progressive films as *The Jackal of Nahueltoro* (1969, directed by M. Littin) and *Three Sad Tigers* (1968, directed by R. Ruiz). Social concern and a high artistic level mark the films *Bloody Saltpeter* (1969, directed by H. Soto), *The House We Live In* (1970, directed by P. Kaulen), *Valparaíso, My Love!* (1970, directed by A. Francia), and *Araucana* (1971, directed by J. Coll), a joint production with Spain and Italy.

Under the Unidad Popular government the state studio Chile Films was formed with Littin as president. The "Political Manifesto: Cinematographers and the UP Government," issued in 1971, called for the creation of a genuinely national and humanistic revolutionary cinema. Films were made that have become part of the golden treasury of Latin-American cinema: *Comrade President* (1970, directed by Littin), *Oath and Gun* (1971, directed by H. Soto), *Witnesses* (1971, directed by C. Elsesser), *The Benefactor* (1973, directed by B. Gebel), and *The Promised Land* (1973, directed by Littin). During S. Allende's years in office 13 feature films and 150 documentaries were made. The leading film stars were M. Romo, T. Ferrada, L. Perucci, E. Guzman, and C. Paz. Chile had 310 motion-picture theaters, three of them equipped with wide screens.

After the fascist junta seized power, progressive film-makers were subjected to repression, and many felt compelled to emigrate. American films again filled the country's screens.

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V. A. KISLOV [29–565–6; updated]

CHILE, UNIVERSITY OF, the largest state higher educational institution in Chile, located in Santiago. Founded in 1738 as the Royal University of San Felipe, the school was reorganized in 1843 as the University of Chile and A. Bello was appointed its first rector.

Under the Unidad Popular government (1970–73) efforts were made to democratize the university. The social composition of the student body changed as more students of working-class background were admitted, and student organizations played an active role in university affairs. The military junta that seized power in 1973 purged the university of its progressive students and teachers.

In the 1976–77 academic year, the university had 19 faculties: physics and mathematics, chemistry and pharmacy, natural sciences, medicine (four faculties), dentistry, agronomy, veterinary science, forestry science, architecture, education, music, the humanities, fine arts, philosophy and letters, juridical and social sciences, and economics. There were eight branch campuses in other cities, including Antofagasta, Arica, Iquique, and La Serena. Affiliated institutions include the Institute for Materials Research and Testing, the Genetic Society of Chile, the National Conservatory, the National Astronomical Observatory, the Art of the American Peoples Museum, and the Contemporary Art Museum.

In 1976–77 the university had an enrollment of about 64,000 students and a faculty of 16,800 instructors. The Central Library contains more than 200,000 volumes, and the 40 other university libraries have about a million volumes. The university publishes *Anales de la Universidad de Chile*, and it oversees other higher educational institutions.

N. D. LUTSKOV [29–593–4]

CHILEAN ARCHIPELAGO, the general name of a longitudinal group of islands that includes several large islands, notably Chiloé, Wellington, and Santa Inés, dozens of smaller islands, and several thousand islets off the coast of southern Chile. The islands are continental in origin, chiefly segments of the Coastal Cordillera of the Andes, reach a maximum elevation of 1,300 m, and show strong traces of glacial action. With the exception of Chiloé, the islands are very sparsely settled. Dense evergreen and deciduous forests cover the islands, and the main economic activities are fishing and forestry.

[29–593–2]

CHILEANS, a nation and the main population of Chile, numbering about 10 million (1975 estimate). The Chileans evolved through the intermingling of Spanish conquerors with local Indian tribes, notably the Araucanians and Diaguitas. They speak Spanish and profess Catholicism.

[29–593–5]

CHILE BASIN, an ocean basin in the southeastern Pacific. It is bounded on the east by the Peru-Chile Trench, on the northwest by the Sala-y-Gómez and Nazca underwater ridges, and on the southwest by the West Chile Ridge. The maximum depth is about 4,800 m. Abyssal hills predominate, although individual underwater mountains have relative elevations of up to 4,000 m. Bottom sediments are mainly aleuritic argillaceous carbonate oozes.

[29–592–2]

CHILIK (also Shilik; in the upper course, Dzhangyryk), a river in Alma-Ata Oblast, Kazakh SSR; a left tributary of the Ili River. The Chilik is 245 km long and drains an area of 4,980 sq km. It rises on the southern slopes of the Transili Alatau and subsequently enters the Ili Basin, where it branches into the Kur-Chilik and Ul'khun-Chilik. The Chilik empties into the Kapchagai Reservoir. It is fed by glaciers and by snow. The mean flow rate 63 km from the mouth is 32.2 cu m per sec. The Chilik is used for irrigation.

[29–594–1]

CHILILABOMBWE, a city in Zambia, near the Zaïre border. Population, approximately 40,000. Chililabombwe is linked by railroad with the city of Ndola. It is a center for the exploitation of a large copper deposit.

[29–594–2]

CHIL'KHUDZHRA, an early medieval castle (late fourth to early eighth centuries) located south of the settlement of Shakhristan in Ura-Tiube Raion, Tadzhik SSR. Chil'khudzhra was excavated from 1961 to 1966. Quadrangular in plan and constructed of mud brick, it had strong walls, with round corner towers and a donjon. Three building periods were traced. The ceilings were vaulted, and a ramp linked the interior with the roof. Remains of wall paintings, wood sculptures and utensils, fragments of the oldest musical instruments in Tadzhikistan, jewelry, and a gold bracteate were found. The most valuable finds were epigraphic remains: three small boards with Sogdian inscriptions in ink (one a receipt for repayment of a debt), which solved the problem of the linguistic affiliation and written language of the population of Ustrushana.

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U. P. PULATOV [29–594–7]

CHILLÁN, a city in Chile and capital of Ñuble Province. Population, 85,000 (1970). Chillán is the center of an agricultural region that produces vegetables, grapes and other fruits, cereal grains, and livestock. It has enterprises of the food-processing and leather and footwear industries.

[29–595–1]

CHILLON, a castle in Switzerland, on the shore of Lake Geneva. The earliest known reference to Chillon dates from 1150. The castle was rebuilt several times between the 13th and 14th centuries. The present chapel was built in the 13th century, and the interior ornamentation dates from the 15th and 16th centuries.

During the Middle Ages, the castle was the residence of the counts and, later, the dukes of Savoy. The Swiss political figure F. Bonivard was imprisoned in the dungeon of Chillon from 1530 until 1536.

[29–1198–2]

CHILOÉ, an island off the coast of southern Chile. The Isla de Chiloé is separated from the South American mainland by the Chacao Strait, the Golfo de Ancud, and the Golfo Corcovado. The island is approximately 8,000 sq km in area and reaches a maximum elevation of 820 m. A hilly plain lies in the eastern part of the island; the eastern coastline is highly indented.

Chiloé has a temperate oceanic climate. The average monthly temperature varies from 7° to 14°C; precipitation averages 2,000 to 3,000 mm annually. The island has evergreen mixed forests. The inhabitants engage in logging, commercial fishing, and oystering. Ancud is the principal city and port of the Isla de Chiloé.

[29–594–5]

CHILTERN HILLS, an upland in southeastern Great Britain, on the edge of the London Basin. The upland, with elevations to 260 m, is a cuesta ridge extending from southwest to northeast for 100 km. It is composed of limestones and is dissected into hills by lateral valleys. The slopes have stands of oak, beech, and hornbeam.

[29–594–6]

CHIMBAI, a city (since 1926) under republic (ASSR) jurisdiction and administrative center of Chimbai Raion, Kara-Kalpak ASSR. Situated on the right bank of the lower Amu Darya, 56 km north of Nukus. Population, 21,000 (1974). Industry is represented by a cotton-ginning plant, a vegetable-oil mill, a brickyard, a building-materials plant, and an asphalt-concrete plant. Chimbai has a sovkhoz technicum and a pedagogical school.

[29–595–5]

CHIMBORAZO, an extinct volcano in Ecuador, near the eastern slope of the Cordillera Occidental of the Andes. Mt. Chimborazo, rising to an elevation of 6,262 m, is the highest mountain in Ecuador. The slopes have high-elevation equatorial paramo meadows. Above 4,700 m the peak is permanently snow-capped. The volcano has glaciers. [29–596–1]

CHIMBOTE, a city in Peru, in the department of Ancash; situated on the Pan-American Highway, near the mouth of the Santa River. Population, 103,000 (1970). Chimbote is a port on the Pacific Ocean and has a railroad station. It has enterprises of the ferrous metallurgy industry. A large fishing center, the city produces processed fish, mainly fish meal. Fish meal and agricultural products are exported. [29–596–2]

CHIMION, an urban-type settlement in Fergana Raion, Fergana Oblast, Uzbek SSR. Located in the foothills of the Alai Range, in the Altyaryksai River valley, 24 km south of the Altyaryk railroad station (on the Kokand-Andizhan line) and 32 km southwest of Fergana. Chimion has a machine repair plant, and there is production of crude oil. A balneological health resort, Chimion has hot dry summers, with an average July temperature of 26°C, and mild winters, with an average January temperature of −3°C. The annual precipitation totals about 200 mm. Curative measures include baths in sulfide chloride-sodium-magnesium water. Disorders of the skin, the organs of motion and support, and the peripheral nervous system are treated. There is a balneological clinic in the settlement. [29–596–4]

CHIMISHLIIA, an urban-type settlement and administrative center of Chimishliia Raion, Moldavian SSR. Located 12 km from the Chimishliia railroad station on the Bessarabskaia-Bendery line and 75 km south of Kishinev. Enterprises include a winery, a butter factory, the Iantarnyi sovkhoz, and a poultry hatchery. The settlement also has a museum of local lore. [29–596–5]

CHIMKENT, a city and administrative center of Chimkent Oblast (from 1932 to 1962, Iuzhnyi Kazakhstan Oblast; from 1962 to 1964, Iuzhnyi Kazakhstan Krai), Kazakh SSR. Situated on a foothill plain, between the Badam and Sairam rivers of the Syr Darya basin. Junction of railroad lines to Dzhambul, Arys', and Lenger. Population, 303,000 (Jan. 1, 1977; 74,000 in 1939, 153,000 in 1959, and 247,000 in 1970).

Chimkent has been known since the 12th century. In 1864 it became part of the Russian Empire and was made a district capital in Syr Darya Oblast. During the years of Soviet power, the city has been transformed into a large industrial and cultural center of Kazakhstan.

Industry in Chimkent is linked primarily with the processing of local agricultural products and minerals. One of the city's largest enterprises is a lead-processing plant. Other enterprises include the Fosfor production association, the Kalinin Automatic Press Plant, plants for the production of Cardan shafts, chemicals, pharmaceuticals, and phosphorus salts, and a hydrolysis plant. An oil refinery is under construction (1978). Light industry is represented by a cotton combine, cotton-ginning and karakul plants, the Elastik hosiery and knitwear production association, the Voskhod clothing factory, and the Chimkentmebel' furniture production association. The food-processing industry is represented by a meat-packing plant, a combine for the production of oils and fats, and a production association of the milk industry. The building-materials industry is represented by a cement plant, a brickyard, and an asbestos roofing combine.

Chimkent has institutes of chemical technology and pedagogy, a pedagogical institute of culture, a branch of the Alma-Ata Institute of the National Economy, and five technicums—power, automotive, polytechnic, cooperative, and irrigation construction technicums. It also has a medical school, a music school, and an art school. There are two theaters (Kazakh and Russian) and a museum of local lore in the city.

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[29–596–6]

CHIMKENT OBLAST (until 1962, Iuzhnyi Kazakhstan Oblast; until 1964, part of Iuzhnyi Kazakhstan Krai), an oblast in the southern part of the Kazakh SSR. Formed Mar. 10, 1932; present boundaries established 1973. Area, 116,300 sq km. Population, 1.501 million (1977). Chimkent Oblast has 15 administrative raions, eight cities, and seven urban-type settlements. The administrative center is the city of Chimkent. The oblast was awarded the Order of Lenin on Aug. 12, 1967.

Natural features. Chimkent Oblast lies in the eastern part of the Turan Lowland and the western spurs of the Tien-Shan. Most of the territory is a slightly hilly plain, with elevations of 200 to 300 m. The sandy ridges of the Kyzylkum are in the southwest, on the left bank of the Syr Darya, and the Muiunkum desert lies in the north, on the left bank of the Chu. In the extreme south is Golodnaia Steppe, and in the extreme north, the Betpak-Dala desert. The Karatau mountain range, with Mount Bessaz, which rises to an elevation of 2,176 m, stretches across the central part of the oblast. The southeast is occupied by the western edge of the Talas Alatau and by the Karzhantau and Ugam ranges, with elevations to 2,824 m and 4,238 m, respectively.

The climate is sharply continental and dry, with long hot, dry summers and short warm, virtually snowless winters, characterized by frequent periods of thaw and rain. The average July temperature is 26° to 29°C in the north and southwest and 19° to 25°C in the southeast. The average January temperature ranges from −11°C in the north to −2°C in the south. Annual precipitation amounts to about 100 mm in the Betpak-Dala in the north, 100 to 400 mm on the plains in the southwest, with sharp fluctuations from year to year, 400 to 800 mm in the foothills in the southeast, and as much as 1,000 mm and more in the high mountains. The growing season ranges from 230 days in the mountains to 320 days on the plains.

The largest river is the Syr Darya, which crosses the oblast from south to northwest; its tributaries include the Keles, Kurukkeles, and Arys'. These rivers flow down from the mountains and are extensively used for irrigation. The Chardara Reservoir was constructed on the Syr Darya; the principal irrigation channels are the Kirov channel, with the Dzhetysai branch in Golodnaia Steppe, the Arys' channel, and the Turkestan channel, with the Bugunskoe Reservoir in the foothills of the Karatau. The Chu River, which disappears in the sands of the Muiunkum Desert and breaks up into arms in the summer, flows through the northern part of the oblast. The Syr Darya floodplain abounds in small freshwater lakes; there are a number of salt lakes, including Lake Akzhaikyn, along the lower Chu River.

Deserts predominate on the plains, with sandy and sandy-loam brown and gray-brown soils and with grass-wormwood and saltwort vegetation, interspersed with thickets of the saxauls *Haloxylon aphyllum* and *H. persicum*, tamarisk, and other shrubs. The floodplains of the Syr Darya and the Chu have floodplain meadow, often saline, soils with thickets of reeds and belts of *tugai* forest (a type of gallery forest) of willow and poplar. High-altitude belts are widely represented in the mountains, ranging from deserts, at the foot, to alpine meadows and glaciers; the soil cover ranges from mountain-steppe sierozem, chestnut, and chernozem soils to mountain brown and gray-brown soils and, still higher, to mountain-meadow soils.

Rodents, including susliks, sand launces, and jerboas, live in the deserts. The mountains are inhabited by mountain goats (tauteke) and sheep (argali); snow leopards, bears, and vultures are also encountered. The *tugai* areas are inhabited by wolves, foxes, ermines, polecats, and wild boars, as well as by pheasants; geese and ducks are found around the lakes. Reptiles include snakes, turtles, and lizards. The Aksu-Dzhabagli Reserve is located in the spurs of the Talas Alatau.

Population. Chimkent Oblast is populated by Kazakhs (47 percent, according to the 1970 census), as well as by Russians (22 percent), Uzbeks, Ukrainians, Tatars, Azerbaijanis, Tadzhiks, and Koreans. The urban population totals 40 percent. The average population density is 12.9 persons per sq km. The most densely populated areas are the irrigated lands of the oases in the foothills and in the Golodnaia Steppe, with 30 to 40 persons per sq km. There are a number of individual seasonal settlements in the deserts. With the exception of Chimkent and Turkestan, all of the towns have sprung up in Soviet times in connection with

the exploitation of deposits of minerals (for example, Kentau and Lenger), around railroad stations (for example, Arys'), or in connection with irrigation construction (for example, Dzhetysai, Chardara, and Saryagach).

Economy. The economy combines branches of industry associated with the mining of minerals and the processing of raw agricultural products with intensive, primarily irrigated, farming and diverse stock raising.

Power production is based mainly on natural gas from the Uzbek SSR, coal from the Kirghiz SSR, local lignite from Lenger, and mazut. The oblast is part of the electric power system of southern Kazakhstan and Middle Asia.

The developed branches of industry include mining, nonferrous metallurgy, machine building, the production of chemicals and pharmaceuticals, light industry, and food processing. The mining industry is represented by complex-ore mines and ore-dressing plants in the urban-type settlement of Achisai and elsewhere. Nonferrous metallurgy is represented by the lead-processing plant in Chimkent. Machine-building enterprises include the M. I. Kalinin Automated Press Plant and plants for the production of Cardan shafts, automobile and tractor parts, and power shovels. The chemical and pharmaceutical industry is represented by a chemical-pharmaceutical plant, an antibiotic feed plant, and the Fosfor production association. Light industry enterprises include a cotton combine, a cotton-ginning plant, a karakul plant, the Elastik hosiery and knitwear production association, and clothing and footwear factories. The food-processing industry is represented by meat-packing plants, a combine for the production of oils and fats, butter factories, canned-milk and fruit plants, and wineries. The most important building-materials enterprises are cement plants (in Sastobe), brickyards, a plant for the production of *keramzit* (in Saryagach), and an asbestos roofing combine. Most of the industrial enterprises are located in Chimkent; other important centers are Turkestan, Kentau, and Dzhetysai. An oil refinery is under construction (1978) in Chimkent.

In 1976, Chimkent oblast had 116 sovkhozes and 54 kolkhozes. Agricultural lands, which total 11.4 million hectares (ha), are dominated by pastures, which occupy about 9 million ha. There are winter pastures in the deserts in the north and southwest, summer pastures in the mountains, and year-round pastures in the floodplains of the Syr Darya and Chu rivers. About 180,000 ha are occupied by natural hayfields—dry hayfields in the foothills and flooded hayfields in the Syr Darya floodplain. Arable lands occupy 1.148 million ha (1976), of which 332,000 are irrigated. The sown area totals 1,104,500 ha (1976), of which 57 percent, or 633,000 ha, are under cereal grains, primarily winter wheat and barley, as well as rice; some spring wheat, rice, and corn for grain are also planted. More than 11 percent of the sown area, or 123,700 ha, is under industrial crops, mainly cotton and oil-yielding plants. About one-third of the sown area, or 330,500 ha, is under forage crops, mainly perennial grasses, silage corn, and green fodder. Potatoes (2,600 ha), vegetables (7,900 ha), and melons and gourds (5,200 ha) are cultivated. Also developed is the growing of grapes (9,200 ha) and such fruits as apricots, peaches, pears, and apples. Chimkent Oblast is the Kazakh SSR's leading region of irrigated farming, cotton growing, viticulture, and fruit growing.

Stock raising is dominated by transhumant raising of karakul, fine-wooled, and meat and tallow breeds of sheep; the raising of beef and dairy cattle in stables and on pastures is also developed. Sheep and goats, which number 3.668 million (1976), account for most of the livestock. Cattle (320,600 head, including 136,200 cows), swine (140,700), horses (67,800), camels (10,900), donkeys, and poultry are also raised.

Intensive farming predominates in the oases of the foothill irrigated zone of Chimkent Oblast and along the irrigation channels of the Golodnaia Steppe; here, cotton, forage and grain crops, fruits, grapes, melons, gourds, and various vegetables are cultivated, and sericulture is practiced. Dairy cattle are raised, both in stables and on pastures, as are swine and poultry. Rice growing is the main occupation in the Syr Darya valley, combined with the transhumant raising of sheep, including karakuls, and camels. Nonirrigated grain farming, beef and dairy farming, and horse-breeding on summer pastures are practiced in the mountains. In the deserts, hunting and the gathering of saxaul are common, with some farming and cattle grazing on winter pastures.

Chimkent Oblast has 673 km of railroads, including a section of the Orenburg-Tashkent and Arys'–Alma-Ata main lines. Automobile roads total 5,657 km (1976), of which 4,449 km are hard-surfaced. The most important highways are the Chimkent-Tashkent, Chimkent-Dzhambul, and Chimkent–Turkestan–Kzyl-Orda highways. The city of Chimkent is linked by air with Moscow, Tashkent, Frunze, Alma-Ata, and Karatau and with various parts of the oblast.

The Bukhara–Tashkent–Chimkent–Frunze–Alma-Ata main gas pipeline passes through the oblast. O. R. NAZAREVSKII

Education, cultural affairs, and public health. In the 1914–15 academic year, there were 99 general-education schools, with 5,156 pupils and students. There were no specialized secondary or higher educational institutions. In the 1976–77 academic year, there were 404,600 pupils and students in 995 general-education schools of all types, 19,300 students in 33 vocational-technical educational institutions, including more than 9,000 students in 16 secondary vocational-technical schools, 22,200 students in 19 specialized secondary educational institutions, and more than 12,000 students at the Kazakh Institute of Chemical Technology, a pedagogical institute, a pedagogical institute of culture, and a branch of the Alma-Ata Institute of the National Economy, all in Chimkent. In 1976 more than 55,000 children were attending 395 preschool institutions

Scientific institutions in Chimkent Oblast include the Kazakh Scientific Research Institute of Karakul Raising, the Southern Kazakhstan Scientific Research Veterinary Station, and the Southern Kazakhstan Interbranch Territorial Center of Scientific and Technical Information. As of Jan. 1, 1977, the oblast had 905 public libraries, with 6.114 million books and journals; the Chimkent Oblast Museum of Local Lore, with a branch in the city of Kentau; the Oblast Kazakh Drama and Russian Oblast Drama theaters in Chimkent and the Oblast Musical Drama Theater in Dzhetysai; and 781 clubs, 602 motion-picture projection units, and 92 extracurricular institutions.

The oblast newspapers *Ontustik Kazakstan* (Southern Kazakhstan, published in Kazakh since 1932) and *Iuzhnyi Kazakhstan* (Southern Kazakhstan, since 1925) are published. All-Union radio broadcasts are transmitted 28.5 hours per day; republic and oblast broadcasts are transmitted in Kazakh and Russian nine hours per day and 1.5 hours per day, respectively. Television programs from Vostok are relayed from Moscow 12.9 hours per day; the oblast also receives republic programs from Alma-Ata in Kazakh and Russian, totaling eight hours, and from Tashkent in Uzbek and Russian, totaling seven hours.

As of Jan. 1, 1977, the oblast had 154 hospitals, with 16,200 beds (10.8 beds per 1,000 inhabitants), and 2,900 physicians (one physician per 525 inhabitants). The balneological health resort of Saryagach is located in the oblast.

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Iarmukhamedov, M. Sh. *Ekonomicheskaia geografiia Kazakhskoi SSSR*. 2nd ed. Alma-Ata, 1975. [29–597–1]

CHIMPANZEE, a large anthropoid ape of the genus *Pan* of the family Pongidae. The chimpanzee measures 150–165 cm in height and weighs 45–80 kg; the females are somewhat smaller than the males. The arms are longer than the legs. The fingers are long, and a relatively short thumb is in opposition to the rest of the fingers. The ears are large, the upper lip is high, and the nose protrudes little. Supraorbital and occipital ridges are developed on the skull. The skin on the face, hands, and feet is wrinkled. The hair is black and coarse. The skin is light-colored. There are two species: the common chimpanzee (*Pan troglodytes*) and the dwarf chimpanzee (*P. paniscus*). Both species have a set of 48 chromosomes. Some zoologists consider them to be subspecies of a single species.

Chimpanzees are distributed in equatorial Africa. Semiterres-

trial animals, they inhabit tropical rain and mountain forests, up to elevations of 3,000 m. Each night they build a new nest in a tree. They live in groups of five to 25 individuals under a hierarchical system. They feed on fruits, leaves, shoots, various insects, bird eggs, nestlings, and, sometimes, small mammals. Gestation lasts about 225 days. Sexual maturity is reached at the age of six to ten years. Life expectancy is 50–60 years.

Chimpanzees are curious by nature and are capable of learning through imitation. They are distinguished by the development of social instincts. They are characterized by a considerable variety of facial expressions and gesticulations, and they use about 30 different sounds to communicate. Many scientists have noted that chimpanzees have the capability of goal-oriented activity and possibly of rudimentary abstract thought. According to many biochemical features, they are closer to man than the other anthropoid apes and are therefore used in medicobiological and psychophysiological experiments. Their numbers are few. The dwarf chimpanzee is listed as an endangered species in the *Red Data Book* of the International Union for Conservation of Nature and Natural Resources.

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T. D. GLADKOVA [29–1203–3]

CHIN, a national administrative division in Burma, in the mountainous northwestern section of the country. Area, 33,000 sq km. Population, 354,000 (1969). The district is inhabited primarily by people of the Chin nationality. Falam is the principal city. Agriculture and logging are the basis of the economy. [29–602–2]

CHINADIEVO, an urban-type settlement in Mukachevo Raion, Transcarpathian Oblast, Ukrainian SSR. Chinadievo is located on the Latoritsa River of the Tisza basin and has a railroad station on the Batevo-Stryi line. Industry is represented by a lumber combine, a wood-products shop of the raion-wide industrial combine, and an experimental plant for the manufacture of heels and shoe lasts. [29–603–2]

CHINAKAL, NIKOLAI ANDREEVICH. Born Nov. 7 (19), 1888, in the village of Nur-Ali, in what is now Evpatoriia Raion, Crimean Oblast. Soviet scientist; specialist in mining. Corresponding member of the Academy of Sciences of the USSR (1958). Hero of Socialist Labor (1967). Member of the CPSU since 1944.

Chinakal graduated from the Ekaterinoslav (now Dnepropetrovsk) Institute of Mines in 1912. In the early 1920's he helped reconstruct and mechanize underground mines in the Donets Coal Basin, and in 1935 he proposed the shield system for working large beds in the Kuznetsk Coal Basin. From 1944 to 1973 he served as director of the Institute of Mining of the Siberian Division of the Academy of Sciences of the USSR (until 1957, the Institute of Mining and Geology of the Western Siberian Branch of the Academy of Sciences of the USSR).

Chinakal's principal work has been devoted to the creation and improvement of systems of movable ceiling supports for mining large coal beds. Chinakal received the USSR State Prize in 1943 and the Lenin Prize in 1966. He has been awarded two Orders of Lenin, two other orders, and several medals. [29–603–4]

CHINANTEC, the language of the Chinantec, spoken in the northeastern part of the state of Oaxaca, Mexico. Chinantec is an Otomian-Mixtecan-Zapotecan language.

Chinantec has a rich vowel system. Its dialects have eight short vowels and long and nasalized vowels, and its relatively sophisticated system of consonants includes a glottal *h* and a glottal stop. Chinantec has a complex system of phonological tones: depending on the dialect, there may be three or four simple tones and a sequence of two or three of these tones may occur in a single syllable. The complicated syllabic structure permits initial and final clusters made up of a glottal and a consonant and allows of initial clusters composed of a consonant followed by a glide (*w* or *j*): *hŋĩɑn*$^{2+3}$ ("he kills") and *ry*^{2}*kwəhn*^{1} ("I will give"), with tones indicated by numerals. Grammatical meaning is expressed through affixes (syllabic and nonsyllabic) and alterations in tone, as in *ry*^{2}*kwəhn*^{1} ("I will give") and *ry*$^{2+3}$*kwəh*$^{2+3}$ ("he will give"). Grammatical meaning may also be expressed by auxiliary words and through word order.

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Merrifield, W. R. "Linguistic Clues for the Reconstruction of Chinantec Prehistory." *Ibid.* [29–603–5]

CHINAZ, a city (since 1972) and the administrative center of Chinaz Raion, Tashkent Oblast, Uzbek SSR. Chinaz has a railroad station 63 km southwest of Tashkent. The city also has a cotton-ginning plant and combines for the production of building materials, structural components, and nonmetallic construction materials. [29–603–3]

CHINCHILLA, a genus of rodents of the family Chinchillidae. The body length is 22–38 cm, and the tail length 7–15 cm. The head and eyes are large, the ears orbicular (5–6 cm), and the whiskers long. The four-toed hind legs are twice as long as the five-toed fore legs. There are 20 teeth, including 16 molars that grow throughout the animal's life. The soft, thick fur reaches 3 cm in length. The coloration is white on the abdomen and blue-gray with dark overtones on the back and sides. Seasonal and sexual dimorphism is absent. There are two species—the long-tailed (*C. laniger*) and the short-tailed (*C. brevicaudata*).

Chinchillas are found in the arid mountainous regions of the Chilean, Peruvian, Bolivian, and Argentinian Andes. They live in colonies in crevices of cliffs; they are nocturnal throughout the year. Chinchillas feed on grasses, shrubs, and cacti. One to three litters are produced yearly, with an average of two young in each (a litter may contain one to six young).

By the early 20th century chinchillas had almost been hunted to extinction for their valuable fur. The animals are now protected by law and bred in small numbers on farms in many countries. In the USSR chinchillas have been bred since 1960 on the test farm of the All-Union Research Institute of Hunting and Fur Farming near Kirov; the animals are also being raised by amateur breeders in 40 oblasts. Experiments on acclimatizing the animals in the Pamirs and Transcaucasia are in progress.

I. B. KIRIS [29–1208–3]

CHINCHILLIDAE, a family of mammals of the order Rodentia. The body length is 22–66 cm; the tail length is 7–32 cm. The family consists of three genera—*Chinchilla, Lagostomus* (with one species, the viscacha), and *Lagidium*. The animals, which inhabit South America, are commercially valuable. Their number is decreasing, but they are now protected animals. [29–1208–2]

CHINDWIN, a river in western Burma. The Chindwin flows into the Irrawaddy from the right and is the Irrawaddy's main tributary. It has a length of approximately 1,100 km and drains an area of approximately 114,000 sq km; part of its basin is in India. The Chindwin rises on the western slopes of the Kumon Range. The upper and middle courses flow through a winding, forested valley, and the lower course flows through a vast intermontane basin, where some of the river's water is used for irrigation. Fed by rain, the river has a monsoonal regimen, with high water occurring in summer. The mean flow rate is greater than 4,000 cu m per sec. The Chindwin is navigable up to the mouth of its main tributary, the Uyu; the total distance is more than 600 km. In the dry season the river is navigable for 400 km upstream. The city of Monywa is situated on the Chindwin. [29–605–4]

CHINGIZTAU, a mountain range in the eastern Kazakh Melkosopochnik, in the Kazakh SSR. The Chingiztau measures approximately 200 km in length and rises to elevations of 1,078 m at Mt. Kosbastau in the northwest and 1,305 m at Mt. Kosoba in the Akshatau Range in the southeast. The range is composed of Paleozoic sandstones, shales, limestones, and porphyrites. Mountain steppes, as well as aspen-birch forests and osier thickets, are found in the valleys. [29–604–2]

CHINGOLA, a city in Zambia. Population, 130,000 (1972, estimate). Linked by railroad with the city of Ndola, Chingola is one of the centers of the Copperbelt of Central Africa. [29–605–1]

CHINGUNJAV (also Chingunzhab). Date of birth unknown; died June 12, 1757. Mongol *noion* (feudal lord). Leader of an anti-Manchu movement in Khalkha in the summer of 1756.

The movement resulted from an intensification of political and economic oppression by the Ch'ing Dynasty, which had long waged war against the Oirat Khanate in Dzungaria, and from the increased repression that followed the outbreak of the uprising led by the Oirat prince Amursana. However, the immediate cause of Chingunjav's uprising was the execution in Peking of Erintsindorji, a Mongol military leader and brother of the *bogdo-gegen* (head of the Lamaist sect in Mongolia).

In July 1756, Chingunjav, who was serving in the Manchu army in Dzungaria as the leader of a 2,000-man detachment of Mongol troops, returned to his native nomad territories near Lake Khubsugul. There he made energetic efforts to incite the Mongol feudal lords to rebel against the Manchus. He also established contact with Amursana.

The Ch'ing responded by dispatching troops from Dzungaria to Khalkha to fight Chingunjav's rebel detachments. Captured in January 1757, Chingunjav and his sons were taken to Peking and executed.

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CHINHAE, a city and port in South Korea, in Kyongsang-namdo (South Kyongsang Province), on Chinhae Bay of the Korea Strait. Population, approximately 100,000. Chinhae is a transportation junction and an important center of the chemical industry. Other economic activities include fishing, food processing, and the production of consumer goods. [29–612–2]

CHINILIN, ANATOLII IVANOVICH. Born Aug. 8 (21), 1913, in the village of Izheslavl', in what is now Riazan' Oblast. Soviet athlete, one of the founders of the Soviet school of volleyball. Honored Master of Sport (1944); international-class official (1951); Honored Coach of the USSR (1956).

Chinilin was volleyball champion of the USSR on several occasions in the 1930's. A member of the CPSU since 1943, he is also a veteran of the Great Patriotic War (1941–45). Chinilin has been awarded two orders and several medals. [29–606–1]

CHINIOT, a city in Pakistan, in Punjab Province, near the Chenab River. Population, 47,000 (1961). Chiniot has a railroad station and cotton-ginning enterprises Local artisans carve ivory, and copperware and fabrics are also produced by hand. [29–606–2]

CHINJU, a city in South Korea, in Kyongsang-namdo (South Kyongsang Province), on the Nam-gang, a tributary of the Naktong-gang. Located west of Pusan. Population, 119,400 (1970). Chinju is an important transportation junction, and it is the center of an agricultural region that produces rice, cotton, and tobacco. The city has food-processing and textile industries. [29–605–3]

CHINK (literary form of the Kazakh and Turkmen word *shïn*), a precipice or scarp at the edge of a plateau or mesa. The term, which is widespread in Kazakhstan, Turkmenistan, and Uzbekistan, is most often used for the precipices of the Ustiurt Plateau. Chinks are 300–350 m high. They form as a result of erosion, denudation, or tectonic processes. [29–606–3]

CHINKOV (also Vorkadin). Date of birth unknown; died after 1612. A Mordovian who became a rebel leader in Nizhny Novgorod Krai during the Peasant Uprising under I. I. Bolotnikov.

Data in the Nizhny Novgorod tax rolls indicate that Chinkov came from the village of Tepelevo in Staryi Berezopol'skii Stan (subdistrict), Nizhny Novgorod District. Between the fall of 1606 and the early months of 1607, Chinkov, Moskov, and the *dvorianin* (nobleman) I. B. Domozhirov, who had been elected as leaders by the rebels, directed the siege of Nizhny Novgorod for several months. [29–606–5]

CHINOOK, a southwesterly foehn that blows on the eastern slopes of the Rocky Mountains in Canada and the USA and on the adjacent parts of the prairie. The chinook is accompanied by a very sudden, sharp increase in air temperature of as much as 20° to 30°C, which facilitates increased melting of snow, faster ripening of fruit, and so on. The chinook is observed year-round but is especially frequent in the winter. The term "chinook" is also applied to the moist southwesterly wind that blows from the Pacific Ocean along the western coast of the USA. [29–612–1]

CHINOVNICHESTVO, a term that was used in Russia to designate all persons holding official rank or employed in state service. This class of state functionaries, or *chinovniki*, grew out of the administrative system of *prikazy* (offices) that arose in the Russian state in the 16th century.

The hierarchy of ranks that developed within the *prikaz* system—including the rank of judge (or chief administrator), *dumnyi d'iak* (duma clerk), *d'iak* (clerk), and *pod'iachii* (lowest-ranking administrative official)—was soon extended to the local official state bodies as well. The *prikaz* judges, *namestniki* (vicegerents; until the mid-16th century), *voevody* (military governors), and *d'iaki* were appointed by the tsar and the Boyar Duma. They were given fiefs and serfs as rewards for service. The *pod'iachie* were appointed by the Razriadnyi Prikaz (War Office). The *d'iaki* and *pod'iachie* multiplied in number with the growth of the state's administrative machinery. In the early 17th century the total number of *d'iaki* was 55; in 1676 there were 103 *d'iaki* in the *prikazy* and 35 in the district offices; in the 1680's approximately 2,000 *pod'iachie* served in 37 *prikazy*.

With the establishment of absolutism in Russia in the early 18th century the *prikazy* were replaced by the collegia (*kollegii*). Peter I introduced legislation establishing obligatory lifelong service for noblemen; former clergymen, merchants, members of the lower middle class, and state peasants were encouraged to enter state service. The status of the *chinovnichestvo* was formally legalized in the first quarter of the 18th century. The higher functionaries—namely, the collegium presidents and the provincial governors (*gubernatory*)—were appointed by the tsar and the Senate; after 1711, when the Razriadnyi Prikaz was abolished, the lower ranks were appointed by the Senate.

The General Statute of 1720 established a uniform structure and a prescribed system of activities for the collegia and other government institutions. The Table of Ranks of 1722 introduced a unified system of ranks and legalized appointments to army and state positions on the basis of individual merit, ability, and experience (see Table 1). The *chinovnichestvo* was divided into the *tabel'noe* (registered) and *vnetabel'noe* (unregistered) *chinovnichestvo*; the former consisted of the 14 classes listed in the Table of Ranks, and the latter, of the state functionaries not included therein (clerks, copyists, and junior clerks).

Beginning in 1764, the functionaries' state salaries were paid in money; in addition, however, such incentives as royal grants of inhabited state lands to members of the upper *chinovnichestvo* remained in use until the early 19th century. Although the Manifesto on Freedom of the Nobility of 1785 abolished compulsory state service for members of the nobility, they continued to be drawn to such services because of the *chinovnichestvo*'s privileged status.

By the middle of the 18th century the number of state functionaries was close to 5,000. Approximately 150 of them—namely, senators, collegium presidents, heads of the most important bu-

Table 1. Table of Ranks (with amendments and addenda, 18th to early 20th centuries)

Class	*Military rank*		*Civilian rank*	*Court rank*
	Army	*Navy*		
1	General field marshal	Admiral general	Chancellor Active privy councillor, first class	
2	General in chief (1716–96) *From 1796* General of the infantry General of the cavalry General of the artillery General of the engineers	Admiral	Active privy councillor	High chamberlain High marshal of the court Senior gentleman squire Senior huntmaster High master of the court Over-butler Senior gentleman of the chamber Senior gentleman carver (from 1856)
3	Lieutenant general (from the 1730's to the late 18th century the term *poruchik* was used instead of "lieutenant")	Vice admiral	Privy councillor	Marshall of the court Gentleman squire Huntmaster Master of the court Senior gentleman of the chamber Senior gentleman carver (from 1856)
4	Major general	Rear admiral	Privy councillor (to 1724) Active civil councillor	
5	Brigadier (1722–99)	Commodore admiral (1722–99)	Civil councillor	Gentleman of the chamber (from 1884)
6	Colonel	Captain, or captain first class	Collegial councillor	*Kamer-fur'er* (to 1884)
7	Lieutenant colonel Host *starshina* (from 1884)	Commander, or captain second class	Aulic councillor	
8	First major and second major (1731–97) *Until 1884* Major Host *starshina* *From 1884* Captain *Rotmistr* *Esaul*	Captain third class (18th century) Lieutenant commander (to 1884 and in 1907–11) Senior lieutenant (from 1912)	Collegial assessor	
9	*Until 1884* Captain *Rotmistr* *Esaul* *From 1884* Staff captain Staff *rotmistr* *Pod"esaul*	Lieutenant commander (18th century) Lieutenant (from 1884) Senior lieutenant (1907–11)	Titular councillor Collegial secretary	
10	*Poruchik* captain (1705–98) *Until 1884* Staff captain Staff *rotmistr* *Pod"esaul* *From 1884* Lieutenant *Sotnik*	Lieutenant (to 1884) *Michman* (from 1885)		
11	*Until 1884* Lieutenant *Sotnik*		Ship's secretary (originally a naval rank)	
12	Second lieutenant and sub-lieutenant (18th century) *Podporuchik* *From 1884* Cornet *Khorunzhii*	*Michman* (to 1885)	Provincial (*gubernskii*) secretary	
13	Ensign *Until 1884* Cornet *Khorunzhii*		Subprovincial (*provintsial'nyi*) secretary Senatorial registrar Synodal registrar Cabinet registrar	
14	*Fendrik* (18th century)	*Michman* (18th century)	Collegial registrar	

reaus and offices, and provincial governors—made up the first four classes of the Table of Ranks. The next group consisted of fifth- to eighth-class functionaries—prosecutors, provincial *voevody*, and members of various bureaus (numbering approximately 600). Classes 9 to 14 constituted the bulk of the executive manpower in state institutions. Two-thirds of the *chinovnichestvo* consisted of functionaries not registered in the Table of Ranks. Almost 80 percent of the last two groups were former members of the nonprivileged estates.

The first half of the 19th century saw a rapid acceleration of the bureaucratization of the state's administrative machinery. The establishment of the ministries between 1802 and 1811 led to the rise of bureaucratic agencies with a complex internal organization and elaborate paper work. The number of registered functionaries grew from approximately 13,200 in 1804 to 71,800 in 1850 and 82,300 in 1856. Similarly, the number of unregistered functionaries grew from 26,300 in 1850 to 31,600 in 1856. The system of service appointments and promotions, as well as the rewards, incentives, penalties, and retirement provisions, were defined in 1832 by the Statute on State Service.

In the first half of the 19th century the *chinovnichestvo* was divided into four groups. The first group, comprising classes 1 to 5, was made up of the upper levels of the bureaucracy, which in effect determined government policy. The second group, made up of classes 6 to 8, included functionaries holding executive positions. Members of these two groups enjoyed great privileges and drew high salaries. The third group—classes 9 to 14—consisted of clerks and lower-level executives. The fourth group, which comprised the unregistered functionaries and was employed for technical work only, differed from the registered groups in both material and legal respects. During the rapid increase in the total number of functionaries, this last group was the most immediate source of recruitment for the registered *chinovnichestvo*.

Until the early 19th century, no educational qualifications were required for appointment to state service. As stipulated in a ukase of 1809 proposed by M. M. Speranskii, a certain level of education was required of state functionaries; for promotion to classes 8 through 5 they had to present a university diploma or pass a series of examinations. The following terms of service were established for promotion to a higher class: three years of service in each class for classes 14 up to 9, four years of service in class 9, five years in class 8, six years in class 7, four years in class 6, five years in class 5, and ten years in class 4. Promotions to classes 2 and 1 were granted at the personal discretion of the tsar and without term-of-service requirements.

Between 1836 and 1843 approximately 7,200 persons were promoted to eighth-class rank, which conferred hereditary nobility; approximately 4,700 of them were not of noble birth. Beginning in 1845, hereditary nobility was conferred on sixth-class ranks in the military service and fifth-class ranks (fourth-class from 1856) in the civil service; personal nobility was conferred on ninth-class ranks.

The upper levels of the prereform *chinovnichestvo* were chiefly composed of the landed nobility. In the words of V. I. Lenin, "the noble landowner had ruled in the absence of a 'plutocracy' . . . and in the absence of a growing third element" (*Poln. sobr. soch.*, 5th ed., vol. 21, p. 81). Inasmuch as the *chinovnichestvo* was viewed as the underpinning of the autocracy, those who were regarded as compromised in terms of their service or found to be politically unreliable were expelled from its ranks. Article 3 of the law of Nov. 7, 1850, gave the authorities the right to dismiss subordinates without explanation; there was no right of appeal.

The organizational form of the *chinovnichestvo* system as it had evolved in the first half of the 19th century was maintained in the subsequent period of capitalist development, when the regime took the first step toward a bourgeois monarchy (see *ibid.*, vol. 20, p. 165); nevertheless, while the upper strata of the *chinovnichestvo* were still made up of the landed nobility, the middle and lower ranks were now enlisting the wealthier elements of the bourgeoisie—that is, the plutocracy.

The new local self-government bodies—established during the city reform of 1870 and the *zemstvo* (district and provincial) reform of 1864–employed hired personnel (such as doctors, teachers, technicians, and agronomists) who came to be known in bureaucratic circles as the third element. In the late 1860's several state agencies began hiring women. In 1897 the number of women employed in various offices was 38,000 (including 28,900 women working in educational institutions); this figure amounted to almost 9 percent of all functionaries, who numbered approximately 440,000. In 1901 the number of functionaries in Russia was close to 500,000, including 120,000 to 125,000 not listed in the Table of Ranks.

In the late 19th and early 20th centuries, as Russia entered the age of imperialism, close contacts were established between the monopolies and government institutions. Individual monopolists served as consultants at various levels in the ministries of Trade and Industry, Communications, Finance, Army, and Navy, as well as in the Main Administration for Land Tenure and Agriculture.

Among those formally included in the *chinovnichestvo* were members of the St. Petersburg Academy of Sciences and Academy of Arts, professors of the universities and other higher educational institutions, *Gymnasium* teachers, and certain other cultural and scientific figures who had a given class rank and were considered to be in state service.

The Revolution of 1905–07 forced the autocracy to grant the right of admission into state service to members of all the estates (excluding some of the non-Russian peoples). In actuality, because of class barriers and educational requirements, this right did not extend to workers and peasants. As early as 1903, V. I. Lenin compared the *chinovnichestvo* to a dense forest through which "a mere worker can never make his way" (*ibid.*, vol. 7, p. 137). The changing social composition of the *chinovnichestvo* in the early 20th century affected the political reliability of some of its members. A special ruling by the Senate on Apr. 30, 1908, affirmed that state service was incompatible with revolutionary and oppositionist activities.

Even after the Revolution of 1905–07 the upper ranks of the *chinovnichestvo* retained many of the elements and traits of the bureaucratic landowning nobility. As Lenin wrote in late 1911, "the bureaucracy is . . . recruited . . . from the old, very old, not only pre-revolutionary (before 1905), but even pre-Reform (before 1861), landed and office-holding nobility"; and this bureaucracy "lends its bourgeois activity *a tendency and a form* that is purely and solely feudal" (*ibid.*, vol. 21, p. 58).

During World War I a great number of military functionaries filled the ranks of Russia's *chinovnichestvo*; at the same time the various state offices made greater efforts to recruit women into service. The third element grew in numbers and in strength throughout the public and state agencies concerned with war supplies and services—particularly the All-Russian Zemstvo Union, the All-Russian Union of Cities, the Zemgor, and the war industries committees. Tsarist functionaries worked together with members of the bourgeoisie in the special conferences, thus initiating the gradual merging of the state apparatus and the imperialist monopolies (*see* SPECIAL CONFERENCES).

The old state apparatus and the *chinovnichestvo* were retained by the Provisional Government after the February Revolution of 1917. While the government was forced to replace certain state functionaries—for example, in the administrative sphere, in the police, and to some extent in the courts—most of those who were dismissed continued to receive government salaries, supplemental allowances, and sizable pensions. The state service system continued to be governed by the Table of Ranks and the Statute on State Service.

After the October Revolution of 1917 the functionaries of the central state institutions began sabotaging the Soviet government, but the counterrevolutionary *chinovnichestvo* failed in its attempt at nationwide sabotage. Many of the saboteurs were fired, and the ringleaders were arrested. At the same time the Soviet government raised the salaries of the lower-ranking employees and offered them jobs in the institutions set up by the soviets. Russia's landowner-bourgeois *chinovnichestvo* was abolished by the first decrees issued under Soviet power—the decree of Nov. 10 (23), 1917, which abolished the estates and state service ranks, and the decree of Dec. 16 (29), 1917, which gave equal rights to all members of the military services. The establishment of a new type of state and of a state apparatus based on new principles signaled the disappearance of the *chinovnichestvo* as a distinct social group and its replacement by the institution of Soviet state employees.

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CHIPPENDALE, THOMAS. Baptized June 5, 1718, in Otley, Yorkshire; buried Nov. 13, 1779, in London. English cabinetmaker.

Chippendale settled in London around 1738, where in time he established the unique Chippendale style. Chippendale's furniture designs, which favored the use of mahogany, combined utility of form, comfort, and clarity of structure with delicate lines and intricate patterns. The designs combined motifs of Chinese art, the Gothic, and the rococo. In the 18th century, furniture in the Chippendale style was known throughout Europe, including Russia. In 1754, Chippendale published his album of furniture designs, *The Gentleman and Cabinet Maker's Director*.

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[29–613–2]

CHIPROVETS UPRISING OF 1688, a revolt of the Bulgarian population of the city of Chiprovets (now Chiprovtsi, northern Bulgaria) and its environs against the Turkish yoke in September 1688. It took place during the war between the Ottoman Empire and the anti-Turkish coalition of European states known as the Holy League.

The uprising was provoked by the Austrians' occupation of Belgrade on Sept. 6, 1688, and their advance on Vidin and Sofia. The rebel forces consisted of artisans and merchants of Chiprovets, who were for the most part Catholics, and Orthodox peasants from nearby villages. The rebel detachments, whose commanders included G. Peiachevich, I. Stanislavov, and L. Andrenin, were crushed by the forces of the Hungarian feudal lord I. Thököly, an ally of the Ottoman Turks. Chiprovets and the various villages that had taken part in the uprising were plundered and burned. Many of the inhabitants were killed; others fled. [29–613–4]

CHIQUINQUIRÁ, a city in Colombia, in Boyacá Department. Situated at an elevation of 2,550 m. Population, 28,000 (1968). Chiquinquirá is linked by railroad with Bogotá. Cottage industry includes the manufacture of musical instruments and wood products. The Muzo emerald mines are nearby. [29–561–4]

CHIR, a river in Rostov Oblast, RSFSR (lower course in Volgograd Oblast); a right tributary of the Don. The Chir is 317 km long and drains an area of 9,580 sq km. It rises in the Don Ridge and empties into the Tsimliansk Reservoir. The river is fed chiefly by snow, and high water occurs in late March and April. The mean flow rate 10 km from the mouth is 12 cu m per sec. The upper course of the Chir sometimes dries up. The river's principal left tributary is the Kurtlak. The city of Surovikino is located near the Chir's mouth. [29–614–1]

CHIRCHIK, a city under oblast jurisdiction in Tashkent Oblast, Uzbek SSR. Situated in the valley of the Chirchik River (a tributary of the Syr Darya), between spurs of the Karzhantau and Chatkal ranges. Railroad station 32 km northeast of Tashkent. Population, 131,000 (1977; 15,000 in 1939).

Chirchik was formed in 1935 from several workers' settlements that had grown up in connection with the construction of the Chirchik Hydroelectric Power System and an electrochemical combine. During the Great Patriotic War of 1941–45, Chirchik became a center for machine building. The Chirchiksel'mash and Uzbekkhimmash plants, as well as a transformer plant, were outfitted with equipment from evacuated factories. The Uzbek Refractory and Heat-resistant Metals Combine and enterprises of the construction industry are in operation in Chirchik. Light industry and the food industry are represented by footwear and garment factories and a meat-packing plant. Chirchik has an evening department of the Tashkent Polytechnic Institute, an industrial technicum, and a medical school, as well as a museum of local lore.

Chirchik has a rectangular street plan, wide main streets, and standardized apartment houses. Master plans were drawn up between 1933 and 1936 by Gidrostroiproekt, Moscow (architects G. M. Orlov, M. I. Tarakanov, and V. A. Lavrov, with V. A. Vesnin as consultant), and in 1964 by Uzgosproekt (chief architect P. A. Duda-Dudinskii).

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CHIRCHIK, a river in Tashkent Oblast, Uzbek SSR; a right tributary of the Syr Darya.

The Chirchik is 155 km long and drains an area of 14,900 sq km. It is formed by the confluence of the Chatkal and Pskem rivers. Its upper course flows for approximately 30 km through a canyon; farther downstream the valley widens and becomes less clearly delineated. The river is fed by mixed sources, with snow predominating. The mean flow rate at its source is 221 cu m per sec. There is some ice on the river between November and March.

The Chervak Hydroelectric Power Plant is situated on the upper course of the Chirchik. Upstream from the Gazalkent Dam, water is diverted at an average rate of 183 cu m per sec via the right upstream diversion canal into the Chirchik-Bozsu Hydroelectric System. Upstream from the Troitsk Dam, the Karasu Canal branches off to the left with a mean flow rate of 47 cu m per sec. Farther downstream the Chirchik feeds other canals.

The cities of Gazalkent, Chirchik, and Tashkent are situated in the valley of the Chirchik. [29–618–1]

CHIRCHIK-BOZSU HYDROELECTRIC SYSTEM, a complex of hydroengineering structures on the Chirchik River. The system's total rated power is approximately 1.2 gigawatts, with an average annual production of 4.7 billion kilowatt-hours. In 1976, 18 of the system's 19 power plants were in service: Charvak; Khodzhikent; Tavak; F. G. Loginov Chirchik; Akkavak I, II, and III; Kadyria; Salar; Bozsu; Sheikhantaur; Burdzhar; Aktepa; and Nizhniaia Bozsu I, II, III, IV, and VI. The Gazalkent Hydroelectric Power Plant was still under construction in 1976.

The system is situated in the middle and lower basin of the Chirchik River. The region is the most densely settled and industrially developed area of the Uzbek SSR, and it has a vast irriga-

tion system. Harnessing the power resources of the Chirchik River began in 1926, when the first of 12 hydroelectric power plants was built on the main Bozsu irrigation canal. Between 1940 and 1943, the following major hydroelectric power plants were put into service: Tavak (73 megawatts), F. G. Loginov Chirchik (86 megawatts), and Akkavak I and II. Construction of the main power plant—Charvak (600 megawatts)—was begun in 1963 and was completed in 1972. The hydroengineering complex includes a rock-fill dam 168 m high that forms a reservoir with a volume of 2 cu km; the reservoir makes it possible to control the discharge of water used for irrigation. The total irrigated area served by the system is approximately 300,000 hectares.

L. B. SHEINMAN [29–618–3]

CHIRI-IURT, an urban-type settlement in Shali Raion, Chechen-Ingush ASSR. Chiri-Iurt is situated on the Argun River in the Terek basin, 35 km south of the city of Groznyi. It has plants for the production of cement, lime, and silicates. [29–616–3]

CHIRIKOF ISLAND, an island in the northern Pacific, in the Gulf of Alaska. Chirikof Island is part of the state of Alaska (USA). It has an area of approximately 160 sq km and a maximum elevation of 300 m. Subarctic meadows are found on the island. Cattle raising is the primary economic activity. The island was discovered by A. I. Chirikov in 1741 and was named in his honor by the English navigator G. Vancouver in 1798. [29–615–3]

CHIRIKOV, ALEKSEI IL'ICH. Born 1703; died November 1748 in Moscow. Russian navigator. Commodore admiral.

Chirikov graduated from the Naval Academy in 1721. He was V. Bering's aide on the First (1725–30) and Second (1733–43) Kamchatka expeditions. On July 16, 1741, aboard the packet boat *Sv. Pavel* (*St. Paul*), Chirikov became the first European to reach the western coast of North America; he also discovered several of the Aleutian Islands. In 1742, while sailing in search of the packet boat *Sv. Petr* (*St. Peter*), which was commanded by Bering, Chirikov fixed the position of Attu Island. In 1746 he took part in the final charting of Russian discoveries in the Pacific Ocean. Capes on Kyushu Island, the Anadyr' Gulf, Taui Guba, and Attu Island, as well as an underwater peak in the Pacific Ocean, have been named after Chirikov.

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CHIRIKOV, EVGENII NIKOLAEVICH. Born July 24 (Aug. 5), 1864, in Kazan; died Jan. 18, 1932, in Prague. Russian writer.

The son of a member of the *dvorianstvo* (nobility), who had achieved noble rank through state service, Chirikov was expelled from the University of Kazan in 1887 during his fourth year of study for having taken part in revolutionary disturbances. His poems and realistic stories were first published in 1885. Such plays as *Jews* (1904), *Ivan Mironych* (1905), and *Muzhiks* (1906) enjoyed great success. Chirikov's work often appeared in the *Sborniki tovarishchestva "Znanie"* (Collections of the Znanie Association).

In the autobiographical novel *The Life of Tarkhanov* (books 1–4, 1911–25) and in the short-story collections *The Flowers of Memories* (1912), *Early Shoots* (1913), and *Volga Tales* (1916), Chirikov dealt with childhood, with pure love, with the provincial intelligentsia, and with nature in the Russian countryside. He emigrated in 1920. Although written from an anti-Soviet point of view, Chirikov's novel *Beast from the Abyss* (published 1926) truthfully portrays the moral decay of the White Army.

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CHIRIK-RABAT, a settlement dating from the second half of the first millennium B.C., located in what is now the Kazakh SSR. The site is situated in the Kyzylkum Desert, on the dry riverbed of the Zhanadar'ia, 200 km southwest of the city of Kzyl-Orda. It was discovered and excavated by S. P. Tolstov in 1946 and 1948–49.

In the middle of the first millennium B.C., Chirik-Rabat was inhabited by one of the Massagetae tribes—probably the Apasiacae mentioned by Strabo. The fortifications were rebuilt in the typical Khwarazmian style shortly before the beginning of the Common Era. The settlement, built on an oval plan, is girdled by two rows of ramparts and walls made of mud bricks. The southeast section of the site has a rectilinear fortification characteristic of ancient Khwarazm. Cattle raising played a major role in the local economy.

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CHIRIN, PROKOPII IVANOVICH. Died in the mid-17th century. Russian painter of the Stroganov school.

In the 1620's, Chirin was a favorite artist of the tsar and a master of the Oruzheinyi Prikaz (State Armory). His works are noted for a refined, yet somewhat dark and monochrome, palette and for delicacy and precision of line. Examples of his icons are *St. Nikita* (early 17th century, Russian Museum, Leningrad), *St. John the Warrior* (early 17th century, Russian Museum, Leningrad), and *The Tikhvin Virgin* (late 16th–early 17th century, Tret'iakov gallery, Moscow). [29–616–1]

CHIRKA-KEM', a river in the Karelian ASSR, a right tributary of the Kem' River of the White Sea basin. The Chirka-Kem' is 221 km long and drains an area of 8,270 sq km. It is formed by the confluence of the Chirka and Kem' rivers, which rise on the West Karelian Elevation. The river flows through a number of lakes before emptying into Lake Iashkoiarvi. Fed by snow and rain, it has a mean flow rate of approximately 81 cu m per sec. The Chirka-Kem' freezes over between late October and December, and the ice breaks up in late April or May. [29–616–4]

CHIRKEI HYDROELECTRIC POWER PLANT, a power plant constructed on the Sulak River in Buinaksk Raion, Dagestan ASSR, between 1963 and 1976. It has an installed capacity of 1,000 megawatts (MW), supplied by four 250-MW units, and an average annual output of 2.43 billion kilowatt-hours. The maximum head is 206 m. The hydroengineering complex has a concrete arch dam 231 m high and 338 m along the crest (one of the largest in the world), a water intake, a powerhouse integrated in the dam, and a tunnel spillway. It forms a reservoir with a volume of 2.8 cu km; the Tishiklin Dike, which provides 10 cu m of water per sec for irrigation, has been built on the reservoir. The power generated by the Chirkei Hydroelectric Power Plant is supplied to the integrated power grid of the Northern Caucasus.

[29–616–5]

CHIRKOV, BORIS PETROVICH. Born July 31 (Aug. 13), 1901, in the village of Lozovaia-Pavlovka, in what is now Dnepropetrovsk Oblast. Soviet Russian actor. People's Artist of the USSR (1950); Hero of Socialist Labor (1975). Member of the CPSU since 1945.

Chirkov, after graduating from the Leningrad Institute of Stage Arts in 1926, performed with the Leningrad Theater for Young Audiences and the New Theater for Young Audiences. He later appeared in several Moscow theaters: the Central Film Actors' Theater Studio, the Pushkin Theater (1950–65), and the Gogol Theater (since 1966).

Chirkov has appeared in motion pictures since 1928. He became especially well known as the title character in the Maksim trilogy: *The Youth of Maksim* (1935), *The Return of Maksim* (1937), and *The Vyborg Side* (1939). In these films he created a romantic and yet deeply realistic portrait of a hero of the revolutionary era, the young worker Maksim, who learns profound lessons from his experiences in the class struggle and becomes a prominent Bolshevik revolutionary.

Chirkov's other motion-picture roles include Stepan Lautin in *The Teacher* (1939), Makhno in *Aleksandr Parkhomenko* (1942), the title role in *Glinka* (1947), and Chizhov in *True Friends* (1954). In the theater he has played the roles of Kuzovkin in Turgenev's *The Boarder*, Lebedev in Chekhov's *Ivanov*, and Rasputin in *The Empress's Plot* by Shchegolev and A. N. Tolstoy.

Chirkov was a deputy to the third convocation of the Supreme Soviet of the USSR. A recipient of the State Prize of the USSR in 1941, 1947, 1949, and 1952, Chirkov has been awarded three Orders of Lenin, two other orders, and several medals.

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N. D. GADZHINSKAIA [29–617–1]

CHIRVINSKII, NIKOLAI PETROVICH. Born Apr. 28 (May 10), 1848, in Chernigov; died Jan. 5, 1920. Russian specialist in animal husbandry.

Chirvinskii graduated from the St. Petersburg Agricultural Institute in 1872. From 1879 to 1894 he worked at the Petrovskoe Farming and Forestry Academy (now the K. A. Timiriazev Moscow Agricultural Academy); he was made a professor in the academy's department of animal husbandry in 1891. From 1898 to 1919, Chirvinskii was a professor in the agricultural department of the Kiev Polytechnic Institute.

Chirvinskii primarily studied livestock feeding, in particular, the utilization of feeds by animals of various ages and the effects of mineral supplements, especially on the formation of body fat. His work in sheep breeding included classification of domestic coarse-wooled breeds and analysis of conditions leading to the formation of karakul fur. Chirvinskii also studied the growth and development of sheep and swine under various management and feeding conditions.

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CHIRVINSKII, PETR NIKOLAEVICH. Born Jan. 26 (Feb. 7), 1880, in Petrovsko-Razumovskoe, now within the city limits of Moscow; died June 21, 1955, in Perm'. Soviet geologist. Doctor of sciences in geology and mineralogy (1919). Son of N. P. Chirvinskii.

P. N. Chirvinskii graduated from the University of Kiev in 1902. He became a professor at the Don Polytechnic Institute in Novocherkassk in 1909 and at the University of Perm' in 1943.

Chirvinskii's main works dealt with such fields as mineralogy and petrology, geochemistry, paleohydrogeology, the study of useful minerals, and the history of science. Chirvinskii was the first to determine the average chemical and mineral composition and atomic structure of granites and other plutonic rocks (1911), of the earth as a whole (1919), and of meteorites. He ascertained the laws governing the crystallization of plutonic rocks and meteorites. He also explained the origin of a number of deposits of various minerals, such as iron ores, phosphorites, tuffs, and potassium salts.

Chirvinskii wrote *A Course in Deposits of Useful Minerals* (parts 1 and 2; 1926) and *A Textbook for Hydrogeology* (1922).

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D. P. SERDIUCHENKO [29–614–3]

CHISANA, a valley glacier in North America, on the northeastern slope of the Wrangell Mountains of southern Alaska. The glacier, which measures 25.8 km in length, is the source of the Chisana River, a left tributary of the Tanana River (Yukon River basin). [29–619–2]

CHISHMY, an urban-type settlement and the administrative center of Chishmy Raion, Bashkir ASSR. Located 57 km southwest of Ufa, Chishmy is a junction for railroad lines to Ufa, Kuibyshev, and Ul'ianovsk. The settlement has a sugar factory, a butter factory, a brickyard, a poultry-packing plant, a grain elevator, and a sovkhoz where fruit plants are raised for transportation. [29–667–4]

CHISLO, a state tax system introduced in the 1250's in territories subject to the Mongol khans. The *chislo* replaced the system of tax farming in the lands conquered by the Mongols.

Under the great khan Mangu (ruled 1251–59), the *chislo* was introduced in China, Middle Asia, Iran, and Armenia and was also extended to Russian lands, including northeastern Rus', the principalities of Riazan' and Murom, and the Novgorod Feudal Republic. To aid in collecting the tax, the Mongol officials took a house-to-house census of the population, which was divided for the purpose into groups of ten, one hundred, one thousand, and ten thousand; the clergy were not included in the census. The persons who implemented the *chislo* were called *chislenniki* or *pistsy*. The counting of the population was accompanied by numerous abuses, and it provoked uprisings, such as the uprising of 1257 in the Novgorod Feudal Republic. In Rus', the practice of dividing the population into groups of tens to facilitate the payment of ordinary taxes and extraordinary horde taxes was retained until the 15th century.

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CHISTALEV, VENIAMIN TIMOFEEVICH (also Tima Ven'). Born Oct. 8 (20), 1890, in the village of Pomozdino, in what is now the Komi ASSR; died Oct. 13, 1939, in Syktyvkar. Soviet Komi writer.

The son of a peasant, Chistalev became a schoolteacher. His first literary efforts belong to the prerevolutionary period. His nature lyrics glorify the Komi land. In the narrative poem *In the Days of the Transformation of the Land* (1927), Chistalev depicts the heroism of socialist construction in the north. He is the author of the first essays and short stories written in the Zyrian (Komi) language. Chistalev also translated works by various Russian writers.

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CHISTIAKOV, IVAN DOROFEEVICH. Born October 1843 in the Caucasus; died June 3 (15), 1877, in Moscow. Russian botanist.

Upon graduation from Moscow University in 1868, Chistiakov joined the university's teaching staff. In 1871 he was appointed

professor and director of the university's botanical gardens. Chistiakov was the founder of the Moscow school of plant embryologists and cytologists. He was one of the first to observe and describe mitosis in plants (1874).

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CHISTIAKOV, IVAN MIKHAILOVICH. Born Sept. 14 (27), 1900, in the village of Otrubnivo, in what is now Kashin Raion, Kalinin Oblast. Soviet military leader; colonel general (1944). Hero of the Soviet Union (July 22, 1944). Member of the CPSU since 1926.

The son of a peasant, Chistiakov joined the Red Army in 1918. He fought in the Civil War of 1918–20 as an assistant platoon commander. He graduated from machine gunner's school in 1920, Vystrel courses in 1930, and the Advanced Academic Courses of the K. E. Voroshilov Higher Military Academy in 1949. During the Great Patriotic War of 1941–45, he commanded the 64th Infantry Brigade on the Western Front from 1941 to 1942 and the 8th Guards Rifle Division and the II Guards Rifle Corps in 1942 on the Kalinin Front. He served as troop commander of the First Guards Army (September–October 1942), Twenty-first Army (October 1942–April 1943), and Sixth Guards Army (April 1943 to the end of the war) on the Stalingrad, Don, Voronezh, First and Second Baltic, and Leningrad fronts. In 1945, Chistiakov commanded the Twenty-fifth Army, which fought in the Harbin-Kirin Operation during the defeat of the Japanese forces in the Soviet Far East. After the war he held various command positions. He was the first deputy commander of the Transcaucasian Military District from 1954 to 1957 and inspector general of the Inspectorate of Ground Forces of the Main Inspectorate of the Ministry of Defense of the USSR from 1957 to 1968. He retired in July 1968.

Chistiakov was a deputy to the second and fourth convocations of the Supreme Soviet of the USSR. He has been awarded two Orders of Lenin, five Orders of the Red Banner, two orders of Suvorov First Class, two orders of Kutuzov First Class, the Order of Suvorov Second Class, and various medals. He has also received various foreign orders and medals. [29–647–4]

CHISTIAKOV, MIKHAIL NIKOLAEVICH. Born Nov. 6 (18), 1896, in St. Petersburg. Soviet military leader; marshal of the artillery (1944). Member of the CPSU since 1944.

The son of a railroad employee, Chistiakov fought in World War I from 1915 as an artillery scout and was twice awarded the Cross of St. George. In 1917 he was promoted to ensign and made a platoon commander. He joined the Red Army in September 1918. During the Civil War of 1918–20, Chistiakov commanded a platoon, a battery, and a battalion. He graduated from courses for senior command personnel in 1926 and from advanced courses for higher command personnel at the M. V. Frunze Military Academy in 1930.

During the Great Patriotic War of 1941–45, Chistiakov was commander of artillery on the Western Front and later commanded the Thirty-fourth Army on the Northwestern Front (1941). He was named head of the Directorate of Combat Training of the Main Artillery Directorate in December 1941 and deputy artillery commander of the Red Army in June 1943. As a representative of the commander of the artillery, Chistiakov helped prepare and execute several operations on the Stalingrad, Don, Southern, Voronezh, Steppe, Third and Fourth Ukrainian, Third Byelorussian, and First, Second, and Third Baltic fronts. As acting commander of the artillery under the commander in chief of Soviet forces in the Far East, he participated in the defeat of the Japanese forces in the Far East in 1945.

In April 1946, Chistiakov was named deputy artillery commander of the armed forces of the USSR. He became inspector general of the Main Inspectorate of the Ministry of Defense in November 1957 and military inspector-adviser of the Group of Inspectors General of the Ministry of Defense in December 1964. Chistiakov has been awarded three Orders of Lenin, the Order of the October Revolution, three Orders of the Red Banner, the Orders of Suvorov First and Second Class, two orders of Kutuzov First Class, the Order of Bogdan Khmel'nitskii First Class, the Order of the Patriotic War First Class, the Order of the Red Star, the Order for Service to the Motherland in the Armed Forces of the USSR Third Class, and various medals. He is also the recipient of foreign orders and medals. [29–648–1]

CHISTIAKOV, PAVEL PETROVICH. Born June 23 (July 5), 1832, in the village of Prudy, in present-day Kalinin Oblast; died Nov. 11, 1919, in Detskoe Selo, now the city of Pushkin. Russian educator and painter.

Chistiakov studied at the Academy of Arts with P. V. Basin from 1849 to 1861. From 1862 to 1870 he studied on a stipend at the academies of arts in Paris and Rome. Chistiakov taught at the Drawing School of the St. Petersburg Society for the Encouragement of the Arts from 1860 to 1864 and at the St. Petersburg Academy of Arts from 1872 to 1912. He was a professor at the academy's studio from 1908 to 1910 and head of the academy's mosaic department from 1890 to 1912. His students included V. M. Vasnetsov, M. A. Vrubel', V. D. Polenov, I. E. Repin, V. A. Serov, and V. I. Surikov.

Chistiakov's system of teaching art developed in constant struggle with the stagnant system of academism and played an enormous role in the development of realism in Russian art of the second half of the 19th century. Chistiakov's goal was the preparation of a citizen-artist of high professional skill. His teaching method presupposed the blending of the artist's direct perception of the subject with a scientific study of it. In his own work he strove for drama in his historical compositions and psychological depth in his historical and genre portraits. Examples of his works are *Head of a Chuchara* (1864, Russian Museum, Leningrad) and *The Boyar* (1876, Tret'iakov Gallery, Moscow).

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CHISTIAKOVO, until 1964, the name of the city of Torez, Donetsk Oblast, Ukrainian SSR. [29–649–1]

CHISTOE, an urban-type settlement in Chkalovsk Raion, Gorky Oblast, RSFSR. Chistoe is located 34 km southwest of the Zavolzh'e railroad station, the terminus of a spur from Gorky. The settlement has a peat enterprise. [29–642–2]

CHISTOOZERNOE, an urban-type settlement and the administrative center of Chistoozernoe Raion, Novosibirsk Oblast, RSFSR. The settlement has a railroad station on the Tatarskaia-Karasuk line, 528 km west of Novosibirsk. Chistoozernoe also has a butter factory. [29–643–2]

CHISTOP, a mountain massif in the northern Urals, in Sverdlovsk Oblast, RSFSR. The Chistop Range rises to an elevation of 1,292 m and is composed mainly of gabbro. The weakly dissected slopes have mountain taiga of spruce, larch, and birch, while at elevations higher than 900 m there is moss and lichen tundra. [29–644–1]

CHISTOPOL', a city under republic jurisdiction and the administrative center of Chistopol' Raion, Tatar ASSR. Landing on the Kuibyshev Reservoir. Located 144 km southeast of Kazan. Population, 67,000 (Jan. 1, 1977). The Avtospetsoborudovanie Plant is located in Chistopol'. The city also has a watch and clock plant, a ship repair yard, a motor-vehicle repair plant, a plant producing liqueurs and spirits, a clothing factory, a knitwear factory, a footwear factory, and a furniture factory. Educational and cultural institutions include a sovkhoz technicum, a medical school, a pedagogical school, a museum of local lore, and a people's amateur theater. [29–644–2]

CHISTOVICH, NIKOLAI IAKOVLEVICH. Born Dec. 2 (14), 1860, in St. Petersburg; died Mar. 29, 1926, in Leningrad. Soviet internist and microbiologist; specialist on infectious diseases. Academician of the Academy of Military Medicine (1914).

Upon graduation from the Academy of Military Medicine in 1884, Chistovich worked in S. P. Botkin's clinic. In 1887 he defended his dissertation on experimental cardiology, which he wrote under the direction of I. P. Pavlov. Between 1887 and 1890, Chistovich worked abroad, at the Koch Institute in Berlin and in I. I. Mechnikov's laboratory in Paris. In 1898 he became a professor in the subdepartment of contagious diseases and bacteriology at the Academy of Military Medicine; in 1910 he was made a professor in the academy's clinic of internal medicine. From 1900 he occupied the chair of descriptive pathology and treatment of internal diseases at the Women's Medical Institute (now the First Leningrad Medical Institute).

Chistovich was one of the first in Russia to regard infectious diseases as a scientific discipline and a subject to be taught. His research was on lobar pneumonia, cholera, tuberculosis, and other infectious diseases. He also studied aspects of local immunity, antiphagins, the bacteria carrier state, hematology, and the history of medicine. In 1922, Chistovich wrote the first Soviet textbook of descriptive pathology and treatment of internal diseases. He also founded a clinical school (M. I. Arinkin, S. I. Zlatogorov, S. M. Ryss, N. N. Savitskii).

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V. I. BORODULIN [29–642–1]

CHITA, a city and administrative center of Chita Oblast, RSFSR. Located in Transbaikalia, at the influx of the Chita River into the Ingoda River. Population, 294,000 (1977; 121,000 in 1939, 172,000 in 1959, and 241,000 in 1970). A transportation junction on the Trans-Siberian Railroad and a highway junction, Chita has an airport. It is divided into four city districts. It was awarded the Order of the October Revolution on Oct. 23, 1972.

Chita has existed since 1653, when it was known as the settlement of Ingodinskoe Zimov'e. In 1690 it became a *sloboda* (tax-exempt settlement), populated by cossacks and trappers (it was renamed Chitinskaia in 1706), near which a stockade was built, where many Decembrists later served their sentences of hard labor. In 1851 it became a city and administrative center of Transbaikalia Oblast. Chita's economic importance grew after the building of the Transbaikal Railroad in 1900. Gold mining and the lumber industry developed in the city's environs. Chita was the seat of the administration of the Nerchinsk Mining District. In 1902, under the direction of E. M. Iaroslavskii, a Social Democratic organization and a committee of the RSDLP were established. The workers and soldiers of Chita took an active part in the Revolution of 1905–07 (*see* CHITA REPUBLIC).

Soviet power was established on Feb. 16, 1918. On Aug. 26, 1918, the city was seized by White Guard bands. On Oct. 22, 1920, partisan units of the Amur Front liberated the city, which became the capital of the Far East Republic. In 1922 it was made the administrative center of Transbaikalia Province, in 1926, of the Chita District of the Far East Krai, and in 1937, of Chita Oblast.

Chita is a major industrial and cultural center of Eastern Siberia. The most important enterprises are the automotive assembly plant, the machine-building plant, the machine-tool plant, the K. E. Voroshilov Locomotive and Railroad Car Repair Plant, and the furniture and wood-products combine. A state district power plant is located in the city, as is the Vostochnaia lignite mine. Light industry is represented by worsted cloth and leather-footwear combines, a chrome-leather tannery, and a sheepskin and fur factory. The food industry is represented by flour-milling, meat-packing, and milk combines and by enterprises of the Ingoda food firm.

Among the research and educational institutions in Chita are the Transbaikalia Integrated Scientific Research Institute of the Ministry of Geology of the USSR, the Transbaikalia Scientific Research Technological Institute of Sheep and Beef Cattle Raising, a branch of the institute of experimental veterinary medicine of Siberia and the Far East, pedagogical, medical, and polytechnic institutes, a branch of the Khabarovsk Institute of Railroad Engineers, a correspondence law school of the University of Irkutsk, and 12 specialized secondary educational institutions. Also in Chita are a dramatic theater, a puppet theater, a philharmonic society, and the oblast museum of local lore.

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CHITAIA, GEORGII SPIRIDONOVICH. Born Nov. 10, 1890, in the city of Poti. Soviet ethnographer. Academician of the Academy of Sciences of the Georgian SSR (1969).

Chitaia has studied the ethnogenesis and the material and spiritual culture of Georgians and other peoples of the Caucasus. He has written on general ethnography and the methods of ethnographic research. Chitaia has been awarded the Order of the Red Banner of Labor.

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CHITA OBLAST, part of the RSFSR. Formed on Sept. 26, 1937. Located in Transbaikalia. Area, 431,500 sq km. Population, 1.227 million (Jan. 1, 1977). Chita Oblast, which includes the Aga-Buriat Autonomous Okrug (formerly Aga-Buriat National Okrug), is divided into 30 raions and has ten cities and 42 urban-type settlements. The administrative center is the city of Chita. Chita Oblast was awarded the Order of Lenin on Dec. 14, 1957.

Natural features. Most of the oblast lies between the Iablonovo Range in the west and the Argun' River in the east. The relief is dominated by mountains of medium elevation (600–700 m). Among the ranges east of the Iablonovo Range are the Cherskii, Borshchovochnyi, and Daurian ranges, which are separated by intermontane basins. The vast Onon Plain lies in the south. In the north, the mountains rise to an elevation of 3,000 m, in the Kodar Range, and are extremely dissected; there are alpine-type peaks.

The climate is sharply continental. The winters are long and dry, with average January temperatures between −26° and −33°C. Summers are very warm and short, with average July temperatures of 17° to 21°C. Annual precipitation ranges between 240 and 400 mm, most of which occurs in the summer. The growing season lasts 120 to 160 days. Permafrost is widespread.

The largest rivers are the Shilka and the Argun' (the sources of the Amur). The other major rivers, the Khilok and the Chikoi, belong to the Lake Baikal basin. The Vitim and the Olemka flow into the Lena River. The potential hydroelectric power resources are 9.4 gigawatts. The largest lakes are Bol'shoi Leprindo, Leprindokan, Nichatka, the Chita Lakes group, Kenon, Zun-Torei, and Barun-Torei. There are several mineral springs in the oblast.

Mountain taiga podzolic soils predominate in Chita Oblast. There are chernozems and chestnut soils in the steppes and meadow-frost and meadow-chernozem soils in the intermontane basins. Forests cover about one-half of the oblast's area. The total timber reserves are 2.3 billion cu m; 78.6 percent of the forested area is covered by Dahurian larch, 12 percent by pine, 4.9 percent by cedar, and 3.2 percent by birch. The steppes are covered with various grasses and forbs.

The forests abound in various valuable fur-bearing animals, including the sable, squirrel, Siberian weasel, ermine, fox, brown bear, and lynx. Ungulates include the elk, roe deer, wild boar, reindeer, and Manchurian deer. Badgers, wolves, chipmunks, hares, and susliks inhabit the forest-steppe and steppe regions. Muskrats have been acclimatized. Common birds include capercaillies, hazel hens, grouse, woodpeckers, cuckoos, larks, ducks, cranes, and bustards. The rivers contain such valuable fish as the cisco, sturgeon, taimen (*Hucho taimen*), and common whitefish.

The Sokhondo Wildlife Preserve is located in Chita Oblast.

Population. Among the peoples living in Chita Oblast are Russians (89.6 percent; 1970 census), Buriats (4.5 percent), Ukraini-

ans (2.2 percent), and Tatars (1.3 percent). The average population density is 2.8 persons per sq km (1977). The most densely populated areas are along the Trans-Siberian Railroad and in the valleys of the Ingoda, Shilka, and Argun' rivers.

The urban population constitutes 63 percent. The principal cities are Nerchinsk and Sretensk; Petrovsk-Zabaikal'skii, Balei, Borzia, Shilka, Mogocha, Khilok, and Krasnokamensk have been built during the years of Soviet power.

Economy. The economy is dominated by industry. Between 1940 and 1976 the gross industrial product increased by a factor of 7.

Mining is an important branch of industry. The mines and ore-dressing combines are highly mechanized. Gold (at the Balei and other deposits), fluorite and molybdenum (at Davenda), tin (at Sherlovaia Gora), and lead-zinc ores (at Khapcheranga) are mined. Ferrous metallurgy is represented by the Petrovsk-Zabaikal'skii Metallurgical Works. Coal is mined at the Kharanor and other deposits. The Chita State District Power Plant produces 530 megawatts of electricity, and the Kharanor State District Power Plant is under construction (1978). There are thermal steam-turbine power plants in Krasnokamensk, Sherlovaia Gora, Priargunsk, and Petrovsk-Zabaikal'skii.

The lumber industry is well developed. Various wood products are manufactured by the Olengui Combine, including lumber, sleepers, and crates. The Amazar Wood-products Combine is under construction (1978). Machine building specializes in "northern style" automobile assembly and in the production of mobile compressor units, refrigeration units, drilling equipment, rock-loading machines, metal-cutting machine tools, diesel boats, fishing vessels, bridge cranes, and saw frames (plants in Chita, Nerchinsk, and the settlements of Darasun, Kokui, Oloviannaia, and Tarbagatai).

The principal enterprises of light industry are the worsted-wool combine, leather-footwear combine, chrome-leather tannery, and sheepskin and fur factory in Chita and the boot factory in Sretensk. The food-processing industry is also developed, with meat-packing plants in Chita, Borzia, Oloviannaia, Petrovsk-Zabaikal'skii, Nerchinsk, Sretensk, and Pervomaisk; there are a number of enterprises of the butter and milk industry. Mineral water is bottled (Darasun, Kuka, and Molokovka mineral waters).

The main branch of agriculture is stock raising, which is dominated by the raising of fine-wooled and semifine-wooled sheep. Cattle are also raised, as are reindeer (in the north). The oblast has (Jan. 1, 1977) 4.311 million sheep and goats, 664,000 head of cattle, and 128,000 hogs. The major stock-raising regions are the Aga-Buriat Autonomous Okrug and the southern and southeastern parts of the oblast. The hunting and trapping of sable, squirrel, and muskrat for fur is important in the mountain and taiga regions.

Agricultural lands total (1976) 6.8 million hectares (ha), of which the sown area accounts for 31.8 percent, pastures for 50.4 percent, and hayfields for 17.8 percent. The oblast has (1976) 151 kolkhozes and 99 sovkhozes. The lands under cultivation total (1976) 1.8 million ha, with grains, occupying 1.2 million ha, predominating. Potatoes and vegetables occupy 30,000 ha, and fodder crops, 60,000 ha. Grains include wheat (400,000 ha in 1976), oats, barley, and buckwheat.

Transportation. The oblast has 2,126 km of railroads (1976). It is crossed from west to east by the Trans-Siberian Railroad, of which the Petrovskii Zavod–Karymskaia section is electrified; there is a branch line to Mongolia and China. Plans are under way to construct a section of the Baikal-Amur Railroad in northern Chita Oblast.

Motor vehicles provide local transportation. The total length of roads is 13,400 km (1976), of which 7,000 km are hard-surfaced. The main highways are Ulan-Ude–Chita–Zabaikal'sk, Chita-Darasun-Khapcheranga, Chita-Aginskoe-Nerchinsk-Sretensk, Borzia–Nerchinskii Zavod–Sretensk, and Petrovsk-Zabaikal'skii–Krasnyi Chikoi–Iamarovka.

The Shilka River is the principal artery. There are 2,100 km of waterways. The city of Chita is linked by air with Moscow, Irkutsk, Khabarovsk, and other cities.

INTERNAL DIFFERENCES. The Khilok-Ingoda Region is noted for ferrous metallurgy, machine building, light industry, the food-processing industry, logging, timber processing, and the mining of lignite. Agriculture is dominated by the production of dairy products and vegetables. There is also fur trapping.

The Shilka-Argun' Region is the center of the ore-mining (nonferrrous metals) industry. Coal and lignite are also mined. Meat, wool, and other agricultural products are processed. Sheep are raised on pastures, and grains are grown.

The Vitim-Amur Region is known for gold and molybdenum mining and logging. There is also hunting and reindeer breeding. The area abounds in mineral and water resources. Preparations are under way for the construction of a section of the Baikal-Amur Railroad and for exploitation of the Udokan Mining Region.

Education, cultural affairs, and public health. In the 1914–15 academic year, the area that is now Chita Oblast had 637 general-education schools, with 32,600 pupils and students, and one specialized secondary educational institution, with 76 students. There were no higher educational institutions. In the 1976–77 academic year, Chita Oblast had 779 general-education schools of all types, with about 191,500 pupils and students, 40 vocational-technical educational institutions, with more than 14,900 students, and 21 specialized secondary educational institutions, with about 21,700 students. Its higher educational institutions, including polytechnic, medical, and pedagogical institutes, a branch of the Khabarovsk Institute of Railroad Engineers, and the correspondence law school of the University of Irkutsk, all located in Chita, had an enrollment of 11,800.

The largest scientific establishments are the Transbaikalia Integrated Scientific Research Institute of the Ministry of Geology of the USSR, the Transbaikalia Scientific Research Technological Institute of Sheep and Beef Cattle Raising, and a branch of the institute of experimental veterinary medicine of Siberia and the Far East.

Chita Oblast has (Jan. 1, 1977) 734 public libraries, with 7.094 million books and journals, and four museums of local lore—the Chita Oblast Museum of Local Lore, the Aga Okrug Museum of Local Lore, the Nerchinsk Interraion Museum of Local Lore, and the Sretensk Raion Museum of Local Lore. It also has an oblast dramatic theater and an oblast puppet theater, both in Chita, as well as 879 clubs and 1,096 motion-picture projection units.

The oblast newspapers *Zabaikal'skii rabochii* (Transbaikal Worker; since 1905) and *Komsomolets Zabaikal'ia* (Transbaikal Komsomol; since 1951) are published. Broadcasts from the All-Union Radio, totaling 38 hours per day, are relayed. Local broadcasts total 11 hours, including seven hours of basic programming and seven hours of VHF and FM. Television broadcasts over two programs total 15.5 hours per day, of which 12 hours are programs relayed by way of the Orbita system and 3.5 hours are local programs.

As of Jan. 1, 1977, Chita Oblast had 191 hospitals, with 14,100 beds (11.5 beds per 1,000 inhabitants), and 3,400 physicians (one physician per 364 inhabitants). Health resorts include the balneological and balneoclimatic resorts Kurort-Darasun, Shivanda, Kuka, Urguchan, Iamkun, Molokovka, Olentui, and Iamarovka, the Ugdan pelotherapeutic resort, the Shiviia and Darasun-Nerchinsk balneological therapeutic districts, and 11 sanatoriums. Tourist sites include the Chary Depression and the Kodar and Udokan ranges. There are five tourist centers, near Chita and at Kuka and the settlement of Arei.

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A. A. NEDESHEV [29–653–2]

CHITA OPERATIONS OF 1920, during the Civil War of 1918–20, combat operations conducted from April to October 1920 by the People's Revolutionary Army (PRA) of the Far East

Republic and partisans against the White Guards and interventionists for the liberation of Chita. The western and eastern parts of the Far East Republic were separated by the "Chita plug"—the region including Chita, Karymskaia, Sretensk, and Nerchinsk occupied by White Guards (groups led by G. M. Semenov and V. O. Kappel') and the Japanese interventionists. In order to eliminate the Chita plug, three operations were launched, during which the PRA command, in adhering to Lenin's directive on the impermissibility of military actions against the Japanese forces, was compelled to avoid clashes with the Japanese at all costs.

By the end of March 1920, the White Guard forces under the command of Lieutenant General G. M. Semenov numbered approximately 20,000 men, 496 machine guns, and 78 guns. The activities of the eastern Transbaikalia partisans forced the White Guard command to tie up more than half of its forces in the Sretensk and Nerchinsk areas; west of Chita and in the city itself, the White Guards numbered 8,500 men, 255 machine guns, and 31 guns. Also here were units of the Japanese Fifth Infantry Division, which numbered 5,200 men and 18 guns. The PRA, then in the organizing stage (commander in chief G. Kh. Eikhe; members of the Military Council N. M. Goncharov and A. A. Shiriamov), numbered, including the partisan detachments, approximately 9,800 men, 72 machine guns, and 24 guns.

In the first Chita operation (April 10–13), the PRA launched the main attack on Chita from the north across the Iablonovo Range and a secondary attack from the southwest. The main forces—V. I. Burov's column—managed to reach the outskirts of Chita but were soon pushed back by the Japanese forces. In the west, E. V. Lebedev's column advanced after the withdrawing Japanese forces to the Gongota station, where its advance was halted by the enemy.

In the second Chita operation (April 25 to May 5), a lack of coordination in the operations of three small columns of PRA forces and partisans (who had formed the Amur Front on April 22) enabled the enemy, strengthened by reinforcements, to halt the attack with a maneuver in the interior operational sectors and to throw the main PRA forces back to the west between May 3 and May 5. In the summer of 1920, the Far East Republic's position became firmly established and, on July 17, the Japanese command was compelled to sign the Gongota agreement on the cessation of hostilities and to begin the evacuation of its forces from Chita and Sretensk on July 25. A neutral zone was established west of Chita. As a result, the focus of the struggle between the PRA and the White Guards was shifted to the Amur Front (commanded first by D. S. Shilov and then by S. M. Seryshev; members of the Military Council Ia. P. Zhigalin and S. G. Velezhev), where the PRA forces numbered approximately 30,000 men, 35 guns, two tanks, and two armored trains. The White Guards had approximately 35,000 men, 40 guns, and 18 armored trains.

In the third Chita operation (October 1–31), the partisans to the north and south of Chita launched various military actions, while the forces of the Amur Front passed to the offensive on October 15 and took the Karymskaia railroad station and Chita on October 22. Counterattacks by the White Guard forces were repulsed. On October 30, PRA units occupied the stations Byrka and Oloviannaia, and the remaining White Guards fled to Manchuria.

The crushing defeat of the White Guards made possible the unification of the Transbaikalia and Amur oblasts, forced the Japanese to hasten the evacuation of their troops from Khabarovsk, and paved the way for the liberation of the Far East. [29–659–2]

CHITA REPUBLIC, a revolutionary democratic dictatorship of workers and peasants, established as a result of a de facto takeover of Chita by the Chita committee of the RSDLP and the Chita soviet of soldiers' and cossacks' deputies in December 1905 and January 1906.

In August 1905 the workers of the railroad shops and depots, under the leadership of the Bolsheviks, began forming a militia, which during the October All-Russian political strikes of 1905 grew to 2,000 persons. On October 15, the arming of all the workers was begun, and subsequently the number of workers in the militia, headed by A. A. Kostiushko-Voliuzhanich, reached 4,000. On November 22, at the suggestion of the Bolsheviks, a soviet of soldiers' and cossacks' deputies was formed. On November 24, political prisoners from the Chita prison were freed, soon followed by the release of prisoners from Akatui prison. In December, control of postal and telegraph communications was established and an eight-hour workday at railroad and commercial enterprises was instituted. Government institutions were virtually paralyzed. Power had in fact passed into the hands of the Chita committee of the RSDLP and the soviet of soldiers' and cossacks' deputies.

On December 7, the Bolshevik newspaper *Zabaikal'skii rabochii* (Transbaikal Worker) began publication under the editorship of V. K. Kurnatovskii; it played a significant role in rallying the revolutionary forces in Transbaikalia. After crushing the December uprising in Moscow and Central Russia, the tsarist government sent punitive expeditions to Siberia. A detachment under General P. K. Rennenkampf advanced on Chita from the east, and a detachment under General A. N. Meller-Zakomel'skii from the west. In light of the superiority of the government forces, the Chita committee of the RSDLP decided to avoid a confrontation. On January 22, Rennenkampf's forces occupied Chita. Reprisals against revolutionary workers, soldiers, and cossacks began. Among those executed by firing squad were many Bolsheviks, including I. V. Babushkin, A. A. Kostiushko-Voliuzhanich, and A. I. Popov.

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Iakovlev, N. N. *Vooruzhennye vosstaniia v dekabre 1905 g.* Moscow, 1957. G. Ia. DANILINA [29–658–1]

CHITTAGONG, a city in Bangladesh, on the Karnaphuli River; located 15 km from the Bay of Bengal. Capital of Chittagong Division and District. Population, 416,000 (1974). A major transportation junction, Chittagong is the largest seaport in Bangladesh; in 1975 it handled 4.7 million tons of freight. The city is the country's most important economic center after Dacca. It has jute, cotton, chemical, food-processing, match, wood-products, metalworking, and cement industries. It also has a metallurgical plant, an oil refinery, a shipyard, and trading companies. There is a university in the city. [29–660–2]

CHITTARANJAN, a city in northeast India, in West Bengal. Population, 40,800 (1971). Chittaranjan is a new industrial center located in the country's major region of heavy industry, in the Damodar River valley. The city has a locomotive plant. [29–660–3]

CHIVILIKHIN, VLADIMIR ALEKSEEVICH. Born Mar. 7, 1928, in Mariinsk, Kemerovo Oblast. Soviet Russian writer. Member of the CPSU since 1952.

The son of a worker, Chivilikhin graduated from the faculty of journalism of Moscow State University in 1954. In 1957 he published the documentary novella *The Life Force*. In the novellas *Of Klava Ivanova* (1964), *Fiddlesticks!* (1965), *Above Sea Level* (1967), and *The Many-colored Rock* (1969) he shows human personalities in the process of formation and presents a positive image of contemporary man.

Chivilikhin explores his principal subjects—man, society, and nature—in both artistic and publicist works, including *Land in Distress* (1969), *Does She Love You?* (1968), *Swedish Stops* (1974), and *By Cities and Hamlets* (1976). He published *Poems* in 1974.

Chivilikhin received the Lenin Komsomol Prize in 1966 and the M. Gorky Prize of the RSFSR in 1977; he has been awarded two orders.

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CHIZHAPKA, a river in Tomsk Oblast, RSFSR; a right tributary of the Vasiugan of the Ob' River basin. The Chizhapka is 511 km long and drains an area of 13,800 sq km. It flows through the Vasiugan'e region. The river is fed primarily by snow; high water occurs between May and July. The mean flow rate 24 km from the mouth is 85.5 cu m per sec. The Chizhapka freezes over in late October or early November, and the ice breaks up in late April or in May. The river is used for timber flotation. The Chizhapka is navigable for a distance of 108 km from its mouth. [29–550–4]

CHIZHEVSKII, ALEXSANDR LEONIDOVICH. Born Jan. 26 (Feb. 7), 1897, in the city of Ciechanowiec, now in Poland; died Dec. 20, 1964, in Moscow. Soviet biophysicist; founder of heliobiology and aeroionification. Son of L. V. Chizhevskii.

Chizhevskii graduated from the Moscow Archaeological Institute in 1917 and the Moscow Commercial Institute in 1918. He also studied at the faculties of physics and mathematics (1915–19) and medicine (1919–22) of Moscow University. From 1917 to 1927 he taught a course on the physical methods of archaeology at Moscow University and the Moscow Archaeological Institute. From 1922 to 1924 he was a consultant at the Institute of Biophysics, and from 1925 to 1931, a senior research worker (professor) at the laboratory of animal psychology of the People's Committee of Education of the RSFSR. In 1931, Chizhevskii organized the Central Scientific Research Laboratory of Ionization. From 1937 to 1942 he headed two laboratories of the Construction Administration of the Palace of Soviets of the Council of People's Commissars of the USSR; from 1958 to 1962 he was head of the laboratory of aeroionification under the State Planning Commission of the USSR.

While studying the effects of cosmic physical factors on processes in living nature, Chizhevskii established the relationship between the cycles of solar activity and many phenomena in the biosphere; he showed that the physical fields of the earth and its environment should be included among the basic causes affecting the condition of the biosphere. In 1935 he discovered the metachromasia of bacteria, known as the Chizhevskii-Vil'khover effect, which makes it possible to predict solar emissions harmful to man on earth as well as in space. Chizhevskii was the first to experimentally determine the opposite physiological effects of negative and positive air ions on living organisms, the pathologic effect of air with reduced ion concentration, and the stimulating effect of negative air ions on living organisms (1919–30). He also made use of the artificial aeroionization in medicine, agriculture, and stock raising (1930–36). The importance of Chizhevskii's work on aeroionification was noted in a resolution of the Council of People's Commissars of the USSR in 1931. Chizhevskii also discovered the spatial arrangement of the structural elements in flowing blood.

Chizhevskii was honorary president of the international congress on biological physics and space biology (United States, 1939).

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L. V. GOLOVANOV [29–550–5]

CHIZHEVSKII, LEONID VASIL'EVICH. Born Jan 1 (13), 1861, in Kiev; died Apr. 14, 1929, in Kaluga. Russian artilleryman and scholar. Major general (1916). Hero of Labor of the Workers' and Peasants' Red Army (1928).

Chizhevskii graduated from the Alexander Military School in 1881. During World War I, he commanded an artillery battalion and a brigade on the Southwestern Front. He joined the Red Army in 1918 and served as director of courses for Red Army commanders in Kaluga. In 1885, Chizhevskii invented and tested an azimuth instrument for commanders that made it possible to deliver parallel sheaf fire on unseen targets.

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CHIZHEVSKII, NIKOLAI PROKOP'EVICH. Born Mar. 27 (Apr. 8), 1873, in Kazan; died Apr. 22, 1952, in Moscow. Soviet metallurgist; specialist in the chemistry of coke. Academician of the Academy of Sciences of the USSR (1939).

Chizhevskii graduated from the faculty of physics and mathematics at St. Petersburg University in 1899, the faculty of metallurgy at the Mining Academy in Leoben, Austria, in 1902, and the faculty of chemistry at the Kiev Polytechnic Institute in 1904. He became an instructor at the Tomsk Institute of Technology in 1909 and served as head of the institute's faculty of ferrous metallurgy from 1910 to 1923; he gained a professorship at the institute in 1911. Chizhevskii became a professor at the Moscow Academy of Mines in 1923 and a professor at the Moscow Institute of Steel in 1930. From 1935 he also worked at the Institute of Fuel Resources of the Academy of Sciences of the USSR.

Chizhevskii's major work was on the metallurgy of iron and steel, the direct reduction of iron ore, expansion of the fuel base for metallurgy, and the design of coke ovens. He received the State Prize of the USSR in 1943. He was also awarded two orders and several medals.

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A. S. FEDOROV [29–551–2]

CHIZHIKOV, DAVID MIKHAILOVICH. Born Nov. 5 (17), 1895, in Novaia Priluka, in what is now Vinnitsa Oblast; died Aug. 24, 1974, in Moscow. Soviet metallurgist. Corresponding member of the Academy of Sciences of the USSR (1939). Member of the CPSU from 1921.

Upon graduation from the Moscow Academy of Mines in 1924, Chizhikov worked as an engineering director at various enterprises. From 1933 to 1941 he worked at the Moscow Institute of Nonferrous Metals and Gold, where he became a professor in 1934. He worked at the Institute of Metallurgy of the Academy of Sciences of the USSR from 1939 to 1974.

Chizhikov's principal work dealt with the theory and technology of electrothermal production of nonferrous and rare metals, the chlorination of complex metal and tin ores, and the electrolysis of sulfide materials. Chizhikov received the State Prize of the USSR twice (1942 and 1951). He was also awarded the Order of the October Revolution, two other orders, and several medals.

WORKS

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Metallurgiia tiazhelykh tsvetnykh metallov. Moscow-Leningrad, 1948.
Khloridnaia metallurgiia olova. Moscow, 1962. (With G. S. Frents and B. Ia. Tratsevitskaia.)
Gidroelektrometallurgiia sul'fidnykh splavov i shteinov. Moscow, 1962. (With others.)

N. K. LAMAN [29–552–1]

CHIZHOV, MATVEI AFANAS'EVICH. Born Nov. 10 (22), 1838, in the village of Pudovo, in present-day Moscow Oblast; died May 28 (June 10), 1916, in Petrograd. Russian sculptor.

Chizhov studied at the Stroganov Commercial Art School in Moscow from 1856 to 1857, the Moscow School of Painting, Sculpture, and Architecture from 1857 to 1860, and the St. Pe-

tersburg Academy of Arts from 1860 to 1867 (with N. S. Pimenov and P. K. Klodt). In 1893 he became a member of the Academy of Arts. Chizhov taught at Baron Shtiglits' Central School of Technical Drawing in St. Petersburg from 1879 to 1910.

Chizhov's works are devoted to themes from the life of the people. His treatment of figures is similar to that of the *peredvizhniki* (the "wanderers"—a progressive art movement). Examples are *Peasant in Misery* (bronze, 1872, Russian Museum, Leningrad; marble, 1873, Tret'iakov Gallery, Moscow) and *Mother Teaching Her Daughter the Mother Tongue* (plaster of paris, 1873, Russian Museum, Leningrad). Chizhov also sculpted a number of portraits.

REFERENCE
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CHKALOV, VALERII PAVLOVICH. Born Jan. 20 (Feb. 2), 1904, in the village of Vasilevo, now the city of Chkalovsk, Chkalovsk Raion, Gorky Oblast; died Dec. 15, 1938, in Moscow. Soviet aviator. Hero of the Soviet Union (July 24, 1936); brigade commander. Member of the CPSU from 1936.

The son of a worker, Chkalov volunteered for the Red Army in 1919 and worked as an airplane assembler with an airpark in Nizhny Novgorod. From 1921 to 1924, he studied at the Egor'evsk and Borisoglebsk flight schools, the Moscow School of Aerobatics, and the Serpukhov Higher School of Air Gunnery and Bombing. In 1924 he joined the Red Banner Fighter Squadron, distinguishing himself as a skillful pilot. In 1930 he became a test pilot at the Air Force Research Institute. He tested more than 70 types of airplanes and developed and introduced new aerobatic maneuvers, namely, the ascending spin and the slow roll.

Chkalov was exceptionally courageous, persistent, and tenacious. Between July 20 and 22, 1936, Chkalov, together with G. F. Baidukov and A. V. Beliakov, made a nonstop flight from Moscow to Udd Island via Petropavlovsk-na-Kamchatke, covering 9,374 km in 56 hours and 20 minutes. Between July 18 and 20, 1937, Chkalov, Baidukov, and Beliakov flew nonstop from Moscow to Vancouver (USA) over the North Pole, covering 8,504 km in 63 hours and 16 minutes.

Chkalov was a deputy to the first convocation of the Supreme Soviet of the USSR. He was awarded two Orders of Lenin and the Order of the Red Banner. He died while testing a new fighter plane. He is buried on Red Square at the Kremlin wall.

WORKS
Moia zhizn' prinadlezhit Rodine: St. i rechi. Moscow, 1954.
REFERENCES
Vodop'ianov, M. V. *Letchik Valerii Chkalov*. Moscow, 1959.
Beliakov, A. V. *V. Chkalov*. Moscow, 1974. [29–667–6]

CHKALOVSK (until 1937, Vasilevo) a city (since 1955) and the administrative center of Chkalovsk Raion, Gorky Oblast, RSFSR. A landing on the right bank of the Volga, on the Gorky Reservoir, Chkalovsk is located 40 km from the Zavolzh'e railroad station and 95 km northwest of Gorky. Industry is represented by the Ul'ianov (Lenin) Shipyard, a drawn-thread embroidery workshop, a furniture factory, a clothing factory, and a winery. The city was renamed for V. P. Chkalov, who was born in Vasilevo; a memorial museum devoted to Chkalov is located in the city. [29–668–2]

CHKALOVSK, a city (since 1956) under oblast jurisdiction in Leninabad Oblast, Tadzhik SSR. Located on the Leninabad-Kokand highway, 3 km from the Leninabad railroad station on the Khavast-Kokand line. Population, 27,000 (1974). Chkalovsk has a theater of drama and comedy and a puppet theater. [29–668–3]

CHKHARTISHVILI, ARCHIL EVSTAF'EVICH. Born Jan. 6 (19), 1905, in Tiflis. Soviet stage director. People's Artist of the USSR (1968). Member of the CPSU since 1945.

Chkhartishvili began his theatrical career in 1921. He staged plays at the Kutaisi Theater and served as artistic director of the Chechen-Ingush and Batumi theaters. During the years 1949–52 and 1963–64 he headed the Mardzhanishvili Theater in Tbilisi. He was a director at the Rustaveli Theater in Tbilisi from 1957 to 1962 and principal director from 1965 to 1968.

Chkhartishvili's most outstanding works have included *The Good Soldier Švejk* (after the novel by Hašek, 1931), Shanshiashvili's *Anzor* (1935), Tsagareli's *Times Are Different Now* (1939), Sophocles' *Oedipus Tyrannus* (1946), Mosashvili's *His Star* (1951), Vazha Pshavela's *The Exile* (1956), Vishnevskii's *An Optimistic Tragedy* (1958), Gamzatov's *Mountain Girl* (1960), Ebralidze's *A Modern Tragedy* (1961), Euripides' *Medea* (1962), and Eliozishvili's *Old Zurnachi* (1966).

Chkhartishvili's productions are noted for their brilliant theatricality, skillful and dynamic staging of mass scenes, and rhythmic integration of action and music.

Chkhartishvili received the State Prize of the USSR in 1952. He has been awarded four orders and several medals.

E. M. KRASNOVSKAIA [29–778–2]

CHKHEIDZE, NIKOLAI SEMENOVICH (also Karlo Chkheidze). Born 1864 in the village of Puti, in what is now Zestafoni Raion, Georgian SSR; died 1926 in Paris. Menshevik leader.

Chkheidze became involved in the social-democratic movement in the late 1890's. He represented Tiflis Province as a deputy to the Third State Duma of 1907–12 and the Fourth State Duma of 1912–17 and served as chairman of the latter's Menshevik faction. During World War I he was a centrist; he favored worker participation in the war industries committees and opposed the national-liberation movement in Georgia.

After the February Revolution of 1917, Chkheidze was a member of the Provisional Committee of the State Duma, chairman of the Executive Committee of the Petrograd Soviet of Workers' and Soldiers' Deputies, and chairman of the first convocation of the All-Russian Central Executive Committee. While invested with the authority of the soviets, he sought to conceal the counterrevolutionary nature of the policies of the bourgeois Provisional Government. He took part in the State Conference in Moscow in 1917.

After the October Revolution of 1917, Chkheidze served as chairman of the counterrevolutionary Transcaucasian Seim of 1918. In 1919 he became chairman of the Constituent Assembly, which was the Menshevik government of Georgia. Chkheidze emigrated in 1921. [29–779–2]

CHKHEIDZE, NODAR GEORGIEVICH. Born Aug. 18, 1917, in Tiflis. Soviet Georgian actor. People's Artist of the Georgian SSR (1966). Member of the CPSU since 1950.

In 1942, Chkheidze graduated from the Georgian Theatrical Institute and was accepted into the company of the Rustaveli Theater in Tbilisi. He plays dramatic and comedy roles and is noted for his acute characterizations, brilliant, typically Georgian sense of humor, and dramatic force. His roles have included Giko in Sundukian's *Pepo*, Chinchakhov in Buachidze's *There Is a Ferocious Dog in the Yard*, Hamlet and Edgar in Shakespeare's *Hamlet* and *King Lear*, Neznamov in Ostrovskii's *Guilty Though Guiltless*, and Franz Moor in Schiller's *The Robbers*. [29–779–3]

CHKHEIDZE, REVAZ DAVIDOVICH. Born Dec. 8, 1926, in Kutaisi. Soviet motion-picture director. People's Artist of the Georgian SSR (1966). Member of the CPSU since 1958.

Chkheidze studied in the directing department of the Tbilisi Shota Rustaveli Theatrical Institute from 1943 to 1946 and graduated in 1953 from the All-Union State Institute of Cinematography, where he studied in the workshop of M. I. Romm and S. I. Iutkevich. He is a director at the Gruziia-fil'm studio, where, together with the director T. E. Abuladze, he has produced several documentary films, as well as the feature film *Lurdzha Magdany* (1956; prizewinner at the Ninth International Film Festival in Cannes). Chkheidze's most outstanding works as a director have been *The Father of a Soldier* (1965), the leading actor of which, S. A. Zakariadze, was awarded the Lenin Prize in 1966, and *The Seedlings* (1972). His other films have included *Our Yard* (1957), *Maia From Tskhneti* (1960), and *Those Young People!* (1969).

Chkheidze was a deputy to the ninth convocation of the Supreme Soviet of the USSR. He has been awarded the Order of Lenin, two other orders, and several medals. [29–780–1]

CHKHEIDZE, USHANGI VIKTOROVICH. Born Nov. 27, 1898; died Dec. 1, 1953, in Tbilisi. Soviet Georgian actor. People's Artist of the Georgian SSR (1935).

Chkheidze enrolled in G. Dzhabadari's theater studio in 1919, and after graduating he joined the company of the Workers' Theater of the Avchal Auditorium. In 1921 he became an actor at the Shota Rustaveli Theater, and in 1928 he helped organize a theater in Kutaisi, now named the K. A. Mardzhanishvili Georgian Theater and relocated in Tbilisi. In 1935 he left the stage because of illness.

Chkheidze gained renown for his performances as Hamlet and Iago in the Shakespearean tragedies *Hamlet* and *Othello* and in the title role in Gutzkow's *Uriel Acosta*. In the Georgian repertoire he played the title role in Kakabadze's *Kvarkvare Tutaberi* and the police officer Chaliani in Dadiani's *Yesterdays'*. He also played Godun in Lavrenev's *The Break*. He was the author of the historical drama *Georgii Saakadze*, which was staged in 1940 at the Mardzhanishvili Theater, and the books *Kote Mardzhanishvili—Director and Teacher* (1949) and *Reminiscences and Letters* (1956). Chkheidze also appeared in motion pictures. [29–780–2]

CHKHENKELI, AKAKII IVANOVICH. Born 1874 in the city of Khoni, now the city of Tsulukidze, Georgian SSR; died 1959, in Paris. A leader of the Georgian Mensheviks.

Chkhenkeli joined the social democratic movement in 1898. Between 1907 and 1914 he was a Liquidator. Chkhenkeli served in the Fourth State Duma (1912–17) as a deputy from Kars and Batumi oblasts and Sukhumi Okrug. During World War I he was a defensist; that is, he supported the war on the grounds of national defense.

After the February Revolution of 1917, Chkhenkeli became a commissar of the bourgeois Provisional Government in Transcaucasia and a member of the Special Transcaucasian Committee. In April 1918 the Transcaucasian Seim confirmed him as head of the Transcaucasian Provisional Government. He subsequently served as minister of foreign affairs in the Menshevik government of Georgia and as the Menshevik government's envoy to France. Chkhenkeli became an émigré in 1921. [29–780–3]

CHKHENKELI, IVAN NOEVICH. Born Sept. 16 (29), 1910, in Batumi. Soviet Georgian architect. Honored Artist of the Georgian SSR (1961). Member of the CPSU since 1945.

Chkhenkeli studied at the Civil Engineering Institute in Tbilisi from 1928 to 1933. He has taught at the Academy of Arts in Tbilisi since 1944. From 1959 to 1972 he was chief architect of Tbilisi, and since 1962 he has been chairman of the board of the Architects' Union of Georgia. Most of Chkhenkeli's major works are in Tbilisi. They include apartment houses on Plekhanov Prospect (1950), the renovated Communications Building (1954), and the Concert Hall of the Georgian State Philharmonic (1971). Chkhenkeli won the Rustaveli State Prize of the Georgian SSR in 1973. He has also been awarded two orders and various medals. [29–780–4]

CHKHIKVADZE, NOE. Born July 18 (30), 1883; died May 24, 1920. Georgian poet.

The son of a poor peasant, Chkhikvadze took part in the Revolution of 1905–07. His first collection of verse was published in 1908. In his poetry Chkhikvadze strove to express the ideas of social and national liberation. He was a major representative of the democratic school in Georgian poetry. Chkhikvadze's intimate and philosophic lyrics sometimes exhibit pessimistic attitudes and motifs of loneliness and impending doom.

WORKS

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REFERENCE

Baramidze, A., Sh. Radiani, and B. Zhgenti. *Istoriia gruz. lit-ry*. Tbilisi, 1958. [29–781–1]

CHKHIKVADZE, VIKTOR MIKHAILOVICH. Born Dec. 19, 1911 (Jan. 1, 1912), in the village of Zorveti, in what is now Zestafoni Raion, Georgian SSR. Soviet jurist. Corresponding member of the Academy of Sciences of the USSR (1964). Member of the CPSU since 1939.

Chkhikvadze was director of the Institute of State and Law of the Academy of Sciences of the USSR from 1964 to 1973. He was president of the International Association of Legal Science from 1968 to 1972 and vice-president of the International Political Science Association from 1968 to 1970. He was named a foreign member of the Bulgarian Academy of Sciences in 1970.

Chkhikvadze has been awarded four orders and the Joliot-Curie Gold Peace Medal of the World Peace Council.

WORKS

Voprosy sotsialisticheskogo prava i zakonnosti v trudakh V. I. Lenina. Moscow, 1960.

Gosudarstvo, demokratiia, zakonnost': Leninskie idei i sovremennost'. Moscow, 1967.

Bor'ba za mir—neodolimoe dvizhenie sovremennosti. Moscow, 1969. [29–780–5]

CHKHOROTSKU, an urban-type settlement and the administrative center of Chkhorotsku Raion, Georgian SSR. Chkhorotsku is located on the Khobi River, which empties into the Black Sea. The settlement lies 40 km north of the Tskhakaia railroad junction. Chkhorotsku has a tea factory and a winery. [29–781–5]

CHKONIIA, LAMARA GRIGOR'EVNA. Born Dec. 27, 1930, in Batumi. Soviet Georgian singer (lyric-coloratura soprano). People's Artist of the USSR (1976). Member of the CPSU since 1974.

Chkoniia graduated from the Tbilisi Conservatory in 1956, where she studied voice under V. S. Kashakashvili and G. M. Gogichadze. From 1956 to 1960 and since 1968 she has been a soloist at the Georgian Theater of Opera and Ballet; from 1960 to 1968 she was a soloist at the Ukrainian Theater of Opera and Ballet.

Chkoniia possesses a voice of delicate silvery timbre, as well as extraordinary musicality and impeccable technique. Her roles have included Marfa in Rimsky-Korsakov's *The Tsar's Bride*, Tat'iana and Iolanthe in Tchaikovsky's *Eugene Onegin* and *Iolanthe*, the title roles in Puccini's *Madame Butterfly* and Massenet's *Manon*, Violetta in Verdi's *La Traviata*, Rosina in Rossini's *The Barber of Seville*, and Maro and Eteri in Z. Paliashvili's *Daisi* and *Abesalom and Eteri*.

Chkoniia was a prizewinner at the Young Opera Singers' Competition in Sofia in 1963 and at the Glinka All-Union Vocalists Competition in Moscow in 1960. She gives recitals in addition to her theater performances. Chkoniia has been awarded the Order of the Badge of Honor and several medals. [29–668–4]

CHLIA, a lake in Khabarovsk Krai, RSFSR. The lake has an area of 140 sq km; its average depth is 0.9 m, with a maximum of 2.6 m. The banks are generally steep and covered with forest, but those in the southwest are low and swampy. The Podgornaia River connects Lake Chlia with Lake Orel'; the Glinskaia River connects it with the Amur River. The highest water levels occur in August and September, with a range of fluctuation of about 4.5 m. Lake Chlia freezes over in late October or early November. [29–674–1]

CHMI, a group of archaeological remains dating from the Bronze Age, the early Iron Age, and the late Middle Ages, located near the settlement of Chmi on the left bank of the Terek River, 22 km south of the city of Ordzhonikidze. Among the finds was a large burial ground from the sixth to ninth centuries belonging to the ancestors of the Ossetians—the Alani. The site was excavated beginning in 1882 by various archaeologists, including D. Ia. Samokvasov. The catacomb burials yielded weapons (swords, axes, arrows, and chain mails), gold, silver, and bronze ornaments, Byzantine and Arabic coins, beads, and clay and glass vessels. The burial inventory at Chmi is similar to that of other Alani burial grounds (*see* SALTOVO-MAIATSKOE CULTURE) and reflects the process of social differentiation among the Alani.

REFERENCE

Samokvasov, D. Ia. *Mogily Russkoi zemli*. Moscow, 1908. [29–674–2]

CHMSHKIAN, GEORG ARUTIUNOVICH. Born Mar. 7 (19), 1837, in Tbilisi; died Dec. 28, 1915 (Jan. 10, 1916), in Petrograd. Armenian actor, stage director, and theatrical figure.

Chmshkian, who first appeared on the stage in Tbilisi in 1862, helped establish the Armenian professional theater in that city. One of the best educated men of his time, he was a man of progressive views. He was the first to stage and popularize the works of Shakespeare and Molière on the Armenian stage, as well as the Russian classics, especially the plays of N. V. Gogol and A. N. Ostrovskii. He translated Russian and French plays and wrote vaudevilles, comedies, and dramas, including *The Teacher* (1890).

Chmshkian was a friend and colleague of the playwright G. M. Sundukian and was regarded as the best interpreter of roles in Sundukian's plays. The professional association of the two furthered the establishment of realism and a reform of the Armenian theater. Chmshkian's company toured in many cities of Transcaucasia with large Armenian populations. In 1879 he invited into his company several outstanding Armenian actors who were then performing in Constantinople, including P. Adamian and Sirandish.

Chmshkian's best roles were Othello and Shylock in Shakespeare's *Othello* and *The Merchant of Venice*, the title role in Sundukian's *Pepo*, and Krechinskii in Sukhovo-Kobylin's *Krechinskii's Wedding*.

WORKS

Ch'mshkian, G. *Im hishatakarane: Tebste patr. Foreward by S. A. Melibset'ian*. Yerevan, 1953.

REFERENCE

Harolt'yolnian, S. S. *Geuorg Chmshkian*. Yerevan, 1960. [29–675–2]

CHMUTOV, KONSTANTIN VASIL'EVICH. Born Mar. 8 (21), 1902, in Moscow; died there May 29, 1979. Soviet physical chemist. Corresponding member of the Academy of Sciences of the USSR (1953). Member of the CPSU from 1947.

A student of N. A. Shilov's, Chmutov graduated from the Moscow Higher Technical School in 1928 and taught there from 1928 to 1932; he also taught at other higher educational institutions in the USSR. In 1950 he joined the staff of the Institute of Physical Chemistry of the Academy of Sciences of the USSR. Chmutov's principal works are devoted to the study of surface phenomena and ion-exchange chromatography.

Chmutov has been awarded six orders and various medals.

WORKS

Fiziko-khimicheskie osnovy protivogazovogo dela. Moscow, 1939. (With M. Dubinin.)

Tekhnika fiziko-khimicheskogo issledovaniia, 3rd ed. Moscow, 1954.

Khromatografiia. Moscow, 1962. [29–675–1]

CHOBANIAN, ARSHAK. Born July 15, 1872, in Istanbul; died June 9, 1954, in Paris. Armenian writer, critic, and historian. Wrote in Armenian and French.

In 1885, Chobanian moved to Paris, where he published the journal *Anait* from 1898 to 1911 and from 1929 to 1949. He attempted to attract western support for the liberation of the Armenian people from the Ottoman yoke. He was one of the first prominent Armenians outside Russia to embrace the October Revolution of 1917.

In the 1930's and 1940's, Chobanian published in *Anait* material dealing with the culture and arts of Soviet Armenia. His works *Armenia, Its History and Literature and Its Role in the East* (1897) and *Armenian Folk Singers* (1906) are widely known. Chobanian's work *The Beauty of Armenia* (1918–29) is an outstanding monument of Armenian culture.

WORKS

Kyanb a erad. Paris, 1945.

Eoker. Yerevan, 1966.

Petros Dolryani kyank'n ol gortse. Yerevan, 1967.

REFERENCES

Veselovskii, Iu. "Populiarizator armianskoi slovesnosti vo Frantsii." In *Ocherki armianskoi literatury i zhizni*. Armavir, 1906.

Briusov, V. *Poeziia Armenii*. Yerevan, 1966.

Hapeshyan, H. *Arshak Ch'opanyan*. Paris, 1924.

Fenerchyan, G. *Arshak Ch'opanyan*. Paris, 1938. [29–676–1]

CHOBANU, ION KONSTANTINOVICH. Born Nov. 6, 1927, in the village of Budei, in what is now Teleneshty Raion. Soviet Moldavian writer. Member of the CPSU since 1947.

Chobanu's novel *Kodry* (books 1–2, 1952–57; Russian translation, 1958) is a broad epic narrative that depicts the hard lot of the Moldavian people in the past and portrays the struggle waged by the working people under Communist leadership for liberation and for reunification with the Soviet motherland. The novel *Bridges* (1966; Russian translation, 1968) deals with life in a Moldavian village during and immediately after the war. The novel *Kukoara* (1975) was written as a sequel.

Between 1961 and 1965, Chobanu was chairman of the administrative board of the Writers' Union of the Moldavian SSR. He served as a deputy to the sixth through ninth convocations of the Supreme Soviet of the USSR. Chobanu has been awarded two orders and various medals.

WORKS

Teriia slovei meestrite. Kishinev, 1971.

REFERENCES

Ocherk istorii moldavskoi sovetskoi literatury. Moscow, 1963.

Kozhevnikov, Iu. "Dorogoi narodnoi zhizni." *Druzhba narodov*, 1968, no. 6. [29–675–4]

CHOBAN-ZADE, BEKIR VAGAP OGLY. Born Jan. 9 (21), 1893, in the village of Argyn in the Crimea; died Apr. 18, 1938. Soviet Crimea Tatar poet and Turkic scholar.

Choban-zade studied at the Sultanî Lycée in Istanbul from 1909 to 1914 and graduated from the University of Budapest in 1918. He became a doctor of philology in 1920 and was a professor at the universities of Budapest and Lausanne in 1919 and 1920. In 1919 he was a prominent member of the Hungarian Commune.

Choban-zade returned to his homeland in 1920 and joined the Crimean Central Executive Committee in 1921. He became a professor at the Crimean University in 1922 and the University of Azerbaijan in 1924. In 1935 he became a member of the Azerbaijan branch of the Academy of Sciences of the USSR and the Paris Linguistic Society.

Choban-zade was the author of several books of poetry, including narrative poems, and many works on the history of the literature and folklore of the Crimean Tatars and other Turkic peoples. He helped create a Turkic alphabet based on the Latin alphabet.

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CHOCANO, JOSÉ SANTOS. Born May 14, 1875, in Lima; died Dec. 13, 1934, in Santiago, Chile. Peruvian poet.

Chocano's poetic works *Soul of America* (1906) and *Let There Be Light!* (1908) revealed traits characteristic of Spanish-American modernism of the turn of the century—the rich use of metaphor, interest in national tradition, and recognition of the prophetic mission of the poet.

Chocano led an active political life in many countries of Latin America. He took part in several risky political undertakings, and as a result he was murdered in Chile.

WORKS

Obras completas. Mexico City, 1954.

REFERENCES

Mariátegui, J. C. *Sem' ocherkov istolkovaniia peruanskoi deistvitel'nosti*. Moscow, 1963. (Translated from Spanish.)

Mamontov, S. P. *Ispanoiazychnaia literatura stran Latinskoi Ameriki v XX v*. Moscow, 1972.

Torres Rioseco, A. *Bol'shaia latino-amerikanskaia literatura*. Moscow, 1972. (Translated from Spanish.)

Sánchez, L. A. *Aladino: Vida y obra de José Santos Chocano*. Mexico City, 1960. [29–678–4]

CHOCÓ, a department in Colombia. Area, 47,200 sq km. Population, 202,000 (1973). The capital is Quibdó. Livestock is raised on pastureland, and fields are cultivated to aid animal husbandry. Gold, silver, and platinum are mined in Chocó. Industry includes sawmilling. Banana plantations are found near the Gulf of Urabá. [29–679–1]

CHOCOLATE, a confectionery obtained by processing cacao beans with sugar and other food products. Chocolate was long used as a beverage in Mexico. During the 16th century, the Spanish brought cacao beans from Mexico to Europe.

A distinction is made between natural chocolate, which contains only cacao products (cacao beans and cocoa butter) and sugar, and chocolate with additives, such as dried milk, coffee, and nuts. Depending on the fineness of the particles, chocolate is subdivided into plain and dessert chocolate. Chocolate confectioneries often contain various fillings. The fat content of chocolate is 35–37 percent; the caloric value is 2,240 kilojoules, or 540 kilocalories, per 100 g.

After cleaning, sorting, and roasting, cacao beans are broken up into nibs, which are then ground into a plastic liquor. The liquor is then pressed to obtain cocoa butter. Chocolate is obtained by mixing the liquor, cocoa butter, sugar (usually powdered), and the necessary flavorings and aromatic additives. This mixture is then ground until the size of the solid particles does not exceed 20 micrometers. The resulting mass is mixed once more with cocoa butter and cooled to 30°–31°C, whereupon it is ready to be produced into plain chocolate or chocolate-coated candy by chocolate-molding equipment. To produce dessert chocolate, which has improved flavor and aroma, the chocolate mass is subjected to additional processing, at a temperature of 70°C for an average of three nights and days, before it is molded.

Chocolate is manufactured in the form of blocks, various figures, and round medallions; chocolate confectioneries are produced as bars or assorted candies. Natural chocolate can be stored up to six months, and mixed chocolate, up to three months. G. A. MARSHALKIN [29–1337–1]

CHOCOLATE-MOLDING EQUIPMENT, a group of automated integrated machines, linked by conveyors, for molding chocolate confectioneries, both with and without candy centers. The following operations are performed by chocolate-molding equipment: the molds are heated to 32°C and the chocolate is deposited into the molds, compacted by vibration, cooled, and removed from the inverted mold by impact or vibration.

In the production of chocolate confectioneries with candy centers, a chocolate shell with one open end is initially formed and cooled and then the candy filling is deposited into it. The filled shell is condensed and cooled and then chocolate is poured over it. The candy product is recooled and then removed from the mold onto a conveyor belt or plate moved by a conveyor. There is specialized and general-purpose chocolate-molding equipment, as well as equipment for the manufacture of certain chocolate items. Chocolate confectioneries with candy centers are produced using all the components of a general-purpose chocolate-molding machine, while chocolate bars, decorated chocolate confectioneries, and hollow figures are produced by excluding some components.

REFERENCE

Marshalkin, G. A. *Tekhnologicheskoe oborudovanie konditerskikh fabrik*, 2nd ed. Moscow, 1968. G. A. MARSHALKIN [29–1337–3]

CHODRISHVILI, MIKHAIL IOSIFOVICH (also Mikha Chodrishvili). Born Aug. 15 (27), 1853, in Signakhi, in what is now the Georgian SSR; died Dec. 25, 1929, in Tbilisi. Figure in the Russian revolutionary movement. Member of the Communist Party from 1896.

The son of an artisan, Chodrishvili became a worker in Transcaucasia in 1868. He began taking part in Narodnik (Populist) circles in 1873 and became an organizer of social democratic workers' circles in 1895. From 1904 to 1909 his joiner's workshop in Tbilisi was the clandestine meeting place of the Caucasian Union and Tiflis committees of the RSDLP.

Chodrishvili undertook party work in Rostov-on-Don in 1910 and in Tbilisi in 1913. Between 1917 and 1920 he was a member of the Tiflis party committee. He was arrested a number of times, first by the tsarist authorities and later by the Georgian Mensheviks. In 1921 he became a member of the collegium of the Peoples's Commissariat of Justice, a member of the Central Control Commission of the Communist Party (Bolshevik) of Georgia, and the chairman of the republic committee of the Society for Assistance to Defense, Aviation, and Chemical Construction. Chodrishvili was a member of the Central Executive Committee of the Georgian SSR and of the Transcaucasian Federation. [29–677–1]

CHOE CHI-WON (pseudonym, Koun). Born 857 in Kyongu; year of death unknown. Korean poet and scholar.

Choe Chi-won's poetry and prose collections *Chungshan pokkwe chip* and *A Collection of Verse* have not been preserved. Some parts of his *Literary Works From the Garden of Cinnamon Trees* have survived, and some of his writings were preserved in the works of later authors. Choe Chi-won's poetry, written in *hanmun*, includes lyrical nature poems, descriptions of the calamitous history of the Korean people, and criticism of the Confucian policies of the government.

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CHOE IK-HYON. Born 1833 in Po-chon, Kyonggi-do (Kyonggi Province); died 1906 (according to some sources, 1909) on the island of Tsu-shima. Korean political figure and Confucian scholar.

Choe Ik-hyon protested against the establishment of Japanese rule in Korea. In the summer of 1906 he and his followers organized a partisan detachment, which took up armed struggle against the Japanese. Choe Ik-hyon was captured by the Japanese and was banished to the island of Tsu-shima, where he committed suicide. [29–778–3]

CHOE NAM-SON (pen name, Yuktan). Born 1890 in Seoul; died there October 1957. Korean literary figure and historian. One of the founders of modern Korean literature.

From 1904 to 1906, Choe Nam-son studied at Waseda University in Japan. He first published his works in 1906. In 1908 he began publishing *Son yon*, Korea's first literary monthly of enlightened thought; in this journal he printed his own verses and narrative poems, which firmly established free verse in Korean poetry, and he wrote articles on politics, culture, and literature as well.

After drafting the Declaration of Independence, which was signed by the bourgeois nationalists on the eve of the March 1919 uprising in Korea, Choe Nam-son was arrested. In 1925 he switched allegiance and worked for the Japanese colonial powers. After the liberation of the country in 1945 he lived in South Korea, having lost his public influence. He opposed the Korean Federation of Proletarian Art.

Choe Nam-son, a prominent bourgeois historian, wrote works on Korean history and published many old Korean historical documents and literary works.

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L. R. KONTSEVICH [29–778–4]

CH'OERH HO, a river in Northeast China; a right tributary of the Nonni River (Nen Chiang) of the Sungari River basin. The Ch'oerh Ho is 610 km long and drains an area of about 24,000 sq km. It rises in the Greater Khingan Mountains and flows through mountains and hills before crossing the Sung-Liao Plain in the

lower course. The river empties into the Nonni through two arms. The water level is highest in spring and summer and lowest in winter. The mean flow rate is approximately 70 cu m per sec. The Ch'oerh Ho freezes over for five or six months a year. The river is used for floating timber, and in the lower course it is navigable by small vessels. [29–680–1]

CHOE SUH-HAE (pen name of Choe Hak-song). Born Jan. 12, 1901, in Songjin District, Hamgyang-pukdo (North Hamgyang Province); died July 9, 1932, in Seoul. Korean writer.

Choe Suh-hae's cycle of short stories consisting of "Yearning for the Homeland" (1925), "The Madman" (1926), "Tongues of Flame" (1926), and "Man tu" (1931) is devoted to the hard life of Korean settlers in Manchuria. The writer stated his aesthetic credo in his autobiographical story "Confession of a Fugitive" (1925) and the collection *Trail of Blood* (1926). He protested against violence and oppression in the stories "Hunger and Murder" (1925) and "The Death of Pak Tol" (1925).

Choe Suh-hae's works are distinguished for their genuinely Korean national character, psychological depth, and simple, laconic style. Choe Suh-hae was one of the founders of the New Direction School of literature (*singyonghyangpa*) and of the Korean Federation of Proletarian Art.

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L. R. KONTSEVICH [29–778–5]

CHOGORI (also Mt. Godwin Austen), the highest mountain peak in the Karakoram. Mt. Chogori rises to an elevation of 8,611 m, making it the second highest mountain in the world after Chomolungma (Mt. Everest). It is composed of granites and gneisses. The Baltoro Glacier lies along the southern slope. The mountain was first ascended in 1954 by the Italians L. Lacedelli and A. Compagnoni. [29–676–3]

CHOGUK KWANGBOKHOE (Society for the Revival of the Fatherland), a people's front organization founded by Korean Communists in May 1936 in order to unify the patriotic forces in their armed struggle against the Japanese occupiers of Northeast China and the northern regions of Korea. The chairman of the society was Kim Il-sung.

The program of the Choguk Kwangbokhoe, which was published on May 5, 1936, set forth in ten points the chief tasks of the antifeudal and anti-imperialist revolution in Korea. These tasks included the liquidation of Japanese colonial supremacy; the establishment of an independent, democratic Korean state; the formation of a people's government; the confiscation of all enterprises, banks, railroads, and lands owned by Japanese imperialists and their Korean accomplices; and the realization of political, socioeconomic, and cultural transformations.

The Choguk Kwangbokhoe had sections in both Korea and Northeast China, where approximately 1 million Koreans were in residence and the main Korean partisan forces were operating. The society published illegal literature, including the journals *Samil* (The First of March) and *Hwa cheng ming* (Peasant of the Fiery Field). It also directed the activities of various mass social organizations. Supported by the Choguk Kwangbokhoe, Korean Communists intensified the armed struggle against the Japanese in Northeast China and Korea.

After the liberation of North Korea, the tasks set forth in the society's program were further developed in the political platform of the people's regime.

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[29–676–4]

CHOIBALSAN, KHORLOGIIN. Born Feb. 8, 1895, in Tsetsenkhan Aimak (now Eastern Aimak); died Jan. 26, 1952, in Moscow; buried in Ulan Bator. Mongolian political and state figure.

The son of a poor Mongolian *arat* (livestock-raising serf), Choibalsan in 1912 made his way to Urga (now Ulan Bator), where he worked as a porter and a watchman. After teaching himself to read and write, he entered a school for translators and learned Russian. In 1914 he was sent to Irkutsk to continue his education, and he remained there until 1917.

The revolutionary events in Russia strongly influenced Choibalsan. In 1919, D. Sukhe-Bator organized a revolutionary circle in Urga; Choibalsan formed a similar circle in the city later that year. In 1920 the two groups merged, forming the Mongolian People's Party (since 1925, the Mongolian People's Revolutionary Party). In the summer of 1920, Choibalsan went to Soviet Russia as a member of the first Mongolian delegation sent by the revolutionaries; the delegation requested the government of the RSFSR to render assistance to the Mongolian people in its struggle for liberation from foreign aggressors.

After returning to Mongolia in November 1920, Choibalsan helped organize units of the People's Revolutionary Army, and he took part in preparations for the First Congress of the Mongolian People's Party, which was held in March 1921. He served in the Provisional People's Government, which was established in March 1921, and in July 1921, after the victory of the Mongolian People's Revolution, he became a member of the People's Government. In 1924 he was elected for the first of several times to the Central Committee of the Mongolian People's Party and to the Presidium (Politburo) of the Central Committee.

From 1921 to 1923, Choibalsan served as deputy commander in chief of the Mongolian People's Army, and in 1923 and 1924 he studied at the Military Academy in Moscow; from 1924 to 1928 he was commander in chief of the Mongolian People's Revolutionary Army. Choibalsan served as chairman of the Presidium of the Lesser People's Khural of the Mongolian People's Republic from 1928 to 1930, as minister of foreign affairs in 1930, and as minister of land cultivation and livestock raising from 1931 to 1935. Choibalsan was the first deputy premier of the Mongolian People's Republic from 1935 to 1939, when he became premier. He served as commander in chief of the Mongolian People's Revolutionary Army during the joint Soviet-Mongolian operations that defeated the Japanese aggressors in the region of the Khalkin-Gol in 1939; he was also commander in chief during the Manchurian Operation of 1945.

Choibalsan was given the rank of marshal in 1936. The title of Hero of the Mongolian People's Republic was conferred on him twice, and a city in Mongolia was named for him. Choibalsan was awarded such Mongolian orders as the Order of Sukhe-Bator and the Order of the Red Banner of Combat; among the Soviet orders he received were two Orders of Lenin.

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[29–677–3]

CHOIBALSAN (until 1921, San-Beise; until 1941, Baian-Tumen), a city in the eastern Mongolian People's Republic, near the Chinese border, on the Kerulen River. Administrative center of Eastern Aimak. Population, 22,500 (1975). Choibalsan is connected by railroad with the Solov'evsk station of the Trans-Siberian Railroad in the USSR. It is a highway junction and is connected by air with Ulan Bator. Building materials are manufactured in Choibalsan, and the city has automotive-repair facilities. A milling combine, a meat-packing plant, and a wool-scouring plant are located there. Brown coal and fluorite (in Berkh) are mined in the area. [29–678–1]

CHOIBALSAN ULA (also Bogdo Ula, Bogd Khaan Uul), a preserve in Mongolia, near Ulan Bator. In 1649 the mountain Bogdo Ula (2,257 m) was declared sacred. Its status as a preserve was established by an act of legislation in 1809. Choibalsan Ula covers an area of 36,600 hectares (1976). The typical southern-taiga complex on the slopes and the steppe vegetation of the foothills are protected. [29–678–2]

CHOIMBOL, SONOMYN. Born 1907 in Lun, Arakhangai Aimak. Mongolian sculptor.

Choimbol studied in Moscow under S. D. Merkurov from 1943 to 1946. He has designed severe, impassioned monuments for the squares of Ulan Bator, notably *Sukhe-Bator* (artificial granite, 1946) and *Choibalsan* (concrete, 1947), as well as smaller free-standing pieces, such as *The Fighter's Entrance* (gypsum, 1958, Museum of Fine Arts of Mongolia, Ulan Bator), and portraits. [29–678–3]

CHOISEUL, ÉTIENNE FRANÇOIS DE (Comte de Stainville, Duc de Choiseul). Born June 27 or 28, 1719; died May 8, 1785, in Paris. French state figure.

Choiseul achieved a high rank in the army during the War of the Austrian Succession. He was ambassador to Rome from 1754 to 1757 and to Vienna in 1757 and 1758. Between 1758 and 1761 he served as minister of foreign affairs. He strengthened France's ties to Austria with the Alliance Treaty of Versailles of 1758 and signed the Family Compact of 1761.

Choiseul was minister of war from 1761 to 1770. He also served as minister of the navy from 1761 to 1766 and for a second time as minister of foreign affairs from 1766 to 1770. Between 1758 and 1770 he was the dominant figure in the French government.

After France's defeat in the Seven Years' War of 1756–63, Choiseul began preparing the country to take revenge. His measures included reorganizing the army and navy and reinforcing the artillery. In 1770, Choiseul was removed from office and exiled to his estates at Chanteloup. [29–1510–3]

CHOISEUL, an island in the Pacific Ocean; one of the Solomon Islands. Population, more than 8,000 (1970). Choiseul Island covers an area of 2,600 sq km and rises to a maximum elevation of 1,067 m. The island has evergreen forests. Coconut palms are raised, and copra is exported. [29–1510–4]

CHOKHA, a man's overcoat made of cloth, popular in the past among Georgians and other peoples of the Caucasus. The *chokha* was similar to the common Caucasian *cherkeska*. Unlike the *cherkeska*, however, it had a stand-up collar and elbow-length sleeves with slits, and it came only to the knees. The *chokha* was often girded by a sash instead of a belt. [29–689–2]

CHOKHATAURI, an urban-type settlement and administrative center of Chokhatauri Raion, Georgian SSR. Chokhatauri is situated on the Supsa River, which empties into the Black Sea. It is located on the Novorossiisk-Batumi highway, 20 km south of the Sadzhevakho railroad station on the Samtredia-Batumi line.

Chokhatauri has three tea factories, a winery, and a branch of the Kutaisi Automotive Plant. The city has a museum of local lore and a people's amateur theater. [29–689–3]

CHOKHOV, ANDREI (also Andrei Chekhov). Year of birth unknown; died between Jan. 23 and Dec. 8, 1629. Russian maker of cannons and bells.

For more than 60 years, Chokhov worked at the Cannon Yard (Pushechnyi Dvor) in Moscow, where he made many heavy artillery pieces. More than 20 of these were mentioned in historical documents, including the Tsar Cannon (1576). Chokhov usually gave a name to each cannon, for example, Lisitsa (Vixen, 1575), Volk (Wolf, 1576), Inrog (Unicorn, 1577), Lev (Lion, 1590), Aspid (Asp, 1590), and Tsar Akhilles (King Achilles, 1617). Chokhov's cannons were outstanding examples of artillery engineering. They were decorated with high relief, ornate floral ornamentation, and inscriptions in keeping with their names. Some of the sturdy weapons were used in the Northern War (1700–21). Of the 12 Chokhov cannons that have survived, seven are in Leningrad, at the Military History Museum of the Artillery and Engineer and Signal Corps, and three are in the Moscow Kremlin. Two others, the Volk models produced in 1576 and 1578, are housed in Gripsholm Castle, near Stockholm; they were brought to Sweden during the Livonian War. Tsar Peter I ordered that Chokhov's cannons be preserved as historical monuments.

Chokhov also made bells, including the Reut (Howler, 1621–22), which weighed 2,000 poods (about 32 tons), for the Bell Tower of Ivan the Great. He taught his craft to many pupils.

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CHO KI-CHON. Born Nov. 16, 1913, in the village of Yuaedugou, near Nikol'sk-Ussuriiskii (present-day Ussuriisk); died July 31, 1951, in Pyongyang. Korean poet.

Cho Ki-chon graduated from the philology department of the Omsk Pedagogical Institute in 1937. He worked as a correspondent and translator in the Korean press from 1945. In his early poems and the narrative poems *Song of the Land* (1946) and *Hymn of Life* (1950), he celebrated the new life in free Korea and the valor of the Soviet soldiers. The poem cycle *Uprising in Yosu* (1949) is devoted to the people of South Korea. The narrative poem *Paektu-san* (1947; National Prize First Class, 1948) deals with the struggle between the Korean partisans and the Japanese colonizers in the 1930's. For his poem cycle *Korea in Battle* (1951) he was posthumously awarded the National Prize First Class in 1952.

Cho Ki-chon was killed while serving as a military journalist.

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CHOKRAK LAKE (also Messir), a salt lake in Crimean Oblast, Ukrainian SSR. Located in the northern part of the Kerch' Peninsula. Chokrak Lake is separated from the Sea of Azov by a sand barrier and has an area of 8.5 sq km. It is fed by seawater and underground water. On the bottom of the lake is a layer of mud 2 to 3 m thick; the mud is used for pelotherapy. [29–679–3]

CHOLA, the name of an ancient and medieval state in southern India and the dynasty that ruled the state. The capital of the state, Cholamandalam, was located in the region of Thanjavur. The state language was Tamil.

The feudal despotism of the Chola dynasty reached its height between the late tenth and early 12th centuries, when the rulers subjugated other regions of Tamil Nadu (including Panyamandalam, Tondaimandalam, and Kongumandalam) and parts of what are now Kerala, Karnataka, Andhra Pradesh, and Sri Lanka. During the same period, the economy and culture of Tamil Nadu flourished. From the 13th to 18th centuries, branches of the Chola family governed a number of small princely states in various regions of southern India. [29–680–2]

CHOLPON-ATA, a city (since 1975) under oblast jurisdiction and the administrative center of Issyk-Kul' Raion, Issyk-Kul' Oblast, Kirghiz SSR. Cholpon-Ata is located at an elevation of more than 1,600 m, on the northern shore of Lake Issyk-Kul', 225 km east of the city of Frunze and 75 km from the Rybach'e railroad station. It is a climatic health resort. The summers are moderately warm, with an average July temperature of 17°C, and the winters are mild, with an average January temperature of −3°C; annual precipitation totals 250 mm. Therapeutic remedies include climatotherapy and the silt mud and mineral water from Lake Issyk-Kul'. Persons suffering from disorders of the nervous system and the musculoskeletal system are treated. Medical facilities include sanatoriums for adults, a children's pulmonary tuberculosis sanatorium, and a hydropelotherapeutic clinic. There is a milk combine in Cholpon-Ata. Also in the city is the house-museum of the Kazakh writer Mukhtar Auezov. [29–680–3]

CHOLUTECA, a city in southern Honduras, on the Pan-American Highway; capital of Choluteca Department. Population, 22,000 (1972). Choluteca is the center of an agricultural region

that raises cotton, coffee, sesame, maize, and cattle. In addition to sawmills, the city has plants for the processing of raw agricultural products. [29–680–4]

CHO MYONG-HI (pen name, Posok). Born 1894; died Feb. 20, 1942. Korean writer. Born in the village of Pyogam-ni, Chinchon District, Chungchong-pukto (North Chungchong Province). One of the founders of modern Korean literature. Ideologist of the Korean Federation of Proletarian Art.

Cho Myong-hi, a participant in the March 1919 uprising in Korea, studied in the philosophy department of the Oriental Institute in Tokyo from 1919 to 1923. In the stories "To the Land" (1925), "Comrade" (1926), and "Low Atmospheric Pressure" (1926), he depicted his fellow countrymen and their lack of rights. The story "The Naktong River" (1927) reveals the basic features of Cho Myong-hi's writing—subtle lyricism, sincerity, and optimism.

In 1928, Cho Myong-hi emigrated to the USSR. He wrote poetry, essays, stories, and publicist articles on the life of the land of the Soviets. In 1934 he was accepted for membership in the Writers' Union of the USSR. In 1937 he wrote the novel *Manchurian Partisans* (unpublished), which dealt with the Korean partisan movement in northeastern China.

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V. N. Li [29–680–6]

CHON, a group of linguistically related South American Indian tribes of Argentina and Chile that included the Tehuelche of Patagonia and the Ona, or Shelknam, who constituted the eastern group of the Fuegians. The Chonan languages have been little studied. Most of the Indians of the Chon group had been exterminated by the early 20th century, and in the mid-20th century they numbered in the dozens. [29–682–1]

CHONA, a river in Irkutsk Oblast and the Yakut ASSR, a right tributary of the Viliui River of the Lena basin. The Chona is 802 km long and drains an area of 40,600 sq km. It flows over the Central Siberian Plateau and empties into the Viliui Reservoir. The lower 170 km of the river valley is flooded. The Chona is fed by snow and rain. The mean flow rate is approximately 125 cu m per sec. The Chona freezes over in October, and the ice breaks up in May. [29–682–3]

CHONAN, a city in South Korea, in Chungchong-namdo (South Chungchong Province). Population, approximately 100,000. Chonan, an important transportation junction on the Seoul-Taejon-Pusan route, has textile and food-processing industries. [29–781–2]

CHON BURI, a city in Thailand, on the Gulf of Thailand. Capital of the *changwat* (province) of Chon Buri. Population, 40,500 (1965). A transportation and trade center on the Bangkok-Sattahip highway, Chon Buri has a food-processing industry, the principal product of which is sugar. [29–682–5]

CHONDON, a river in the Yakut ASSR. The Chondon is 606 km long and drains an area of 18,900 sq km. It rises on the slopes of the Selenniakh Range and flows mainly through the Iana-Indigirka Lowland before emptying into Chondon Bay of the Laptev Sea. The river is fed by snow and rain. It freezes over in late September or early October, and the ice breaks up in June. The river is sometimes entirely frozen. Fish found near the mouth of the Chondon include the arctic cisco, the least cisco, the nelma, and the muksun. [29–683–2]

CHONG CHOL (pen name, Songgang). Born Jan. 27, 1536, in Seoul; died Feb. 7, 1594, on the island of Kanghwa-do. Korean poet.

Chong Chol left seven volumes of poetry and prose known as *Songgang Chip*, which were written in *hanmun*. His *Songgang Kasa*, his first collection of Korean-language poetry, includes more than 80 *sijo* (short lyrical poems) and five *kasa* (narrative poems). His most famous works are his *kasa*, including *Longing for My Beloved* and *Still Longing for My Beloved* (1585–87). Chong Chol's works are distinguished for their range, expressiveness, and dynamism. His *kasa*, which were written in the lyrical folk-song tradition, helped writers of the following centuries justify the writing of poetry in their native tongue under bilingual conditions.

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[29–683–6]

CHONG IN-JI. Born 1396 in Soksong; died 1478 in Seoul. Korean scholar and state figure.

From 1444 to 1446, Chong In-ji helped design the *hunmin chongum* alphabet (now called *hangul*). He also took part in the compilation of a number of works on the exact sciences, politics, military affairs, and history (including *The History of Koryo*, 1451). He was the chief minister in the government of the *wang* (ruler) Sejo, who held power from 1456 to 1468. Because he opposed the policy of encouraging Buddhism, however, he was banished to Puyo in central Korea. Under the next *wang*, Chong In-ji returned to the capital and received general recognition. [29–683–3]

CHONGJIN, a city in the northeastern People's Democratic Republic of Korea, an ice-free port on the Sea of Japan. Capital of Hamgyong-pukto (North Hamgyong Province). Population, 290,000 (1972). Chongjin is a transportation junction and an important center of ferrous metallurgy, which is based on the Musan iron ore deposits. The city has machine-building (including shipbuilding), textile (including the manufacture of artificial-silk fabrics), chemical, food-processing, and building-materials industries. Fishing is also of some importance in the local economy. [29–781–3]

CHONGJU, a city in South Korea, on a river in the Kum-gang system. Capital of Chungchong-pukto (North Chungchong Province). Transportation junction. Population, 141,000 (1970). Chongju is a major center of the textile (including silk weaving) and tobacco industries. Other industries include agricultural machine building, the assembly of motor vehicles, food processing, and the manufacture of wood products. Products of the city's chemical industry include rubber goods and soap. Nickel is mined in the vicinity of Chongju. [29–781–4]

CHONG PONG-JUN. Born 1853 in Kobu District, Cholla-do (Cholla Province), southern Korea; died 1895. Leader of a Korean peasant rebellion.

Chong Pong-jun was the son of a minor district official who was

executed for organizing a peasant rebellion. In 1888, Chong joined the Tonghak sect and assumed the leadership of its branch in Kobu. In 1894 he became the leader of a peasant rebellion that started in Cholla-do but quickly spread through the entire country. Chong Pong-jun was captured and executed by the authorities. [29–682–4]

CHONGURI. (1) A Georgian four-stringed plucked instrument. The *chonguri* has a pear-shaped body that is truncated at the bottom. The long neck, which has fastened or carved frets, terminates in a curved pegbox with three pegs, one for each of the main strings; the short fourth string fastens to a peg midway up the side of the neck. The silk or nylon strings are tuned to D, G, and B of the one-line octave and D of the two-line octave. Played primarily by women, the *chonguri* is used to accompany singing. Improved versions of the *chonguri* are used in Georgian folk-instrument orchestras.

(2) One of the names of the *panduri*, a Georgian three-stringed plucked instrument.

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CHONG YAK-YONG (also Chong Tasan). Born Aug. 5, 1762, in the village of Mahyong, Kwangju, Kyonggi-do (Kyonggi Province); died there Apr. 7, 1836. Korean scholar and encyclopedist; representative of the *sirhak p'a* movement.

Born into a noble family, Chong Yak-yong entered government service in 1789. He proved to be a talented engineer and architect, and he introduced vaccination into Korea. He denounced the arbitrariness and venality of state officials. In 1801, charged with spreading Christianity, he was condemned to death; however, the sentence was commuted to 18 years in exile.

Chong Yak-yong devoted his years of banishment and his later life to scholarly and literary activities. In his works he criticized the principles of the prevailing Confucian ideology, assailed feudalism, and expressed profound sympathy for the oppressed people. Recognizing material force (*ch'i*) as the basis of the universe, he approached philosophical materialism. Chong Yak-yong regarded state authority as the result of a social contract; he declared absolute rule from above to be unjust and opposed class distinctions, royal privileges, and the despotic monarchy. His plan for land reform foreshadowed the eventual liquidation of landlord property rights.

Although Chong Yak-yong's theories could not be realized under the conditions of feudalism, his ideas and contribution to learning were of enormous importance for the subsequent development of the antifeudal ideology and culture of the Korean people.

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Istoriia Korei, vol. 1. Moscow, 1974. (See name index.)

M. N. Pak [29–684–1]

CHONJU, a city in South Korea and capital of Cholla-pukdo (North Cholla Province). Population, 277,000 (1973). Chonju, a transportation junction, is linked by railroad with the ports of Kunsan on the Yellow Sea and Yosu on the Korea Strait. The city has enterprises of the food-processing (including rice-polishing), textile, wood-products, and paper industries. [29–683–1]

CHONKADZE, DANIEL GEORGIEVICH. Born Mar. 18, 1830, in Kvavili; died June 17 (29), 1860, in Tiflis. Georgian writer. Son of a village priest of peasant origin.

Chonkadze graduated from the Tiflis Theological Seminary in 1851. He is highly esteemed in the history of Georgian literature as the author of the realistic novella *The Surami Fortress* (1859). The work, which deals with a peasant and his struggle against serfdom, influenced the social consciousness of Georgia on the eve of the abolition of serfdom. It played an important role in popularizing the Georgian literary language. Chonkadze also collected Ossetian proverbs.

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Xundaze, A. *Daniel Chonk'aze*. Tbilisi, 1966. [29–683–4]

CHONOS, ARCHIPIÉLAGO DE LOS, an archipelago off southern Chile, between 44° S lat and the Taitao Peninsula. The islands include Melchor and James. The archipelago is separated from the mainland by the Moraleda Channel. The maximum elevation is 1,680 m. Mixed evergreen forests grow on the islands. There is fishing in the area. [29–683–5]

CHOP, a city (since 1957) in Uzhgorod Raion, Transcarpathian Oblast, Ukrainian SSR. Chop, located near the border of Hungary and Czechoslovakia, is a junction for railroad lines to Uzhgorod, Mukachevo, Budapest, and Prague. The city has enterprises servicing the railroad industry, a plant for the production of brick and tile, and a garment division of the Uzhgorod Textile and Clothing Accessory Factory. [29–684–2]

CHOPIN, FRÉDÉRIC-FRANÇOIS (also Fryderyk Franciszek Chopin). Born Feb. 22, 1810 (according to some sources, Mar. 1, 1810), in Zelazowa Wola, near Warsaw; died Oct. 17, 1849, in Paris. Polish composer and pianist.

Chopin's father, Nicolas Chopin, was a French emigrant who took part in the Polish Uprising of 1794, and his mother, J. Krzyżanowska, was a Polishwoman. Chopin received his first piano lessons from his sister Ludvika (Louise) Chopin. In 1816 he began studying with the Czech pianist and composer W. Zywny in Warsaw. Chopin's gifts as a pianist and composer were manifested at a very young age; in 1817 he wrote two polonaises in the style of M. K. Ogiński, and in 1818 he performed in public for the first time. While studying at the lyceum (1823–26), he continued to perfect his playing technique and to perform in public; beginning in 1822 he studied the theory of composition with J. Elsner and later graduated from his class at the Central School of Music in Warsaw, where he studied from 1826 to 1829.

Chopin's creative development proceeded amid an upsurge in Polish national culture. While still a student, Chopin established close ties with the progressive intelligentsia and the revolutionary-minded youth. In the years 1825–29, during travels in various parts of Poland, he became acquainted with folk art and the life of the people. In 1828 he visited Berlin, and in 1829, Vienna, where he composed a number of works and gave concerts, performing, among other things, his own work Variations on "Là ci darem" from Mozart's *Don Giovanni* for piano and orchestra.

The Warsaw period of Chopin's life (up to November 1830) played a crucial role in the formation of Chopin's creative art. In his native land, having absorbed the influence of Ogiński, Elsner, M. Szymanowska, F. Lessel, K. Kurpiński, and F. Ostrowski, among others, Chopin composed two concerti for piano and orchestra (1829–30), a piano trio (1829), the Grand Fantasy on Polish Airs for piano and orchestra (1830), the Krakowiak, or Grand Rondo de Concert, for piano and orchestra (1828), a sonata (1828), a number of polonaises and mazurkas, the Nocturne in E Minor (1827), and the first of the 12 grand studies (1829–30), which he later completed in Paris, where he also completed other cycles of piano pieces. The works composed in Poland reflect the influence of national folk music, which is particularly evident in the melodic turns and the nature of the rhythms, linked with the Polish dances, such as the mazurka and polonaise, and with the characteristics of the harmonic texture, as well as with the structure of the forms. They fully reflect the uniqueness of Chopin's music, namely, the extensive use of the devices of alternation, especially with respect to the subdominant, that is, the "Slavic fourth" (the alternation of a natural and an augmented fourth), a feature characteristic of Chopin's mature works as well. Based on

the national dances, Chopin also composed poetic miniatures and grand concerti for piano and orchestra, imbuing them with traits of epic poems. In his native land he also composed songs to the words of Polish poets; of the several dozen written, only 19 have been preserved, all published posthumously.

A milestone event in Chopin's life and work was the Polish Uprising of 1830–31; it found him in Vienna, from where he set out for Paris, stopping along the way in Munich and Stuttgart (it was in Stuttgart that Chopin learned of the fall of Warsaw). In Vienna and Stuttgart (1830–31), Chopin composed or began composing his first scherzo (1831–32) and first ballade (1831–35), the Revolutionary Etude in C Minor (1831), which soon became famous (one of the streets in Warsaw has been named the Street of the Revolutionary Etude), and other works, many of which were completed in Paris.

Chopin settled in Paris in September 1831, although he retained spiritual ties with Poland until the end of his life. In 1832 he began his triumphant concert appearances in Paris, in the course of which he met the leading literary and art figures of France and other countries, including F. Liszt, H. Berlioz, V. Bellini, G. Meyerbeer, H. Heine, and E. Delacroix. In 1834–35, Chopin journeyed along the Rhine with F. Hiller and F. Mendelssohn; in 1835 he made the acquaintance of R. Schumann in Leipzig. In 1835–36 he traveled to Bohemian health resorts. He spent late 1838 on the island of Majorca with George Sand, and in subsequent years he spent several summers on her estate at Nohant. The liaison between Chopin and George Sand ended abruptly in 1847, which adversely affected Chopin's health and hastened his death. In 1848, Chopin toured Great Britain. Chopin died in Paris and was buried there; his heart, in accordance with his deathbed wishes, was brought by his sister to Warsaw and placed into one of the columns of the Holy Cross Church.

Chopin's most important works of the Paris period are dominated by heroic-dramatic and tragic images, stemming from bitter contemplation about the failure of the Polish Uprising. The music is imbued with a unique passion and intensity of feeling and a sense of conflict and is characterized by the power and breadth of the images; at the same time, the features of national folk music are more pronounced. The most important theme is the glorification of patriotic endeavors and hopes, whose defeat evoked intense grief. The culmination of the sense of the tragic in Chopin's creative work of the 1830's is the famous Funeral March (the "Mont Blanc of the musical Alps," in the words of A. V. Lunacharskii), composed in 1837 and included in 1839 as the third part of the Sonata in B Flat Minor. The march, which combines a lofty sense of tragedy with an intense lyricism, is now part of numerous funeral rituals throughout the world. Patriotic, nationalistic ideas are particularly vividly expressed in the B Minor Sonata and in the polonaises, characterized by emotional richness, ranging from the nobly festive (the A Flat Major Polonaise) to the tragic (the F Sharp Minor Polonaise). National folk elements are also evident in the numerous mazurkas, on which Chopin worked since his youth. He developed their metric and rhythmic structure, stressing the uniqueness of Polish dance music, and achieved melodic and emotional diversity, ranging from brilliant danceability to the elegiac. His mazurkas present elegant sketches of Polish daily life (Chopin referred to his mazurkas as vignettes) and brief emotional stories of the destiny of his native land. The features of Polish dance music are also evident in Chopin's waltzes, imbued with profound meaning (they influenced the development of the Parisian waltz).

Chopin's treatment of the pianoforte genres was inventive. Chopin transformed the prelude (including a cycle of 24 piano preludes, one in each of the keys, composed during the 1830's and published in 1839) from a mere "introduction" to the fugue or other work into an independent instrumental miniature, condensing considerable emotional feeling; each is an imagistic sketch, reflecting various moods. The nocturne was considerably developed by Chopin, who imbued it with contrasts and drama. Chopin also introduced new and more profound content into the impromptu and transformed the scherzo, imbuing it with passion, the fantastic, and emotional diversity. He treated the etude in a new way, completely subordinating complex, virtuoso aspects of piano-playing technique to the imagery and musical expressiveness.

Chopin's creative work is one of the greatest achievements of Polish and world artistic culture. As the founder of Polish classical music, Chopin raised the national musical art to the highest artistic level through his enormous compositional and performing talents and mastery, innovative development of folk traditions, and transformation of the experience of the masters of national and world musical culture (he particularly valued the music of J. S. Bach and W. A. Mozart), as well as through his progressive ideology, lofty intellect, and ethical, aesthetic, and political convictions (he placed his hopes in the people and their liberty-seeking aspirations). His works are a lofty embodiment of the full range of human emotions, ranging from high tragedy to intense lyricism.

An inspired pianist, Chopin possessed an original performing style, characterized by a *cantabile* style and elegance and combining virtuosic brilliance with profundity and intimacy. His innovativeness was understood only by a few of his contemporaries, primarily F. Liszt and E. Delacroix (who painted several portraits of Chopin), as well as M. I. Glinka, A. S. Dargomyzhskii, the masters of the The Five (Balakirev Circle), and subsequent generations of Russian composers.

Since 1927, Warsaw has been the site of the International Chopin Piano Competition, whose winners have included many Soviet pianists (first prize at the first competition was won by L. N. Oborin). Warsaw is also the site of the Frédéric Chopin Society, which engages in extensive concert, scholarly, publishing, and organizational activity.

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I. F. BELZA [29–1347–4]

CHOPIN, JEAN (Russian, Ivan Ivanovich Shopen). Born 1798 in France; died Aug. 3 (15), 1870, in St. Petersburg. Ethnographer and historian.

Chopin, who was French by birth, moved to Russia in the 1820's. He worked for many years in the Caucasus. At the behest of the *namestnik* (vicegerent) of the Caucasus, he compiled a detailed description of the region. Chopin also wrote the important work *A Historical Record of the Condition of the Armenian Region at the Time of Its Union With the Russian Empire* (1852).

[29–1347–3]

CHOPOVICHI, an urban-type settlement in Malin Raion, Zhitomir Oblast, Ukrainian SSR. Situated near the Irsha River of the Dnieper basin, Chopovichi is 6 km from the Chopovichi railroad station. The settlement has a flax-processing plant and factories for the production of furniture and clothing. [29–685–2]

CHORNYI, KUZ'MA, (pen name of Nikolai Karlovich Romanovskii). Born June 11 (24), 1900, in the village of Borki, in what is now Kopyl' Raion, Minsk Oblast; died Nov. 22, 1944, in Minsk. Soviet Byelorussian writer. Member of the CPSU from 1943.

Chornyi was of peasant stock, the son of a hired hand. He studied in the division of literature and linguistics of Byelorussian State University from 1923 to 1925. His early published works appeared in 1921 and were followed by the short-story collections *The Silver of Life* (1925), *Along the Road* (1926), *Feelings* (1926), and *September Nights* (1929) and the novels *The Sister* (1927–28) and *The Earth* (1928). Chornyi's works reveal a desire common to many Byelorussian writers to master the methods of psychological prose, especially as exemplified by L. N. Tolstoy and F. M. Dostoevsky. The novella *Levon Bushmar* (1930) and the novel *The Fatherland* (1931) re-create revolutionary life in their portrayal of full-scale characters.

The true hero of Chornyi's works is history, philosophically interpreted. The novel *The Third Generation* (1935) and the novella *Liuba Luk'ianskaia* (1936) were intended as parts of a cycle of sociophilosophical works embracing several decades of Byelorussian history. During the Great Patriotic War (1941–45), Chornyi continued to work on the cycle, producing the war novels *The Great Day* (published 1947), *Search for the Future* (published 1950), and *Skip'evskii Forest* (published 1955) and the philosophical novel *The Milky Way* (published 1954).

Chornyi translated the works of A. S. Pushkin, N. V. Gogol, and other Russian classics. His works have been translated into the languages of the peoples of the USSR. Chornyi was awarded the Order of the Red Star and several medals.

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A. M. ADANOVICH [29–685–4]

CHORTKOV, a city (since 1939) and administrative center of Chortkov Raion, Ternopol' Oblast, Ukrainian SSR. Situated on the Seret River, 76 km southeast of Ternopol'. Railroad station. Population, 22,000 (1974). Chortkov has enterprises servicing the railroad industry, a repair plant, a sugar refinery, a cheese factory, a vodka distillery, a meat-packing plant, a bread-baking combine, a garment factory, and a factory for the manufacture of down and feather articles. The city has a historical museum. [29–686–2]

CHORUKH-DAIRON, an urban-type settlement in Leninabad Oblast, Tadzhik SSR, under the jurisdiction of the Kairakkum city soviet. Chorukh-Dairon is located in the foothills of the Mogoltau, 30 km northwest of Kairakkum. Nonferrous metals are mined nearby. [29–686–4]

CHOSENIA, a genus of plants of the family Salicaceae. There is a single species, *C. arbutifolia* (formerly *C. macrolepis*). A rapidly growing tree, it has an erect trunk measuring 25–30 m in height (sometimes to 37 m). The tree is found in Korea, Japan, Northeast China, and the USSR (in the Far East and East Siberia—west to Baikal). The wood is used for telegraph poles, bridges, and various small articles.

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CHOSON, the first state in the history of Korea. Because few details are given in written sources, many questions concerning the history of ancient Choson still remain unanswered.

The state of Choson emerged circa the first millennium B.C. Before the 1960's, Choson was generally regarded as a tribal alliance on the threshold of civilization; since the 1960's, however, scholars in the People's Democratic Republic of Korea have regarded Choson as the first slaveholding state in Korean history. In the late second century B.C., Choson was conquered by the Han Dynasty of China. In the early part of the first millennium A.D., during the people's struggle against the Chinese conquerors, the early feudal Korean states of Koguryo, Paekche, and Silla were formed.

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Kochoson munje yon-gu. (Study of Questions Concerning Ancient Choson). Pyongyang, 1973. [29–688–1]

CHOSON (literally, "morning beauty"; often rendered in translation as Land of the Morning Calm), one of the names of Korea. The etymology of the name remains obscure, but many authors think that the word was used to designate the east, or the direction in which the sun rises. Choson was originally the name of a tribe or of a group of tribes whose alliance gave rise to the first Korean state, also known as Choson. The name later fell into disuse, but it was revived in 1392 when the Yi dynasty was founded and gave the name "Choson" to the state; the Korean state retained the name until 1897, when it was renamed the Taehan Empire. With the formation of the People's Democratic Republic of Korea, the name was incorporated into the official designation of the state, which is known in Korean as the Choson Minjujuui Inmin Konghwaguk. [29–688–2]

CHOTA NAGPUR, a plateau in India that forms the northeastern part of the Deccan plateau and descends in stages to the Gangetic Plain. The Chota Nagpur is approximately 400 km long and up to 200 km wide. Its highest point is Parasnath Hill, which has an elevation of 1,366 m. The plateau consists of gneisses and quartzites that are overlain by basalts in the west. Its rolling surface, with pinnacle-like remnants of dense sandstone, is dissected by broad valleys. Savanna predominates in the plateau. A considerable measure of the plateau is farmed, and its irrigation systems are based on the Damodar River and its tributaries. [29–781–6]

CHOU, a Chinese dynasty and a period in the history of ancient China (1027–256 B.C.; according to some sources, 1027–249 B.C.). The period is divided into the Western Chou period (1027–771 B.C.) and the Eastern Chou period (770 B.C. to 256 or 249 B.C.).

The Chou Dynasty was founded by Wu Wang, leader of the Chou tribe, who in 1027 B.C. defeated the early Shang state and united all the tribes and territories of North China. The country was governed through the allotment of fiefs, in which power was given to relatives, associates, and allies of the *wang* (monarch). The Chou aristocracy, which was supported by Chou warriors, constituted an alien element in a number of the fiefs that had been granted it, and therefore its rule resulted in both social and tribal oppression. The fiefs struggled against the central authority and fought among themselves. Consequently, some were gradually destroyed or weakened, and new kingdoms appeared, which became independent or semidependent states.

In the eighth century B.C., in the Ch'un Ch'iu, or Spring and Autumn, period, the authority of the Chou *wangs* weakened, and in the seventh and sixth centuries the rulers of the most powerful states by turns ruled the country as hegemon. During the Chan Kuo, or Warring States, period (fifth to third centuries), seven powerful kingdoms emerged and warred against one another for control over the country. The Chou Dynasty waned still further, ruling only the Chou family possessions, which were overrun by the Ch'in kingdom between 256 and 249.

The introduction of iron in the sixth century led to a dramatic upsurge of productive forces and an improvement in tillage. The Chou period was marked by the formation of several philosophic schools, including Confucianism, Taoism, and Fa-chia (the Legist school), and the development of literature, the visual arts, and music.

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Fan Wen-lan. *Drevniaia istoriia Kitaia*. Moscow, 1958. (Translated from Chinese.) L. S. VASIL'EV and L. I. DUMAN [29–536–4]

CHOUANS, rebels who engaged in counterrevolutionary activity in northwestern France during the French Revolution and under the Directory and the Consulate. The name "Chouan" is often said to derive from *chat-huant*, or screech owl, the bird whose cry the rebels imitated as a signal.

The first bands of Chouans formed in southern Maine in the summer of 1792. By 1793, the year usually taken as the beginning of the revolt, the Chouan movement had spread throughout northwestern France. Many of the rebels were peasants from economically and politically backward areas who had fallen under the influence of the royalists and counterrevolutionary clergy. Other peasants in the movement wished to avoid the conscription that had been announced in February 1793.

After the Jacobins came to power, rich peasants who had been alienated by government requisitions and by the introduction of the Law of the Maximum joined the Chouans. Ideological leadership of the rebels subsequently passed to the petty nobility and to priests who had refused to take the oath of allegiance.

Republican troops dealt the movement a heavy blow in 1794. Nevertheless, in 1795, G. Cadoudal led more than 10,000 Chouans in support of the Quiberon expedition. The Chouans, who were linked to the royalist émigrés in Great Britain, continued the struggle until 1803, when the rebel movement was finally suppressed. [29–1510–6]

CHOU EN-LAI. Born Mar. 5, 1898, in Shaohsing District, Chekiang Province; died Jan. 8, 1976, in Peking. Chinese state and political figure.

Chou En-lai was the son of a landowner. As a student at Nank'ai University in Tientsin he took part in the anti-imperialist May Fourth Movement in 1919. From 1920 to 1924 he worked and studied in France and Germany. In 1922 he joined the Communist Party of China (CPC). From 1924 to 1926 he was head of the political department of the Whampoa Military Academy and head of the political department of the I Corps of the National Revolutionary Army.

In 1927, Chou became a member of the Central Committee of the CPC and helped organize and lead the Nanch'ang Uprising. In August of that year he became a candidate member of the Politburo of the Central Committee of the CPC, and in 1928, at the Sixth Congress of the Comintern, he was elected a candidate member of the Executive Committee of the Communist International. From 1927 to 1930, Chou was head of the organizational department of the Central Committee of the CPC, and from 1931 to 1934 he headed the Central Committee's bureau for the Central Soviet Region. From 1934 to 1956 he was a secretary of the Central Committee.

In 1934 and 1935, Chou was a leader of the Long March. In 1935, at the Seventh Congress of the Comintern, he was elected a member of the Executive Committee of the Communist International. From 1937 to 1945 he was chairman of the Central Committee of the CPC in the Kuomintang Government, which was located first in Nanking and later in Chungking.

From 1949 to 1954, Chou was premier of the State Administrative Council of the People's Republic of China (PRC), and from 1949 to 1958 he served as foreign minister of the PRC. He became premier of the State Council of the PRC in 1954 and a member of the Standing Committee of the Politburo of the Central Committee of the CPC in 1956. He was vice-chairman of the Central Committee of the CPC from 1956 to 1966 and from 1973 until his death.

Chou delivered the political report of the Central Committee of the CPC to the Tenth Congress of the CPC in 1973 and the report on the work of the government at the 1975 session of the National People's Congress; on both occasions he called for Maoist principles in the domestic and foreign policy of the Chinese leadership. V. I. ELIZAROV [29–538–2]

CHOU HSIN-FANG. Born 1895 in Chekiang Province; died 1966 in Peking. Chinese actor and theatrical figure. Performer of Peking opera, a genre of Chinese traditional theater.

Chou began his stage career in 1902, conventionally cast as an elderly hero, or *lao-sheng*. His first successful roles were in *The Gates of Wenchaokuan* and *The Fisherman's Revenge*. He also appeared in the dramatic theater. In the 1920's and 1930's he substantially broadened his repertoire, appearing in *The Fifth Madame Chao, The Fresh-wind Arbor, The Hall of the Black Dragon, Four Officials*, and *Sung Chiao-jen*.

Chou served in the patriotic movement against Japanese intervention and, after the formation of the People's Republic of China, helped reform the traditional repertoire. He created his own school of acting, distinguished by highly refined vocal skills and the laconic use of expressive devices, based on traditional national technique.

In 1954, Chou became a deputy to the All-China National People's Congress. He became director of the Shanghai Theater of Peking Musical Drama in 1955. He toured several countries, including the USSR in 1956.

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CHOUK'OUTIEN, a habitation site of the early Paleolithic in the K'uoch'ieht'ang cave, located near the Chouk'outien railroad station, about 45 km from Peking. Remains of *Sinanthropus* (Peking man) were discovered at the site. [29–537–1]

CHOU LI-PO. Born 1908 in Iyang District, Hunan Province. Chinese writer. Member of the Chinese Communist Party since 1934.

Chou attended the economics faculty of the University of Shanghai. He was imprisoned by the Kuomintang for being implicated in the revolutionary movement. He worked for the Chinese League of Left Writers from 1934 to 1936 and later served in the ranks of the Chinese Red Army. In 1939 he began teaching in the department of literature of the Lu Hsün Academy of Literature and Art in Yenan.

Chou first published his works in 1938. In 1948 he wrote the novel *Hurricane* (Russian translation, 1951; State Prize of the USSR, 1952). He was also the author of the novel *Big Changes in a Mountain Village* (parts 1–2, 1958–60); the first part was translated into Russian as *Spring Comes to the Mountains* (1960), and the second part as *Clear Streams* (1962). These works depict the socialist reorganization of agriculture. The working class was portrayed in the novel *The Molten Iron Flows* (1955; translated into Russian as *The Steel Stream*, 1957). Chou wrote short stories, essays, and critical articles and translated into Chinese A. S. Pushkin's novel *Dubrovskii* and M. A. Sholokhov's novel *Virgin Soil Upturned*.

Chou was awarded the State Prize of the USSR in 1951.

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CHOUSHAN, a group of islands in the East China Sea, off China; situated near the entrance to the gulfs of Hangchou Wan and Hsiangshan Kang. The islands have a total area of 1,554 sq km, the largest being Choushan. Their maximum elevation is 500 m. They have shrub vegetation. Fishing is practiced in the area. The cities of Choushan and Shenchiamen are situated on the islands. [29–538–1]

CHOU TUN-I (also Chou Lien-hsi). Born 1017; died 1073. Chinese philosopher. One of the founders of neo-Confucianism.

Chou Tun-i wrote the philosophic treatises *An Explanation of the Diagram of the Great Ultimate* and *The Book of Understanding*. Drawing on tenets of Taoism and ideas from the *I Ching* (Book of Changes), he put forth the concept of *t'ai chi* (the Great Ultimate) as the foundation of the world. When *t'ai chi* moves, it engenders yang, or motion; when it is stationary, it gives rise to yin, or repose. The interaction of yang and yin produces the five elements water, fire, wood, metal, and earth.

In a mysterious union with *t'ai chi*, yin, and yang and through the medium of the masculine base (Heaven) and feminine base (Earth), the five elements engender the multiplicity of things, which continuously reproduce themselves. The crown of this process is man, who possesses the five moral principles humanity, justice, decency, knowledge, and fidelity and who distinguishes good from evil. Chou Tun-i also put forth the idea that *ch'eng* (sincerity, honesty), an attribute identical to inaction, is the basis of moral qualities and the source of any activity. [29–536–5]

CHOW CHOW, a breed of dog. The chow chow originated in China and Manchuria, where it was bred as a hunting dog and was also used for food. It was brought to Great Britain in the 19th century and considerably improved. Because of its distinctive appearance, it is now bred as a show dog and pet. The chow chow is of medium height, 45 cm or higher. It has a massive head, a short muzzle, and a broad chest. The front legs are massive; the hind legs have short shins and straight hocks. The tail is highly placed and curved over the back. The fur is straight, with a thick undercoat, and is especially long on the neck, the extremities, and the tail. Its color is various shades of yellow, black, gray, or white. Chow chows are found all over the world. [29–109–4]

CHREVO, in Russian, an archaic word synonymous with the modern Russian *zhivot* ("belly") and *utroba* ("womb"). The noun *chrevougodie* (literally, "belly-pleasing") refers to a passion for food, a satisfying of the appetite, or gluttony. [29–690–1]

CHTENIIA V ISTORICHESKOM OBSHCHESTVE NESTORA-LETOPISTSA (Readings in the Historical Society of Nestor the Chronicler), nonperiodical collections published in Kiev by the Historical Society of Nestor the Chronicler from 1879 to 1914. There were 24 volumes, with Volumes 14 to 24 each having several fascicles.

The first section of each volume contained the minutes of the society's meetings and information about its membership and activities. In addition to reports on archaeological excavations, the second section contained source materials and articles on the history of Russia, the Ukraine, and other Slavic countries. A bibliographic section was added in 1893.

Among the materials and studies published were church polemical literature, "Acta of the History of Land Ownership in Little Russia," articles by V. S. Ikonnikov on events in Russia in the early 17th century, and articles by M. F. Vladimirskii-Budanov on the history of law. Some volumes were published as topical collections. A list of scholarly reports by members of the society that were published in *Chteniia v Istoricheskom obshchestve Nestora-Letopistsa* is given in N. P. Dashkevich's book *The 25th Anniversary of the Historical Society of Nestor the Chronicler* (1889). [29–695–2]

CHTENIIA V OBSHCHESTVE ISTORII I DREVNOSTEI ROSSIISKIKH (Readings in the Society for History and Russian Antiquities), a periodical publication of the Moscow Society of History and Russian Antiquities, which was associated with Moscow University. *Chteniia* contained important studies on the history of the peoples of Russia and the Slavs (some volumes were as large as 60 printer's sheets), extremely rich historical and ethnographic documentary materials, and translations of foreign works about Russia. It was issued as separate books for 72 years, with a ten-year interruption.

The first book came out in January 1846. For the first three years publication was irregular, with books appearing as sufficient material accumulated. Each book consisted of four sections: historical studies, domestic historical documents, foreign materials, and miscellaneous materials. The historical studies and materials were concerned with the history of the peoples of Russia from the eighth to the 19th centuries. The remaining studies and materials dealt with archaeology, ethnography, numismatics, paleography, and other subsidiary historical disciplines.

By June 1848, 23 books had been published. O. M. Bodianskii's inclusion of J. Fletcher's work on the Muscovite state in the book for June 1848 incurred the displeasure of Nicholas I. *Chteniia* was forced to suspend publication, and Bodianskii was dismissed from Moscow University.

Publication did not resume until 1858, when Bodianskii again became secretary of the society. *Chteniia* adopted a Slavophile orientation, and a section of Slavic materials was added to the former four sections. Beginning in 1858, *Chteniia* was published four times a year. From 1858 to 1877, Numbers 24 to 101 appeared, edited by Bodianskii; from 1877 to 1881, Numbers 102 to 117, edited by A. N. Popov; from 1881 to 1907, Numbers 118 to 222, edited by E. V. Barsov; from 1907 to 1916, Numbers 223 to 258, edited by M. K. Liubavskii; and from 1916 to 1918, Numbers 259 to 264, edited by S. A. Belokurov.

The most prominent Russian historians contributed to *Chteniia*, including D. I. Bagalei, D. N. Bantysh-Kamenskii, S. A. Belokurov, I. D. Beliaev, M. M. Bogoslovskii, S. K. Bogoiavlenskii, A. F. Bychkov, S. B. Veselovskii, Iu. V. Got'e, I. E. Zabelin, V. O. Kliuchevskii, and D. F. Maslovskii. Translations of Šafařík and other writers were printed in *Chteniia*.

L. B. LEONIDOV [29–696–1]

CHU, a city under oblast jurisdiction in Chu Raion, Dzhambul Oblast, Kazakh SSR; situated on the left bank of the Chu River, 230 km northeast of Dzhambul. Chu has a railroad station on the Alma-Ata–Dzhambul line. The city has a machinery repair plant, a sugar factory, a milk plant, and enterprises serving railroad transportation. [29–702–2]

CHU, a river in the Kirghiz and Kazakh SSR's. The Chu is 1,067 km long and drains an area of 62,500 sq km. It is formed by the confluence of the Dzhuvanaryk and Kochkor rivers, which originate at glaciers in the Terskei-Alatau and Kirghiz ranges. Below their confluence the Chu enters the Issyk-Kul' Basin, where it flows past the lake Issyk-Kul'; during high water, the Chu discharges some of its water into the lake via the Kutemaldy Arm. After passing the lake, the river flows through Boam Gorge into the Chu Valley, where it receives numerous tributaries from the surrounding mountains. In its lower course it crosses the desert known as the Muiunkum and disappears in the Ashchikol' Depression.

The Chu is fed by glaciers and snow, and subsurface drainage plays an important role. The mean flow rate at the place where the river emerges from the mountains (area of drainage basin, approximately 25,000 sq km) is 130 cu m per sec; maximum flow is in July and August. The lower course dries up in late July or early August, but the flow of water resumes in December. From November to April there is some ice in the upper course, which freezes over only occasionally and usually for about ten days; the lower course is frozen over from December to March. The main tributaries are the Chon-Kemin, Yrgaity, and Kakpatas on the right and the Alamedin, Aksu, and Kuragaty on the left. The Orto-Tokoi Reservoir and three water-raising dams are on the Chu. There are also numerous irrigation canals; 55 percent of the river's water is used for irrigation. The cities of Tokmak and Chu are situated on the Chu. [29–702–1]

CHUANG (self-designation, *puchuang, pupu, pui*, or *punung*), a people in the People's Republic of China, mainly in the Kwangsi Chuang Autonomous Region. According to a 1975 estimate, the Chuang number approximately 10 million. Their language is one of the Thai languages. The predominant religion is animism, but Taoism is also widespread.

The Chuang are one of the most ancient peoples of South China; their ancestors created the ancient state of Nanyüeh, which existed from 207 B.C. to 111 B.C. The Chuang took part in the Taiping Rebellion of 1850–64. Between 1927 and 1937 they helped establish a number of soviet regions in China in the area between the Tso Chiang and the Yu Chiang. They also aided in the formation of the Seventh and Eighth Red Armies.

For centuries the primary occupation of the Chuang has been farming, especially the cultivation of rice; part of the population, however, is now engaged in heavy industry. The Chuang have their own system of writing; in medieval times it was hieroglyphic, but in 1958 they adopted the Latin alphabet. The Chuang have a rich national literature.

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CHUANG-TZU. Born circa 369 B.C.; died circa 286 B.C. Author of the ancient Chinese classic Taoist treatise *Chuang-tzu* (c. 300 B.C.).

Very little is known about the life of Chuang-tzu. It has been established that he deliberately refused to occupy any civil service posts. His treatise, written in the form of parables, short stories, and dialogues, harshly criticizes Confucianism and the teachings of Mo Tzu and preaches fusion with the tao, a certain inexpressible totality of universal life. Chuang-tzu contrasts nature, in which the tao is embodied, with human beings and the world created by them—government, culture, and morality, all of which are based on force.

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CHUBAR', VLAS IAKOVLEVICH. Born Feb. 10 (22), 1891, in the village of Fedorovka (now the village of Chubarovka, Pologi Raion, Zaporozh'e Oblast); died Feb. 26, 1939. Soviet state and party figure. Member of the CPSU from 1907.

The son of a peasant, Chubar' studied at the Aleksandrovsk School of Mechanical Engineering (now the V. Ia. Chubar' Zaporozh'e Institute of Machine Building) from 1904 to 1911. He was a veteran of the Revolution of 1905–07. Beginning in 1911 he worked at plants in Kramatorsk, Mariupol', Moscow, and Petrograd. After the February Revolution of 1917, Chubar' became chairman of the factory committee at an ordnance plant and later a member of the Central Council of Factory Committees and a deputy to the Petrograd soviet. During the October Revolution of 1917, after serving as commissar of the Military Revolutionary Committee in the Main Artillery Directorate, he was a member of the Council of Workers' Control.

In 1918 and 1919, Chubar' was chairman of the board administering machine-building plants (the State Association of Machine Building Plants, or GOMZA) and a member of the Presidium of the Supreme Council on the National Economy. Between 1919 and 1922 he served as chairman of the Organizational Bureau for the Restoration of Industry in the Ukraine, as a member of the All-Ukrainian Revolutionary Committee, and as chairman of the Presidium of the Supreme Council on the National Economy of the Ukraine. He became chairman of the Council of People's Commissars of the Ukrainian SSR and deputy chairman of the Council of People's Commissars of the USSR in 1923, deputy chairman of the Council of People's Commissars of the USSR and of the Council of Labor and Defense in 1934, and people's commissar of finances of the USSR in 1937.

Chubar' was a member of the Politburo of the Central Committee of the Communist Party (Bolshevik) of the Ukrainian SSR from 1920 to 1934. He was a delegate to the Eleventh through the Seventeenth Congress of the ACP(B) and was a candidate member of the Central Committee at the Tenth Congress. He became a member of the Central Committee of the ACP(B) in August 1921, a candidate member of the Politburo of the Central Committee in 1926, and a member of the Politburo in 1935. Chubar' was a member of the All-Russian Central Committee, and the Central Executive Committee of the USSR and its Presidium. He was a deputy to the first convocation of the Supreme Soviet of the USSR. Chubar' was awarded the Order of the Red Banner of Labor.

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Kol'iak, T. M. *Zhyttia v borot'bi*. Dnepropetrovsk, 1971. [29–703–2]

CHUBAROV, SERGEI FEDOROVICH. Born circa 1845 in Penza Province; died Aug. 10 (22), 1879. Russian revolutionary Narodnik (Populist).

Chubarov was of noble birth. He was a student at the Voronezh Cadet Corps in the late 1860's but did not complete the course of study; he subsequently enrolled as an auditor at Moscow University and then at the Forestry Institute in St. Petersburg. In 1869 he moved to the USA to establish a labor commune. He returned to Russia in 1872 and took up residence in Stavropol', Samara Province.

Chubarov joined the Southern Rebels group in 1875 and took part in the Chigirin conspiracy. He became a member of V. A. Osinskii's circle in 1877 and joined a circle of Russian Jacobins in Odessa in 1878. He organized a demonstration to protest the death sentence given to I. M. Koval'skii. On Aug. 5, 1878, in Odessa, Chubarov offered armed resistance to arrest. Sentenced to death by the Odessa military district court, Chubarov, with D. A. Lizogub and others, was hanged in Odessa.

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CHUBINSKII, PAVEL PLATONOVICH. Born Jan. 15 (27), 1839, near Borispol', in what is now the Ukrainian SSR; died Jan. 14 (26), 1884. Bourgeois democratic ethnographer and folklorist specializing in the Ukraine and Russia.

Chubinskii studied the economic resources and ethnography of the northern provinces of Russia in 1867. In 1869 and 1870 he headed an expedition to the country's southwestern provinces. The materials gathered on this trip are a rich source for the historical ethnography of the Ukraine and for the customary law, way of life, folklore, and dialects of the Ukrainians and other peoples. These materials were published in *Works of an Ethnographic-Statistical Expedition to the Western Russian Region Sponsored by the Russian Geographical Society* (vols. 1–7, St. Petersburg, 1872–79).

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CHUBUT, a province in southern Argentina, in the Chubut River basin. Area, 224,700 sq km. Population, 195,000 (1970). The capital of Chubut is Rawson. Petroleum and natural gas are extracted in the province; industry includes oil refining in Comodoro Rivadavia and nonferrous metallurgy in Puerto Madryn and Comodoro Rivadavia. Agriculture in Chubut is dominated by sheep raising. [29–704–6]

CHUBUT, a river in southern Argentina. The Chubut is 810 km long and drains an area of about 138,000 sq km. It rises on the eastern slopes of the Patagonian Andes, crosses the semidesert plateaus of Patagonia in a narrow, deep valley, and empties into the Atlantic Ocean near Rawson. The main tributary is the Rio Chico on the right. The mean flow rate is about 50 cu m per sec. The Chubut carries a small volume of water; small freshets occur in winter. [29–704–5]

CHU CHIANG (also Pearl River, Canton River), a river in Southeast China; left (northern) channel of the delta of the Hsi Chiang. The Pearl River empties into the Chu Chiang K'ou (Bay of Canton) of the South China Sea, forming an estuary. The river is more than 40 km long. The seaport of Canton (Kuangchou) is

situated on the river, above the estuary. The Chu is navigable; it is fished commercially and is a source of pearls. The name "Chu Chiang" is frequently applied to the entire Hsi Chiang system. [29–540–2]

CHU CHIANG K'OU (also Bay of Canton), a bay of the South China Sea, along the southern coast of China. The bay has a length of 63 km and a width of 31 km at the mouth; its maximum depth is 26 m. The Chu Chiang (Pearl River) empties into the bay, which has numerous small islands and shoals. There are mixed tides, with a maximum height of 2.5 m. The port of Hong Kong is situated at the mouth of the bay. [29–540–3]

CHUCHIN, FEDOR GRIGOR'EVICH. Born Feb. 5 (17), 1883, in the village of Zaimishche, Kirillov District, Novgorod Province; died Jan. 15, 1942, in Moscow. Participant in the Russian revolutionary movement. Member of the Communist Party from 1904.

The son of a peasant, Chuchin graduated from the teachers' seminary in Cherepovets in 1904. He took part in the Revolution of 1905–07 and was a member of the Moscow okrug committee and the St. Petersburg committee of the RSDLP. He was arrested and exiled several times. After the February Revolution of 1917, Chuchin became a member of the Tomsk soviet. During the October Revolution of 1917 he was commissar of the Anzhero-Sudzhensk mines and a member of the Siberian oblast bureau of the RSDLP(B). He was a member of the Central Executive Committee of Siberian Soviets in 1918 and 1919 and a member of the provincial committee and chairman of the district committee of the RCP(B) in Cherepovets in 1919 and 1920.

From 1921 to 1924, Chuchin was chairman of the All-Russian Extraordinary Commission for the Liquidation of Illiteracy and chairman of the commission of experts of the People's Commissariat for Foreign Trade. In 1921 he was named commissioner of the All-Russian Central Executive Committee for matters concerned with philately and bonds and commissioner of the Central Committee of the Central Commission for Famine Relief for matters pertaining to stamp donations. He was the founder and editor of the journal *Sovetskaia filateliia*; under his editorship the first Soviet catalogues of postage stamps were issued. Chuchin was a delegate to the Ninth Congress of the RCP(B) in 1920. He took up pedagogical and scholarly work in Moscow in 1924. Chuchin was granted a personal pension in 1931.

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CHUCHKOVO, an urban-type settlement and the administrative center of Chuchkovo Raion, Riazan' Oblast, RSFSR. Chuchkovo has a railroad station on the Riazan'-Ruzaevka line. Industry is represented by an ironworks, a milk plant, a brickyard, an asphalt-concrete plant, and a poultry hatchery. [29–777–2]

CHUCHOU, a city in China, in Hunan Province; situated on the Hsiang Chiang, which empties into the lake Tungt'ing Hu. Population, 510,000 (1973). Chochou's industries include food processing and the repair of railroad cars and locomotives. [29–541–1]

CHUD', the name given in Old Russian chronicles to the Estonians and related Finno-Ugric tribes (Zavoloch'e Chud') living in the domains of the Novgorod Feudal Republic east of Lake Onega, along the Onega and Severnaia Dvina rivers. [29–739–3]

CHUDAKOV, ALEKSANDR EVGEN'EVICH. Born June 16, 1921, in Moscow. Soviet physicist. Corresponding member of the Academy of Sciences of the USSR (1966). The son of E. A. Chudakov.

A. E. Chudakov graduated from Moscow State University in 1947. From 1946 to 1971, he was on the staff of the Institute of Physics of the Academy of Sciences of the USSR. In 1971 he joined the staff of the Institute of Nuclear Research of the Academy of Sciences of the USSR.

Chudakov's main works deal with the nature and properties of cosmic rays. Chudakov developed a technique for measuring the energy of a particle that caused a cosmic-ray shower. He used the technique to search for local sources of high-energy gamma quanta. Together with S. N. Vernov and others, Chudakov discovered and investigated the earth's outer radiation belt; for this achievement, he received a Lenin Prize in 1960.

Chudakov has been awarded three orders and various medals. [29–735–1]

CHUDAKOV, EVGENII ALEKSEEVICH. Born Aug. 20 (Sept. 1), 1890, in the village of Sergievskoe, in what is now Tula Oblast; died Sept. 19, 1953, in Moscow. Soviet scientist, specialist in machine science and automotive engineering. Academician of the Academy of Sciences of the USSR (1939; corresponding member, 1933).

Chudakov graduated from the Moscow Higher Technical School in 1916. Between 1918 and 1928, he taught at the school. From 1936 until his death, he was the head of the automotive subdepartment at the school. In 1918, Chudakov organized an automotive scientific laboratory. From 1921 to 1930, he was the director of the Scientific Motor Vehicle Institute, which was founed on the basis of the laboratory. Between 1930 and 1940, he was the deputy director of the Tractor Scientific Research Institute and then the head of a section of the institute. From 1939 to 1950, Chudakov was the director of the Institute of Machine Science of the Academy of Sciences of the USSR. He was a vice-president of the Academy of Sciences of the USSR from 1939 to 1942, becoming a member of the academy's Presidium of 1942. From 1949 to 1953, he was a member of the Chief Editorial Board of the *Great Soviet Encyclopedia*.

Chudakov's main works dealt with the development of automotive theory. In 1928, Chudakov published *A Dynamic and Economic Study of Motor Vehicles*, in which he demonstrated the relationship between the design features of a motor vehicle and the vehicle's road and overall economic performance. He studied the stability of motor vehicles and the strength and wear of automotive parts.

For a number of years, Chudakov was the chairman of the All-Union Council of Scientific and Engineering Societies and a member of the Presidium of the Society for the Dissemination of Political and Scientific Knowledge. He received the State Prize of the USSR in 1943 and 1951 and was awarded two Orders of Lenin, the Order of the Red Banner of Labor, and various medals.

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CHUDIC MINES, the collective name for ancient mine workings of which traces have been discovered in the USSR. In particular, Chudic mines have been found in the Minusinsk Basin, Western Siberia, and the Urals. The mines were first worked in roughly the first half of the third millennium B.C. The mining was most intensive in the 13th and 12th centuries B.C.; it ceased in the fifth and sixth centuries A.D. in Western Siberia and in the 11th and 12th centuries A.D. in the Central and Northern Urals.

The implements used by the ancient miners in digging the mines included the following: stone hammers, wedges, pestles, and crushers; horn and bone picks; copper, bronze, and (later) iron picks, pickaxes, and hammers; wooden troughs and log ladders; wicker baskets; leather pouches and mittens; and clay lamps. The first step in the working of the mineral deposits was usually the digging of test holes. After reaching a depth of 6–8 m along the dip of a deposit, the miners usually sank funnel-shaped shafts that were slightly inclined and were tapered downward. The miners sometimes excavated adits of small cross section or drove crosscuts through small veins.

The depth of the workings was 10–14 m on the average. Some

of the workings were quite large, since ore was mined in them for hundreds of years. For example, an open-pit copper mine near the city of Orsk was 130 m long and 15–20 m wide.

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CHUDINA, ALEKSANDRA GEORGIEVNA. Born Nov. 6, 1923, in the village of Kramskaia, Kurkino Raion, Tula Oblast. Soviet athlete and coach. Honored Master of Sport (1948).

Chudina, competing on the Moscow Dynamo team, was champion of the USSR in track and field (running, jumping, and the pentathlon) 35 times from 1945 to 1955 and in volleyball seven times from 1947 to 1963. She was European champion in the pentathlon in 1954 and in volleyball four times from 1949 to 1958, and world volleyball champion three times from 1952 to 1960. From 1953 to 1956 she held the world record in high jump and the pentathlon.

Chudina has been awarded the Order of Lenin. [29–736–3]

CHUDNOV, an urban-type settlement and administrative center of Chudnov Raion, Zhitomir Oblast, Ukrainian SSR. The settlement is situated on the Teterev River, a tributary of the Dnieper, 5 km from the Chudnov-Volynskii railroad station on the Kazatin-Shepetovka line. Chudnov has a distilling plant, a food-processing combine, a furniture factory, a peat enterprise, and a feedlot sovkhoz. [29–737–1]

CHUDNOVSKII, GRIGORII ISAAKOVICH. Born Oct. 3 (15), 1890, in Ekaterinoslav (now Dnepropetrovsk); died Apr. 8, 1918. Participant in the October Revolution of 1917 and the Civil War of 1918–20. Joined the revolutionary movement in 1905. Member of the CPSU from August 1917.

The son of a lawyer, Chudnovskii studied law at the University of St. Petersburg. After being exiled to Siberia in 1910 for revolutionary activities, he fled the country in 1913. A centrist during World War I, Chudnovskii returned to Russia in May 1917 and joined the Mezhraiontsy. With them he was accepted into the Bolshevik party at the Sixth Congress of the RSDLP(B).

Chudnovskii served as a member of the corps committee of the Southwestern Front. In October 1917 he became a member of the All-Russian Bureau of Military Organizations of the Central Committee of the RSDLP(B), a member of the Petrograd Military Revolutionary Committee, and commissar of the military revolutionary committee in the Preobrazhenskii Regiment. He was a delegate to the Second All-Russian Congress of Soviets and was elected a member of the All-Russian Central Executive Committee.

As one of the leaders in the taking of the Winter Palace, Chudnovskii arrested the ministers of the bourgeois Provisional Government and escorted them to the Peter and Paul Fortress. He was wounded while helping to crush the Kerensky-Krasnov Rebellion of 1917. Appointed extraordinary commissar of the Southwestern Front in November 1917, Chudnovskii took part in the struggle against the Central Rada. He was arrested by the Central Rada in December and sentenced to death. In the early morning of Jan. 26, 1918, however, he was freed by Soviet troops in Kiev, where he was subsequently appointed commissar of civil affairs. Chudnovskii was killed during a Soviet troop retreat from the Ukraine.

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CHUDNOVSKII, SOLOMON LAZAREVICH. Born Mar. 13 (25), 1849, in Kherson; died Aug. 21 (Sept. 3), 1912, in Odessa. Revolutionary populist.

The son of a merchant, Chudnovskii graduated from the Kherson Gymnasium in 1868. He was expelled from the St. Petersburg Medical and Surgical Academy for his part in the student unrest of 1868–69 and was sent back to Kherson, where he organized a number of activist groups. In 1871, Chudnovskii moved to Odessa, where he became a member of the Chaikovskii circle.

Studying in Vienna in 1872 and 1873, Chudnovskii became close with the Austrian Social Democrats. Upon his return to Russia, he and A. I. Zheliabov were in charge of transporting illegal literature into the country. He was arrested in Odessa on Jan. 27, 1874, and sentenced in the Trial of the 193 to five years at hard labor, which was commuted to exile in Tobol'sk Province.

While in Siberia, Chudnovskii studied peasant society, took part in geographical expeditions, and contributed to the journal *Severnyi vestnik* and the newspaper *Vostochnoe obozrenie*. He returned to Odessa in 1893 and served as secretary of the board of the Southern Russia Printing Society. In 1905 he became a Constitutional Democrat. Chudnovskii contributed to the journals *Byloe, Minuvshie gody*, and *Vestnik Evropy*.

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CHUDOV, MIKHAIL SEMENOVICH. Born Sept. 5 (17), 1893, in the village of Khoneevo, Bezhetsk District, Tver' Province; died Oct. 30, 1937. Soviet and party figure. Member of the CPSU from 1913.

A printer in St. Petersburg, Chudov took part in the February and October revolutions of 1917. He was chairman of the Bezhetsk district party committee and the Bezhetsk district executive committee between 1918 and 1920. Beginning in 1920, he served as chairman of the Tver' provincial executive committee, secretary of the Tver' provincial committee of the RCP(B), secretary of the okrug committee in Rostov-on-Don, and secretary of the Northern Caucasus Krai Committee of the ACP(B). Chudov held the position of second secretary of the Leningrad oblast party committee from 1928 to 1936.

Chudov was a delegate to the Eleventh through Seventeenth Congresses of the ACP(B). He was elected a candidate member of the Central Committee of the ACP(B) at the Twelfth and Thirteenth Congresses and a member of the Central Committee at the Fourteenth through Seventeenth Congresses. Chudov was a member of the All-Russian Central Executive Committee and the Central Executive Committee of the USSR. [29–738–1]

CHUDOV MONASTERY (Monastery of Metropolitan Aleksei and the Archangel Michael), a monastery founded in the Moscow Kremlin circa 1358–65 by Metropolitan Aleksei. Until 1561 the superior of the monastery was considered first among the fathers superior of Russian monasteries. In the late 14th century, the monastery became a major center of Russian culture. From the 15th to the 17th centuries it included a workshop for transcribing manuscripts, where Maksim Grek worked from 1518 to 1525. Under Filaret a Greco-Latin school was opened in the monastery.

In the 1930's the monastery's buildings, which had been constructed in the 16th to 19th centuries, were razed. The monastery's collection of manuscripts from the 11th to 18th centuries is now preserved in the manuscript department of the State Historical Museum.

REFERENCE
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CHUDOVO, a city (since 1937) and administrative center of Chudovo Raion, Novgorod Oblast, RSFSR. Situated on the Kerest' River (basin of Lake Ladoga). Chudovo is a railroad junction at the intersection of the Bologoe-Leningrad and Novgorod-Volkhov lines. The Leningrad-Moscow highway runs through the city.

Chudovo has a match factory, a glassworks, a plant producing reinforced-concrete sleepers, a branch of the Novgorod Glove Production Association, a food-processing combine, and a milk plant; a branch of the Nevskii Zavod Production Association is

under construction. Points of interest include the house-museums of N. A. Nekrasov, who spent summers in Chudovo from 1871 to 1876, and G. I. Uspenskii, who lived there in the 1880's. [29–738–4]

CHUDSKOE-PSKOV, LAKE (also Lake Gdov, Peipsi Järv, or Lake Peipus), a lake in the Estonian SSR and Pskov Oblast, RSFSR. The lake's area is 3,550 sq km. The average depth is 7.1 m, and the maximum depth, 15 m.

Lake Chudskoe-Pskov consists of three parts: Lake Chudskoe, with an area of 2,670 sq km, Lake Pskov, with an area of 710 sq km, and the channel between them, Lake Teploe, with an area of 170 sq km. The lake is a relict of a large glacial reservoir. The shores are mostly low and covered with peat bogs. The lake bottom is flat and consists of a thick layer of gray silt. A sand bar, overgrown in places with pine, extends along the northern and eastern shores of Lake Chudskoe. Islands abound in Lake Chudskoe-Pskov, the largest being Pirissar (Porka). The highest water levels usually occur in mid-April to early May; the range of fluctuation is 3.0 m. Some changes in water level are caused by wind-driven waves. The lake freezes in late November or early December. Lakes Pskov and Teploe open up earlier than Lake Chudskoe, in late April or early May.

About 30 rivers empty into Lake Chudskoe-Pskov, the largest of which are the Velikaia and the Emajõgi (Ema River). The Narva River of the Gulf of Finland basin flows out of it. The lake is navigable. There is commercial fishing for European bream (*Perca fluviatilis*), Eurasian perch, roach, pike perch, whitefish, and lacustrine smelt (*Osmerus ereplanus ereplanus*).

In 1242, a battle between Russian forces and German Livonian Knights took place on the ice in the southern part of the lake (*see* BATTLE ON THE ICE OF 1242). [29–739–2]

CHUDZ'IAVR, a lake on the Kola Peninsula, in Murmansk Oblast, RSFSR. The Chudz'iavr covers an area of 57.8 sq km. The banks are indented, with steep slopes in the west and southwest. The lake is fed by snow and rain. The Chudz'iok River (Voron'ia River basin) flows from the lake. [29–736–1]

CHUFA (*Cyperus esculentus*), also earth almond, ground almond, or rush nut; a perennial herb of the family Cyperaceae. During the first year of vegetation, chufa forms as many as 240 fascicles of leaves and 400 underground shoots with terminal tubers. A single plant may have as many as 1,000 tubers. There are three to 12 leaves in a fascicle. The sessile leaves are long (up to 80 cm) and narrow (5–10 mm). The small flowers are located in the axils of the upper leaves and gathered in umbellate inflorescences. The fruit is a nut.

Chufa is distributed in Egypt, Italy, and Spain, as well as in Asia Minor and in the countries of tropical and southern Africa. In the USSR it is found in Transcaucasia and the Volga Region. The main region of commercial production of chufa is Spain. In the USSR it is found in collection and experimental plantings.

Chufa is cultivated as an annual. The vegetative period is 110 to 120 days. The best soils are sandy loams, light loams, and chernozems; saline and waterlogged soils are unsuitable. Chufa is propagated by tubers or by seedlings. The yield of tubers is 20–30 quintals per hectare (ha) or, if irrigated, 40–50 quintals per ha. The tubers contain 30–35 percent starch, 15–20 percent sugar, 20–25 percent oil, and 3–7 percent protein. Chufa may be eaten raw, fried, or boiled. It is used in the production of confectioneries, beverages, coffee and cocoa substitutes, and cooking oil. The cut green mass can be fed to animals directly, or it can be ensiled.

REFERENCE

Zhukovskii, P. M. *Kul'turnye rasteniia i ikh sorodichi*, 3rd ed. Leningrad, 1971. [29–773–3]

CHUFAROV, GRIGORII IVANOVICH. Born Nov. 1 (14), 1900, in the settlement of Kasli (since 1942, a city), in what is now Cheliabinsk Oblast. Soviet physical chemist. Corresponding member of the Academy of Sciences of the USSR (1953). Member of the CPSU from 1939.

Chufarov graduated from the Urals Polytechnic Institute in 1928. He served as director of the Institute of Chemistry of the Urals Branch of the Academy of Sciences of the USSR from 1939 to 1946 and as rector of the Urals University from 1946 to 1956. In 1956 he began conducting research at the Urals Branch of the Academy of Sciences of the USSR. (In 1971 the Urals Branch and two other institutions were combined to form the Urals Scientific Center.)

Chufarov's principal works are devoted to the physical chemistry of metallurgical processes. He studied the mechanism and kinetics of the dissociation and reduction of metal oxides. He also investigated the etching of metals with acids and the action of inhibitors, and he studied hot tinning, zinc plating, and the decarbonization of ferrosilicon steel.

Chufarov has been awarded two Orders of Lenin, two other orders, and various medals.

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CHUFAROVO, an urban-type settlement in Veshkaima Raion, Ul'ianovsk Oblast, RSFSR. Located on the Barysh River in the Volga basin, Chufarovo has a railroad station on the Ul'ianovsk-Inza line. The settlement has a hardware plant. [29–774–1]

CHUFUT-KALE (or Chufutkale), a medieval cave city-fortress on the outskirts of Bakhchisarai, Crimean Oblast. It is thought that Chufut-Kale was founded in the fifth or sixth century; remains of a defensive wall (known as the middle wall) date from the tenth century. After the Mongol-Tatar invasion (13th century), Chufut-Kale, which is mentioned in various sources as Kyrk-Er in the land of the As-Alani, was the center of a small feudal principality. In the 14th and 15th centuries, a commercial and artisan settlement grew outside the walls. The city gradually fell into decline as Bakhchisarai flourished and, by the mid-19th century, was abandoned by its inhabitants. In the western part of the city, surrounded by the middle wall, there are remains of caves cut into the cliffs, the ruins of a mosque, a mausoleum (1437), and two Karaite cenotaphs. In the eastern part of the city, behind the 15th-century wall, there were a mint and numerous dwellings.

REFERENCE

Iakobson, A. L. *Srednevekovyi Krym*. Moscow-Leningrad, 1964. [29–774–2]

CHUGACH MOUNTAINS, a mountain massif in southern Alaska, bounded in the north by the valleys of the Matanuska and Copper rivers. The mountains measure more than 400 km in length and rise to an elevation of 4,016 m at Mt. Marcus Baker. There are glaciers, the largest of which is Columbia, which reaches sea level. High coniferous forests grow on the slopes to 600 m, and higher there are alpine meadows. [29–729–3]

CHUGAEV, LEV ALEKSANDROVICH. Born Oct. 4 (16), 1873, in Moscow; died Sept. 23, 1922, in the city of Griazovets, in what is now Vologda Oblast. Soviet chemist.

After graduating from Moscow University in 1895, Chugaev became head of the chemistry department at the Bacteriological Institute in Moscow. From 1904 to 1908 he was a professor at the Imperial Technical School (renamed the Moscow Higher Technical School in 1917). From 1909 to 1922 he was a professor at the St. Petersburg Technological Institute; during the same period, from 1908 to 1922, he was also a professor at St. Petersburg University (renamed Petrograd University in 1914). Chugaev was the founder and director, from 1918, of the Institute for the Study of Platinum and Other Noble Metals (in 1934 the institute was incorporated into the Institute of General and Inorganic Chemistry of the Academy of Sciences of the USSR).

Chugaev's first studies were devoted to bacteriology and biochemistry: Chugaev discovered a sensitive reaction for the common colon bacillus (*Escherichia coli*), making it possible to distinguish it from typhoid fever bacteria. In organic chemistry he

investigated a number of terpenes and camphor and developed a "xanthogenic" method of synthesizing unsaturated hydrocarbons (Chugaev method). He developed a method of determining mobile hydrogen atoms in organic compounds, known as the Chugaev-Tserevitinov method. In 1911 he discovered a new type of anomalous rotary dispersion, governed by the presence of two assymetrical centers in a molecule of an organic compound.

Chugaev made major contributions to the chemistry of complex compounds. He established that the most stable inner complex compounds contain five- or six-membered rings (the Chugaev law of rings). He was the first to synthesize (1920) the pentammine compounds—predicted earlier by theory—of tetravalent platinum $[Pt(NH_3)_5Cl]X_3$, where X is a monovalent anion (Chugaev salts). Chugaev discovered (1915) the conversion of complex amino compounds into the corresponding amide compounds. Of importance to analytical chemistry is Chugaev's discovery of the sensitive reagent for nickel—dimethylglyoxime (1905)—and for osmium—thiourea (1918).

Chugaev founded a scientific school of complex compounds in the USSR. He was posthumously awarded the V. I. Lenin Prize (1927).

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CHUGAEV METHOD, the conversion of alcohols into olefins by the thermal dissociation of methyl xanthates obtained from these alcohols; for example,

$$(CH_3)_2CHOH + NaOH + CS_2 \longrightarrow$$
$$(CH_3)_2CHOC(S)SNa \xrightarrow{CH_3I} (CH_3)_2CHOC(S)SCH_3 \xrightarrow{t^\circ}$$
$$CH_3CH{=}CH_2 + COS + CH_3SH$$

The methyl xanthates of tertiary alcohols decompose most readily, already at the time of formation. The methyl xanthates of secondary alcohols decompose less readily (upon heating), while the methyl xanthates of primary alcohols decompose very poorly. The reaction in the Chugaev method is usually not accompanied by secondary reactions, such as isomerization of the carbon skeleton and shifting of double bonds, which are typical of many other methods of producing olefins by the dehydration of alcohols, and hence its importance in the study of structurally complex alcohols.

The Chugaev method has made it possible to successfully determine the formation of many labile structures, such as terpenes. It was discovered by L. A. Chugaev in 1899. [29–729–1]

CHUGAL' (from Russian *chugun*, "cast iron," and *aliuminii*, "aluminum"), a heat-resistant cast iron with a high aluminum content (19–25 percent). *Chugal'* also contains 1.6–2.5 percent C, 1–2 percent Si, 0.4–0.8 percent Mn, up to 0.2 percent P, and up to 0.08 percent S.

Chugal' has a high heat resistance at temperatures of up to 1100°–1150°C in air and up to 1000°C in various corrosive gaseous media, such as furnace gases, sulfur dioxide, or sulfur vapor. It does not react with nitric acid or seawater. It has satisfactory casting properties and is machinable.

Chugal' is used to fabricate furnace accessories, such as blast-furnace tuyeres, lining plates in combustion chambers of gas-turbine installations, and exhaust hoods of cryolite baths. It may also be used as a corrosion-resistant, refractory, or nonmagnetic material. In the USSR, two types of *chugal'* are produced: ZhChIu-22 and ZhChIuSh-22.

REFERENCE
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CHUGUCHAK (in Chinese, T'ach'eng), a city in Northwest China, in the Sinkiang-Uighur Autonomous Region. Situated in the southern foothills of the Tarbagatai Range, near the border with the USSR. Population, more than 30,000 (1957). Chuguchak is a transportation checkpoint on the highway from Urumchi to Aiaguz in the USSR. The city has flour-milling, wood-products, and leather enterprises. Uranium ores are mined in the Chuguchak area. [29–734–3]

CHUGUEV, a city and the administrative center of Chuguev Raion, Kharkov Oblast, Ukrainian SSR. Located on the Severskii Donets River and the Kiev–Rostov-on-Don highway. Railroad station on the Bezliudovka-Kupiansk line. Population, 26,000 (1974).

The first mention of Chuguev in historical sources dates from 1627. A city since 1780, it became the administrative center of a military-settlements district in 1817. In 1819 an uprising of military settlers in Chuguev was cruelly suppressed by government troops. Chuguev became part of Zmiev District of Kharkov Province in 1857. In 1932 it was made the administrative center of a raion of Kharkov Oblast.

Industry in Chuguev is represented by a plant for the production of fuel equipment, a repair plant, a pilot plant for the manufacture of precision equipment, the Gidrozhelezobeton Plant, a building-materials plant, a furniture combine, an embroidery shop, and food-processing enterprises (including a meat-packing plant). Cultural institutions include an art gallery and the I. E. Repin House-museum (Repin was born in Chuguev).

REFERENCE
Istoriia mist i sil Ukrains'koi RSR: Kharkivs'ka oblast'. Kiev, 1967. [29–729–4]

CHUGURIN, IVAN DMITRIEVICH. Born Aug. 15 (27), 1883, in Sormovo; died Feb. 8, 1947, near Moscow. Participant in the revolutionary movement in Russia. Member of the Communist Party from 1902.

The son of a worker, Chugurin began working at the Sormovo Plant in 1894. He took part in the Revolution of 1905–07 in Sormovo, and he attended the party school in Longjumeau in 1911. In 1916 he became a member of the St. Petersburg committee of the RSDLP(B), and in 1917 he was named secretary of the party's Vyborg urban district committee. On Apr. 3 (16), 1917, on behalf of the Vyborg committee, he went to Finland Railroad Terminal to deliver party membership card number 600 to V. I. Lenin, who was returning from abroad. During the October Days of 1917, Chugurin served at the urban district headquarters that directed the uprising.

From 1918 to 1920, in addition to carrying out political work in the Red Army, Chugurin served as a member of the Presidium and as the executive secretary of the All-Russian Extraordinary Commission (All-Russian Cheka). In 1921 he turned to administrative work in industry. Chugurin served as deputy director of the Krasnoe Sormovo Plant, chairman of the administrative board of Sibugol', director of the Northern Shipyard, and director of the Elektropribor Plant.

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REFERENCE
Batakov, V. E. *Ivan Chugurin*. Gorky, 1975. [29–734–2]

CHUGUSH, a mountain peak in the western Greater Caucasus, at the sources of the Belaia River, in Krasnodar Krai, RSFSR. Mt. Chugush, which rises to an elevation of 3,238 m, is composed of gneisses, schists, and granites. Spruce and fir forests grow on the slopes, and subalpine meadows are found at high elevations. The landscape features cirque and hanging glaciers. [29–734–4]

CHU HSI. Born 1130; died 1200. Chinese philosopher, historian, and commentator on the Confucian classics. Leading exponent of neo-Confucianism.

Chu Hsi wrote more than 20 scholarly treatises, including works on jurisprudence, military affairs, astronomy, and geogra-

phy. As prefect of Nank'ang, in Kiangsi Province, from 1179 to 1183 he established the Pai Lu Tung (White Deer Grotto) Academy, which became known throughout China.

Chu Hsi synthesized the major ideas of Confucian thinkers, from Confucius to Chou Tun-i, Chang Tsai, and the brothers Ch'eng I and Ch'eng Hao. He developed the dualistic concept of two interconnected and indivisible principles: the ideal, or *li* (literally, "law," "principle," or "rule"), which precedes all things and transcends all things; and the material, or *ch'i* (literally "substance" or "material force"). *Li* must be joined to a particular *ch'i* and is, at the same time, necessary to the *ch'i* as a condition of the latter's being. Both principles are united in the formless T'ai Chi, or Great Ultimate, which exists in all things taken as a whole and in each thing individually and which, as the highest principle, unites all actual and potential principles and all things and beings.

Chu Hsi's neo-Confucian synthesis became the dominant trend in subsequent Chinese philosophy and a major influence on philosophic thought in Korea and Japan. The Confucian *Ssu shu* (Four Books), selected and with commentary by Chu Hsi, served as the basis for the government examinations in China from the 14th to early 20th centuries. Chu Hsi wrote the historical work *T'ung-chien kang-mu* (The Main Principles of the Comprehensive Mirror), a reworking of Ssu-ma Kuang's *Tzu chih t'ung-chien* (The Comprehensive Mirror for Aid in Government).

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Forke, A. *Geschichte der neueren chinesischen Philosophie*. Hamburg, 1938.
S. KUCHERA [29–540–1]

CHUIA, a river in the Altai, in Gorno-Altai Autonomous Oblast; a right tributary of the Katun' of the Ob' River basin. The Chuia is 320 km long and drains an area of 11,200 sq km. It is a typical mountain river in its upper course. It subsequently crosses the Chuia and Kurai basins, where it branches; farther downstream, it flows through a narrow valley. The Chuia is fed primarily by snow, with high water occurring between May and September. The mean flow rate is 42.1 cu m per sec. The Chuia freezes over in October or early November, and the ice breaks up in late April or in May. Freeze-up is variable. A hydroelectric power plant is situated on the Chuia, and the Chuia Road runs along the river. [29–777–4]

CHUIA (also Bol'shaia Chuia), a river in the Buriat ASSR and Irkutsk Oblast, a right tributary of the Lena. The Chuia is 512 km long, as measured from the source of the Bol'shaia Chuia. The Chuia proper—the segment below the confluence with the Malaia Chuia—is 52 km long. The river drains an area of 18,400 sq km. It rises in the Synnyr Range and crosses the Severo-Baikal Highland. The Chuia is fed primarily by rain and has a mean flow rate of 206 cu m per sec. The Chuia freezes over in October, and the ice breaks up in May. [29–778–1]

CHUIA ROAD, a segment of the Novosibirsk-Biisk-Tashanta highway (Route 34). The Chuia Road is 626 km long. Built between 1903 and 1913 as a cart road to Western Mongolia, it traverses the basins of the Katun' and Chuia rivers. The West Mongolian Road is a continuation of the Chuia Road in the Mongolian People's Republic.

The Chuia Road serves the intermediate points of Maima, Cherga, Shebalino, Tuekta, Ongudai, Inia, and Kosh-Agach, and there is a 38-km access road from it to the mountain climatic health resort of Chemal. The Maima–Gorno-Altaisk–Choia highway extends from the Chuia Road to the highway running from Biisk through Turochak to Artybash (Teletskoe Lake). The road is also joined by the Tuekta–Ust'-Kan highway, which is 95 km long, and by the Inia–Nizhnii Uimon–Ust'-Koksa highway, which is 130 km long.

The Chuia Road provides interoblast and intraoblast transportation links for the Gorno-Altai Autonomous Oblast and handles commercial traffic with Mongolia. It is linked with the country's railroad system at the Biisk station. Most of the freight hauled in the oblast travels via the road. All consumer goods and goods meant for industrial and agricultural enterprises enter the oblast by the road, and livestock-raising products are the principal commodities trucked out of the oblast. There is regular bus service on the Chuia Road. [29–742–3]

CHUIA STEPPE, an intermontane depression in the southeastern Altai, on the upper Chuia River, situated between the Kurai Range in the north and the South Chuia Range in the south. It rises to elevations of 1,750–2,200 m and measures as much as 70 km in length and 30–40 km in width. It is composed of glacial, lake, and river deposits. Predominant in the landscape are semideserts, which are used for pasture. The Chuia Road from the USSR to Mongolia runs through Chuia Steppe. [29–742–1]

CHUIKA, a man's outer garment made of dark cloth, common in Russia in the late 19th and early 20th centuries among urban craftsmen, merchants, and peasants who had come under urban influence. The cut of the *chuika* was originally straight and robelike; later the *chuika* was fitted at the waist and had gussets, or it was truncated in back and had gathers. It was usually knee-length. The collar of a *chuika* was sometimes edged with velvet or fur. [29–740–3]

CHUIKOV, SEMEN AFANAS'EVICH. Born Oct. 17 (30), 1902, in Pishpek (now Frunze); died May 19, 1980, in Moscow. Soviet painter. People's Artist of the USSR (1963); member of the Academy of Arts of the USSR (1958).

Chuikov studied in Vernyi (now Alma-Ata) with N. G. Khludov and in Moscow at the Vkhutemas Vkhutein (State Higher Arts and Technical Studios–Higher Art and Technical Institute) from 1924 to 1930. In the early 1930's he organized the Kirghiz Artists' Union and the Kirghiz Museum of Fine Arts in Frunze. He taught in Moscow at the Academy of Arts from 1930 to 1932 and the V. I. Surikov Art Institute in 1947 and 1948.

Using the traditions of Russian realistic art, Chuikov developed Kirghiz national themes. His genre and landscape paintings depict the life of the people and the natural features of Kirghizia. In the 1950's and 1960's, after travels to India, Chuikov included images from that country in his works. His paintings are noted for spatial clarity, compositional strictness and simplicity, and subtle yet expressive color relationships. He conveys the significance of the common man in his small-figured compositions, resolving differently in each work the relationship of the figure to the landscape and to the plane of the canvas. As Chuikov's style developed, traits of monumentality appeared increasingly. In his last years he frequently used the triptych form.

Examples of his works are the cycles *Kirghiz Kolkhoz Suite* (1939–48), *With Us in Kirghizia* (1946–67), and *Our Brothers* (1952–67). Individual works include *Morning* (1947, Tret'iakov Gallery, Moscow), *Daughter of Soviet Kirghizia* (1948, Tret'iakov Gallery), *On the Road* (1954, Tret'iakov Gallery), *The Himalayas* (1954, Tret'iakov Gallery), *On an Embankment in Bombay in the Evening* (1954, Tret'iakov Gallery), *The Shepherd's Daughter* (1956, Tret'iakov Gallery), *The Simple People of India* (triptych, 1957–60, Russian Museum, Leningrad), *Black Madonna* (1962, Russian Museum), *Living Water* (1966, Tret'iakov Gallery), *They Want to Live* (triptych, 1967, Art Fund of the USSR), and *In Touch With Eternity* (1973).

Chuikov was awarded the State Prize of the USSR (1949, 1951), the I. Satylganov State Prize of the Kirghiz SSR (1972), the Order of Lenin, four other orders, and various medals.

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Sarab'ianov, D. *Semen Chuikov*, 2nd ed. Moscow, 1976.
D. V. SARAB'IANOV [29–741–1]

CHUIKOV, VASILII IVANOVICH. Born Jan. 31 (Feb. 12), 1900, in the village of Serebrianye Prudy, now an urban-type settlement in Moscow Oblast. Soviet military leader; Marshal of the Soviet Union (1955). Twice Hero of the Soviet Union (Mar. 19, 1944, and Apr. 6, 1945). Member of the CPSU since 1919.

Chuikov, the son of a peasant, joined the Red Army in April 1918. He fought in the Civil War of 1918–20 as deputy commander of a company and a regiment and as commander of a regiment. He graduated from the M. V. Frunze Military Academy in 1925 and the eastern department of the academy in 1927 and completed the academic courses at the Military Academy of Mechanization and Motorization of the Workers' and Peasants' Red Army in 1936. He commanded a mechanized brigade, a rifle corps, the Bobruisk Army Group of Troops, and finally an army. During the liberation of western Byelorussia and during the Soviet-Finnish War of 1939–40, he commanded an army. From December 1940 through March 1942 he was a military attaché in China.

During the Great Patriotic War (1941–45), Chuikov was commander of the First Reserve Army (later renamed the 64th Army) from May to August 1942, the Sixty-second Army from September 1942 to April 1943, and the Eighth Guards Army from April 1943 until the end of the war on the Stalingrad, Don, Southwestern, Third Ukrainian, and First Byelorussian fronts.

After the war, Chuikov was a deputy and first deputy of the Group of Soviet Troops in Germany between May 1945 and March 1949 and commander in chief from March 1949 to May 1953. Beginning in May 1953, he was commander of the troops of the Kiev Military District. Beginning in April 1960, he was commander in chief of the ground forces and deputy minister of defense and at the same time, from July 1961, head of Civil Defense of the USSR. Beginning in June 1964, he was head of the Civil Defense of the USSR. In July 1972 he became inspector-general of the Group of Inspectors-general of the Ministry of Defense of the USSR.

Chuikov was a candidate member of the Central Committee of the CPSU from 1952 to 1961. Since 1961 he has been a member of the Central Committee of the CPSU. A deputy to the second through ninth convocations of the Supreme Soviet of the USSR, he has been awarded eight orders of Lenin, the Order of the October Revolution, four orders of the Red Banner, three orders of Suvorov First Class, the Order of the Red Star, an honorary saber, and various medals of the USSR. He has also been awarded many foreign orders and medals.

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Srazhenie veka. Moscow, 1975. [29–740–4]

CHU-ILI MOUNTAINS, a group of mountains in the Northern Tien-Shan, in the Kazakh SSR. In the south, the Chu-Ili Mountains adjoin the Kindyktas Range, a northwestern spur of the Zailiiskii Alatau. The mountains extend for 220 km, with elevations to 1,294 m. They are composed of granites, shales, limestones, and gypsiferous argillaceous rocks. Desert-steppe vegetation grows on the slopes of the Chu-Ili. [29–740–2]

CHUISKIE BELKI, two mountain ranges in the Altai, connected by a transverse mountain chain. The maximum elevations are 3,960 m in the Iuzhno-Chuia Range and 4,173 m in the Severo-Chuia Range. [29–742–2]

CHUKARIN, VIKTOR IVANOVICH (Victor Tchoukarine). Born Nov. 9, 1921, in the village of Krasnoarmeiskoe, Donetsk Oblast. Soviet gymnast. Honored Master of Sport (1951); Honored Coach of the Ukrainian SSR (1972). Docent (1963); head of the subdepartment of gymnastics of the L'vov Institute of Physical Culture (since 1971). Member of the CPSU since 1951.

Chukarin was overall men's champion of the Olympics in 1952 and 1956, of the world in 1954, and of the USSR from 1949 to 1951 and in 1953 and 1955. He was Olympic champion in various events five times in 1952 and 1956, world champion in 1954, and champion of the USSR 13 times from 1948 to 1956.

Chukarin has been awarded the Order of Lenin and several medals.

WORKS

Put' k vershinam. [Moscow] 1955. [29–742–4]

CHUKCHAGIR LAKE, a lake in the basin of the Amgun' River (a left tributary of the Amur), in Khabarovsk Krai, RSFSR. Chukchagir Lake has an area of 366 sq km, an average depth of 2 m, and a maximum depth of 6 m. It has a winding shoreline, and its northern shores are low and swampy. The islands of Godban'ki and Dzhalu divide the lake into three parts. The lake is fed by precipitation and groundwater and is drained by the Ol'dzhikan River, a tributary of the Amgun'. Chukchagir Lake freezes over in late October or early November, and the ice breaks up in May. [29–755–5]

CHUKCHI (Luorawetlan), the language of the Chukchi people. Chukchi is spoken by some 11,000 people (1970 census), most of them living in the Chukchi Autonomous Okrug and in Nizhnekolymsk Raion of the Yakut ASSR. The language is genetically related to the Chukchi-Kamchatka group and consists of five dialects that differ only slightly: Uelen (the eastern dialect, on which the literary language is based), Chaun (western), Enmylin, Nunligran, and Khotyr'.

The phonetic system is characterized by vowel synharmony and a great variety of consonant assimilations and dissimilations. In its grammatical structure, Chukchi is a prefixal-suffixal agglutinative language. It has well-developed declension and conjugation systems. Nouns are inflected by person, and verbs have two types of conjugations: one subject and the other subject-object. A typical feature of the syntax is the presence of a nominative and an ergative construction, as well as incorporation. The vocabulary contains many borrowings from the Russian. A writing system based on the Latin alphabet was created in 1931. Since 1936 the Russian alphabet has been used.

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I. A. MURAV'EVA [29–751–4]

CHUKCHI, a people that constitutes the indigenous population of the Chukchi Autonomous Okrug (formerly Chukchi National Okrug), Magadan Oblast, RSFSR. Chukchi also live in the northern part of the Koriak Autonomous Okrug (formerly Koriak National Okrug) and Nizhnekolymsk Raion, Yakut ASSR.

Chukchi who raise reindeer on the interior tundra call themselves *chavchu* ("reindeer" Chukchi), as distinct from those who inhabit the coasts, who use the term *an'kalyn* (coast dweller). The general self-designation—*luoravetlan* (real person)—has not become established as the designation for the people as a whole. The Chukchi number 14,000 (1979 census). They speak mainly the Chukchi language. Their religion was shamanism and various cults centering on the family, hunting, and fishing.

The Chukchi first came into contact with Russians in 1642 on the Alazeia River, but they remained virtually independent from the tsarist administration until the 19th century. A natural barter economy was maintained between the nomadic reindeer-raising Chukchi and the settled maritime Chukchi, who hunted marine mammals. Under Soviet power, radical changes have taken place in the Chukchi way of life: reindeer raising has been reorganized, and large sovkhozes and kolkhozes have been established; modern technology has been introduced in the hunting of marine mammals. Educational materials and literature are now published in the Chukchi language.

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Ocherki istorii Chukotki s drevneishikh vremen do nashikh dnei. Novosibirsk, 1974. [29–756–1]

CHUKCHI AUTONOMOUS OKRUG, part of Magadan Oblast of the RSFSR. The okrug was formed on Dec. 10, 1930, as the Chukchi National Okrug. Located in the extreme northeastern part of the USSR, the okrug includes the Chukchi Peninsula, the adjacent part of the continent, and a number of islands, among them Vrangel', Aion, Arakamchechen, and Ratmanov. Its coasts are washed by the East Siberian, Chukchi, and Bering seas. The okrug has an area of 737,700 sq km and a population of 127,000 (Jan. 1, 1977). It is divided into eight administrative raions and has two cities and 18 urban-type settlements. The administrative center is Anadyr'.

Natural features. The coast of the East Siberian and Chukchi seas is only slightly indented with one large inlet, Chaun Bay. The Bering Sea has a number of deep fjords (Provideniia, Glubokaia), providing good harbors, and large gulfs, notably Lavrentii, Mechigmen, Krest, and Anadyr'. The seas around the okrug are covered by ice for most of the year. The topography is dominated by plateaus and mountains. North of the marshy Anadyr' Lowland, occupying the central part of the okrug, rise the Pekul'nei Mountains (highest point 1,381 m) and the Chukchi Highlands (highest point 1,843 m), consisting of numerous ranges and medium-elevation massifs. Northwest of the Anadyr' Lowland lies the Anadyr' Plateau, bounded on the west by the Aniui Range (highest point 1,735 m). The ranges of the Koriak and Kolyma highlands extend into the okrug from the south. The edge of the Yukagir Plateau, with elevations between 500 m and 700 m, occupies the southwest. Along the coast in the north lie the Chaun and Vankarem lowlands. Mineral resources include tin and mercury ore, hard and brown coal, and natural gas.

The okrug has a harsh climate, cold marine along the coast and severely continental in the interior. Winter, a time of strong winds, lasts eight or nine months. The mean January temperature ranges from −15° to −21°C on the coast of the Bering Sea and from −27° to −39°C in the interior. Minimum temperatures vary from −38° to −55°C. Summers are short, cool, and rainy. The mean July temperature, 5°–8°C in the north and 9°–10°C along the coast of the Bering Sea, rises to 13°–14°C at the settlement of Markovo in the Anadyr' Lowland. The annual precipitation increases from 200 mm in the west to 300–500 mm along the middle course of the Anadyr' River. The growing season ranges from 75 days at Pevek and 88 at Anadyr' to 101 at Markovo. Permafrost occurs everywhere.

The okrug's rivers, of which the largest is the Anadyr', flow into the Arctic and Pacific oceans. Icebound seven or eight months of the year, the rivers have an uneven flow and high and rapid flooding. Many rivers freeze to the bottom. Also characteristic is the phenomenon known as *naledi*, whereby bodies of ice are formed on rivers by the layer-by-layer freezing of waters that flood the surface of the ice. Most of the rivers may be classified as mountain rivers. The Anadyr', whose main tributaries are the Belaia, Main, and Taniurer, drains into the Bering Sea. The Kolyma, which receives the waters of the Omolon, Bol'shoi Aniui, and Malyi Aniui, flows into the East Siberian Sea. The largest lakes are Krasnoe, El'gygytkhyn, and Pekul'nei.

Mountain tundra soils predominate. Gley, gley-swamp, and peat-gley soils are found in the lowlands, and gley-podzolic soils occur along the river valleys and beneath open larch woodlands. The alluvial and peat-podzolic soils of the river valleys and the Anadyr' basin are the best suited for agriculture.

The vegetation consists chiefly of tundra species. Dry mountain tundra with stunted or low-growing shrubs and saxifrage covers large areas. The lowlands are occupied by lichen tundra of reindeer moss and *Cetraria* and by moss and hummock tundras with a sparse growth of cotton grass (*Eriophorum*), sedges, *Pedicularis*, bog bilberries (*Vaccinium uliginosum*), and cowberries (*Vaccinium vitis-idaea*). The lichen and hummock tundras are used as reindeer pasture. In the basins of the Anadyr' and other rivers grow forests of larch, poplar, *Chosenia* (a genus of willows), and birch, interspersed with thickets of willows, alders, wild currants and raspberries, and wild roses. The coastal strip along the Arctic Ocean and the islands are classified as arctic desert.

The fauna consists primarily of tundra animals, but some taiga species are also encountered. Commom animals include the arctic fox, fox, wolf, wolverine, burunduk, squirrel, suslik (*Citellus undulatus*), lemming, blue hare, brown and polar bear, reindeer, bighorn sheep, muskrat, and mink. There are numerous birds, chiefly willow ptarmigans (*Lagopus lagopus*), ptarmigans (*Lagopus mutus*), ducks, geese, and swans; on the coast murres, eiders, and gulls nest in colonies. The seas abound in chum salmon (*Oncohynchus keta*), pink salmon (*Oncorhynchus gorbuscha*), arctic char (*Salvelinus alpinus*), and such marine animals as the walrus, ringed seal, and gray whale. The rivers and lakes contain broad whitefish (*Coregonus nasus*), nelma (*Stenodus leucichthys*), and graylings (*Thymallus*). Insects are numerous, particularly mosquitoes, black flies, and horseflies.

Population. Northern peoples, notably Chukchi, Eskimo, Evenki, and Yukagirs, constitute 12 percent of the population. The great majority of the inhabitants are Russians (70 percent, 1970 census), and there are small numbers of Ukrainians (10.3 percent), Byelorussians, Tatars, and other nonindigenous peoples. The average population density is 0.2 persons per sq km. Most of the population is located along the coast and in the river valleys. Urban dwellers make up 73 percent of the population. Cities and urban-type settlements were established in connection with the development of mining (Bilibino, Iul'tin, Beringovskii) and maritime transport (Pevek, Provideniia, Egvekinot). B. F. SHAPALIN

Historical sketch. The okrug's territory was settled as early as the Paleolithic. At the end of the second millennium and early in the first millennium B.C., maritime hunters and fishermen, the ancestors of the Eskimo, invented the harpoon and hide-covered frame boat, which allowed them to hunt whales, walrus, and ringed seals. Late in the first century A.D. the ancestors of the Chukchi and Koriaks, who were inland reindeer hunters, domesticated these animals and became reindeer herders. In the 17th century the Chukchi region was absorbed into the Russian state, and a Russian settlement was founded at Anadyr'. Inclusion in Russia promoted the development of large-scale reindeer herding.

From the mid-19th century American entrepreneurs and traders began pushing into the area, introducing alcohol and plundering the indigenous population. In the early 20th century the Chukchi and other native peoples of the okrug had a clan social organization and a patriarchal economy, but already there were signs of property and social differentiation, influenced by trade with the Russians and Americans.

The October Revolution of 1917 liberated the indigenous peoples from national oppression and exploitation. After the Chukchi Revolutionary Committee was formed in the settlement of Anadyr' on Dec. 16, 1919, the fishing rights of the American Swenson Company and local merchants were abolished, and steps were taken to improve trade. On Jan. 31, 1920, however, remnants of Kolchak's forces staged a counterrevolutionary coup and executed the members of the Revolutionary Committee. In July 1920 a detachment of Red Guards routed the Kolchak forces, and Soviet power was restored. The Anadyr' district executive committee was elected and subsequently reorganized as a people's revolutionary committee on Jan. 6, 1921.

In October 1921 the Birich-Bochkarev White Guard bands arrived on the Okhotsk coast and Kamchatka from Vladivostok. In April 1923 an expeditionary Red Army detachment led by G. I. Chubarov crushed the main White Guard forces. Representatives of village and *volost* (small rural district) revolutionary committees attended the First Anadyr' District Congress on Aug. 2–5, 1923. The formation of the Chukchi Regional Soviet at Uelen in 1923 signaled the final establishment of Soviet power throughout the Chukchi Peninsula. A campaign was launched to overcome the region's economic and cultural backwardness.

In the course of the prewar five-year plans agriculture, fishing, and hunting were collectivized, and the working people of the okrug made notable progress in reindeer herding and hunting sea animals. Writing systems were introduced for the Chukchi and Eskimo languages, and illiteracy was basically eradicated. A national intelligentsia emerged among the indigenous population. On Dec. 10, 1930, the Chukchi National Okrug was formed from

Anadyr' and Chukchi raions of the Far East Krai and part of the Yakut ASSR. (In 1977 it was renamed the Chukchi Autonomous Okrug.)

During the Great Patriotic War the peoples of the okrug took an active part in the struggle against the fascist German aggressors. Since the war they have achieved new successes in building socialism. The mining of gold and nonferrous metals has been expanding rapidly, and the transportation network has been considerably enlarged. The constant, unselfish assistance of the Russian and other peoples of the USSR has facilitated economic and cultural growth. On Dec. 9, 1970, the okrug was awarded the Order of the Red Banner of Labor, and on Dec. 29, 1972, it received the Order of Friendship of Peoples. K. G. KUZAKOV

Economy. The leading branch of the okrug's economy is mining, represented by enterprises that extract tin (Val'kumei), mercury (Plamennoe), and hard coal (Bering and Anadyr' deposits). Between 1960 and 1976 the gross industrial output increased by a factor of 3.7. Electricity is supplied by the Bilibino Atomic Power Plant, the Chaun Heat and Electric Power Plant, and the Egvekinot State Regional Power Plant. The okrug's flourishing fishing industry makes use of the resouces of the Bering and Chukchi seas. Other major industries are the production of building materials (Anadyr', Pevek, Bilibino) and food processing.

In 1976 there were 28 sovkhozes in the okrug. The main agricultural sector is reindeer herding. On Jan. 1, 1977, the okrug's reindeer herd of 547,000 accounted for 24 percent of the reindeer in the RSFSR. The traditional occupations of the indigenous population are fishing and the hunting of fur-bearing and marine animals, chiefly arctic foxes and, in coastal waters, ringed seals, walruses, and whales. Dairy farming, poultry raising, and hog raising have been recently introduced. On Jan. 1, 1977, the livestock included 1,900 cattle (about 1,100 of them dairy cows) and 2,600 hogs. Arctic foxes are raised in cages on fur farms. Greenhouse agriculture is developing.

The chief means of transportation are maritime and air transport. The main ports are Pevek, Provideniia, Anadyr', Egvekinot, and Beringovskii. The principal highways link Pevek with Krasnoarmeiskii and Komsomol'skii; Egvekinot with Iul'tin; and Zelenyi Mys with Bilibino. The Anadyr' River is navigable for 572 km, as far as the settlement of Markovo; shipping is also done on the Velikaia River and on the Bol'shoi and Malyi Aniui rivers. The okrug has a well-developed network of local air routes. B. S. SHAPALIN

Cultural development. Before the October Revolution of 1917 the Chukchi were illiterate. In 1914–15 the territory of the present-day okrug was served by one primary school, attended by 40 students. There were no secondary schools. In the 1977–78 school year the okrug's 98 general-education schools of all types had an enrollment of about 27,100 students. Specialized training was provided by a vocational-technical school (200 students). In 1976, 11,200 children were cared for at 112 preschool institutions.

On Jan. 1, 1977, cultural facilities included 94 public libraries (more than 1 million books and magazines), a museum of local lore in Anadyr', 114 clubs, 176 motion-picture projection units, and 18 extracurricular institutions.

There are two okrug newspapers: *Sovetken Chukotka*, published in Chukchi since 1953, and *Sovetskaia Chukotka*, issued in Russian since 1933. Two programs of All-Union Radio are transmitted 17 hours daily, and local broadcasts, in Chukchi and Russian, are on the air seven hours daily. Programs of the Central Television Studios are relayed by two Orbita stations (13.1 hours daily). Local television broadcasts, in Chukchi and Russian, are on the air 1.4 hours daily.

Literature. Before the October Revolution of 1917 the Chukchi had various kinds of oral lore but no written literature. Several factors contributed to the creation of a Chukchi literature: the cultural policies of the Soviet government, the development of a written Chukchi language in 1931, and the spread of the Russian language. Chukchi literature was influenced by the Russian classics and the work of such Soviet writers as V. G. Tan-Bogoraz, T. Z. Semushkin, and N. E. Shundik. The first Chukchi writer was Tynetegyn (F. Tinetev, 1920–40), whose *Chauchu Fairy Tales* was published in Chukchi and Russian in 1940.

In the 1950's and 1960's a number of gifted writers appeared, notably the prose writers Iu. S. Rytkheu (born 1930) and V. Iatyrgin (born 1919) and the poets V. G. Keul'kut (1929–63), A. A. Kymytval' (born 1938), V. Tymnetuvge (1935–65), M. V. Val'girgin (born 1939), and V. Tyneskin (born 1945). Rytkheu's works have become known throughout the USSR and abroad. Among his finest works are the short-story collection *Chukchi Saga* (1956), the trilogy *Time of Melting Snow* (1958), and the novels *Frost on the Threshold* (1970) and *White Snows* (1975), depicting the historical destiny of the Chukchi people and the social transformation and cultural awakening of the Chukchi region. Iatyrgin shows the development of the new man in his autobiographical novella *Fate Does Not Pamper a Man* (1967).

Among the best verse collections are *My Chukotka* (1958) and *Rain Doesn't Hinder* (1963) by Keul'kut, *Songs of the Heart* (1960), *To You* (1967), and *Listening to Music* (1972) by Kymytval', and *Hello, Bright Life!* (1968) and *The Whale Boats Go Out to Sea* (1970) by Val'girgin. Tyneskin is noted for his narrative poem *Heart in Hand* (1970). Lenin is a recurrent theme in the poems of Val'girgin and Tyneskin, and folklore traditions are strong in all Chukchi literature. The works of Chukchi writers are translated into other languages of the peoples of the USSR, and many works by Soviet writers of other nationalities are available in Chukchi. IU. M. SHPRYGOV

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CHUKCHI HIGHLANDS (also Chukchi Range, Anadyr' Range), a system of medium-elevation mountain ranges and massifs in northeastern Asia, stretching for about 450 km eastward from Chaun Bay. The highest elevations are found west of the Amguema River, in the Shelagskii (1,105 m), Ekiatap (1,522 m), and Pegtymel' (1,810 m) ranges; east of the river the ranges give way to uplands and ridges with elevations of 500 to 1,000 m. The northern ranges are composed chiefly of sandstones and shales intruded by granites. In the south volcanic deposits predominate. The Chukchi Highlands form the watershed between rivers flowing into the Arctic Ocean (Pegtymel', Paliavaam, Amguema) and rivers draining into the Bering Sea (upper reaches of the Belaia River, Kanchalan).

The climate is severe, with long winters, lasting seven or eight months, and short and cool summers. Mean January temperatures range from −15°C in the southeast to −30°C in the northwest, and mean July temperatures vary from 3°C in the north to 10°C in the south. The annual precipitation ranges from 250 mm to 400 mm. Fogs occur frequently in the east. Wet hummock tundras of sedges and cotton grass, as well as hypnum moss-grass bogs, are widespread in the coastal regions. The lower parts of the mountain slopes are also covered by alpine tundra vegetation, and arctic mountain deserts are found on the summits. The highlands contain deposits of tin, mercury, and hard coal.

N. I. MIKHAILOV [29–754–1]

CHUKCHI IVORY CARVING, a folk artistic craft of the Chukchi and Eskimo inhabiting the northeastern coast of the Chukchi Peninsula. A major center is the settlement of Uelen. Archaeo-

logical excavations have uncovered examples of such ivory carving dating from the first years of the Common Era.

An ivory carving workshop, now called the Severnye Suveniry Ivory-carving Workshop, was established in 1931. The modern craftsmen carve pieces of walrus tusk into expressive, stylized figurines of northern animals. Their sculptural groups, full of life and movement, frequently depict fights between animals, hunting scenes, or reindeer and dog teams. Whole walrus tusks and such domestic articles as letter openers, earrings, bracelet charms, and pendants are decorated with colored engravings—hachured figures rubbed with colored pencils—depicting subjects from folklore or the daily life of the peoples of the North. Masters of the craft include Aie, Vukvutagin, Tukkai, Khukhutan, Emkul', and Ianku.

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[29–744–2]

CHUKCHI-KAMCHATKA LANGUAGES, an isolated family of languages spoken by a small number of people who constitute the principal native population of the Chukchi region and Kamchatka. The total number of native speakers is approximately 18,000 (1970 census). The Chukchi-Kamchatka languages, which are included among the Paleo-Asiatic languages, are divided into two branches: Chukchi-Koriak and Itel'men. The Chukchi-Koriak branch includes four closely related languages: Chukchi, Koriak, Aliutor (Aliutor proper and the Palana and Karaga dialects), and Kerek (the Maino-Pilgin and Khatyrka dialects). The Itel'men branch consists only of the Itel'men (Kamchadal) language and has a number of substratum features. Some scholars regard the Aliutor and Kerek languages as dialects of Koriak. The Itel'men branch formerly included three languages: Northern and Southern Itel'men, both of which disappeared in the late 19th century, and Western Itel'men, which is represented by the present-day Itel'men dialects.

The Chukchi-Kamchatka languages exhibit vowel harmony (*see* SYNHARMONY) and assimilation and dissimilation of consonants; obstruents are represented by a single series of unvoiced stops, and there is a relatively large number of sonants. The grammatical structure of the Chukchi-Kamchatka languages shows them to be agglutinative languages of the prefixing-suffixing type; they have discontinuous affixes. The case system is well developed; in some positions nouns are inflected for person. The verb has two conjugations: subject and subject-object. The aspectual-temporal system is well developed. In most of the Chukchi-Kamchatka languages verbs and nouns are marked for three numbers—singular, dual, and plural. The numerals are based on a quinary system of counting. A nominative construction and an ergative construction are used in sentences with a verbal predicate. The languages typically exhibit incorporation. The vocabularies of the Chukchi-Kamchatka languages contain borrowings from Russian. Chukchi and Koriak have their own writing systems; Latin-based alphabets were created in 1931, and the current Cyrillic-based alphabets have been used since 1936.

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I. A. MURAV'EVA [29–754–2]

CHUKCHI PENINSULA, a peninsula in northeast Asia, in Magadan Oblast, RSFSR. Washed by the Anadyr' Gulf of the Bering Sea and by the Chukchi Sea, it is separated from North America by the Bering Strait. On the mainland, the boundary of the peninsula runs through the valley of the Vel'mai River to the Chukchi Sea, the banks of which are strongly indented, with Koliuchin Guba in the north, the Mechigmen Gulf in the southeast, and the Krest Gulf in the southwest. At the northeast end of the Chukchi Peninsula is the Dezhnev Cape. The Chukchi Highlands occupy much of the peninsula. [29–751–2]

CHUKCHI SEA, a marginal sea of the Arctic Ocean along the coast of Asia and North America, washing the northern coast of the Chukchi Peninsula and the northwestern shores of Alaska. In the west it is connected with the East Siberian Sea through Long Strait, and in the south it is joined to the Bering Sea by the Bering Strait. Its northern boundary with the Arctic basin and its eastern boundary with the Beufort Sea (along the meridian of Point Barrow) are arbitrary and not morphologically delineated. The sea has an area of 582,000 sq km (according to some sources, 587,100 sq km), a water volume of 45,400 cu km, and an average depth of 77 m. The largest inlets are Kotzebue Sound and Koliuchin Bay, and the major islands are Vrangel', Geral'd, and Koliuchin. The Amguema, Kobuk, and Noatak rivers flow into the sea. The shoreline is fairly regular, and the predominantly mountainous coast is fringed with lagoons and spits in many places.

The Chukchi Sea lies on the continental shelf. The isobaths of 10 m and 25 m come close to the continent and follow the outline of the shore. Fifty-six percent of the bottom area is less than 50 m deep, and 6 percent is more than 100 m deep. In the north depths increase to 200 m or more, reaching a maximum of 1,256 m. The shelf is cut by two submarine canyons: Geral'd at approximately 175°W long., and Barrow, which runs roughly parallel to the coast of Alaska. There are several rises in the northern part of the sea. Most of the bottom is covered by a thin layer of unconsolidated silt, sand, and gravel.

The sea's position between Asia and North America and between two oceans, the Arctic and the Pacific, determines the special characteristics of its climate and hydrological regime. The polar night lasts more than 70 days, beginning in mid-November, and the polar day goes on for 86 days, beginning in mid-May. During the winter, northerly winds prevail over the sea; they are very steady in the south, especially in the Bering Strait. The average wind velocity is 6.2 m per sec. In summer, southerly winds predominate in the southern part of the sea, and light winds of variable direction in the north. The mean February temperature ranges from −21° to −27°C; the minimum temperature may be as low as −47°C. In July the mean temperatures are 2.5°–5.5°C, with a maximum of 25°C and a minimum of −6°C. The sea is completely covered with ice from late October or November until May or June, when the ice begins to break up. During the summer a warm current coming from the Bering Strait divides the sea's ice pack into two large masses, the Chukchi and the Vrangel'. Navigation becomes possible in the southern part of the sea usually in the second half of July; the ice floes in Long Strait presents the greatest hazard to navigation.

The system of permanent currents and drifting ice is determined by the annual influx of about 30,000 cu km of relatively salty water carried by the Bering Sea Current through the Bering Strait. In the Chukchi Sea the current divides into three branches—the Alaskan, Geral'd, and Long currents—which flow, respectively, along the coast of Alaska, to the northwest (east of Geral'd Island), and into Long Strait. In the summer this current is warm, with a temperature of up to 12°C; in the winter the temperature does not exceed −1.8°C. In the course of a year it brings about 27×10^{15} kcal of heat, enough to melt the ice on more than one-third of the sea. The cold Chukchi Current arises along the coast of the Chukchi Peninsula in summer and continues to flow throughout the fall and winter. Moving southeastward toward the Bering Strait, the current carries water that has been freshened in the East Siberian Sea and that is cold in the summer and relatively warm in the winter (temperature of about −1.6°C). In the winter this current brings surface water and ice from the Chukchi Sea to the Bering Sea, forming what is known as the Polar Current.

The fresh-water component of the water balance has a very slight influence on the water circulation. The river runoff of the basin is about 78 cu km per year; the annual precipitation and evaporation total 275 mm and 119 mm, respectively. The low runoff (13 cm) is one of the reasons that the surface waters of the Chukchi Sea are more saline than those of the other Arctic seas, with the exception of the Barents, Greenland, and Norwegian seas. In summer the salinity in the Chukchi Sea is 30–32‰ (24–27‰ along the coast). The summer water temperature is 4°C in the west, 6°C in the central part, and 10–12°C in the south. In winter the water temperature from the surface to the bottom

ranges from −1.6° to −1.8°C, and the salinity is 32.5–33.5‰. The sea has regular semidiurnal tides of up to 0.9 m. Storm surges may cause the water level to rise by as much as 1.4 m generally and by up to 3 m at Point Barrow. In gale winds, wind-driven waves up to 6.5 m high develop in the ice-free parts of the sea.

The fauna of the Chukchi Sea, a mixture of Arctic and Pacific species, includes whales, seals, ringed seals, walruses, and polar bears. The most common fish are the grayling, navaga, arctic char, and polar cod. In the summer ducks, geese, gulls, and other seabirds inhabit the coast and islands.

The sea is a connecting link between the ports of the Far East, the mouths of the Siberian rivers, and the European USSR, as well as between the Pacific ports of Canada and the United States and the mouth of the Mackenzie River. The indigenous coastal population engages in reindeer herding, the hunting and breeding of fur-bearing animals, and the hunting of marine animals. The settlement of Uelen is a well-known center of walrus ivory carving.

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E. G. NIKIFOROV and A. O. SHPAIKHER [29–752–1]

CHUKHADZHIAN, TIGRAN GEVORGOVICH. Born 1837 in Constantinople; died Mar. 11 (23), 1898, in İzmir. Armenian composer, conductor, and figure in the music world.

Chukhadzhian lived in Constantinople, where he studied with the composer G. Eranian; he pursued further study in Milan from 1861 to 1864. Joining with other progressive members of the Armenian community in Turkey in their effort to develop a national culture, he helped organize an Armenian music society, music theaters, a music press, and public concerts and lectures.

Chukhadzhian combined European compositional techniques with the modal harmonies found in the folk music of the western Armenian mountaineers. His compositions include works for piano, songs (including art songs), chamber music, symphonic works, and music for the theater. In addition to the first Armenian opera, *Arshak II* (1868; excerpts performed 1873; performed in its entirety 1945, Yerevan), Chukhadzhian composed the opera–fairy play *Zemire* (1890) and satiric musical comedies involving humble characters, including *Arif* (1872; plot inspired by Gogol's *The Inspector-General*), *The Bald Village Elder* (1873), and *The Pea Vendor* (1875).

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R. A. ATAIAN [29–774–3]

CHUKHANOV, ZINOVII FEDOROVICH. Born Oct. 8 (21), 1912, in the village of Novinki, in what is now Krasnogorsk Raion, Moscow Oblast. Soviet scientist, specialist in thermal power engineering and power production technology. Corresponding member of the Academy of Sciences of the USSR (1939). Member of the CPSU since 1944.

Chukhanov studied at the Moscow Institute of Chemical Engineering. In 1938 he became the head of a laboratory at the Institute of Power Engineering of the Academy of Sciences of the USSR.

Chukhanov's main works deal with problems of the combustion, gasification, and pyrolysis of solid fuels. Chukhanov developed a theory of the high-speed pyrolysis of fuels and proposed new methods for the energy-efficient use of fuels in electric power plants. A number of his works are devoted to heat-transfer theory, diffusion, and systems analysis as applied to the evaluation of the efficiency of new equipment.

Chukhanov has been awarded three orders and various medals.

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Nekotorye problemy topliva i energetiki. Moscow, 1961. [29–775–1]

CHUKHLOMA, a city and the administrative center of Chukhloma Raion, Kostroma Oblast, RSFSR. Chukhloma is situated on Chukhloma Lake, 45 km northeast of the Galich railroad junction and 171 km from Kostroma. It has a logging and timber distribution establishment, an industrial combine, and a creamery. Educational and cultural institutions include a branch of the Kostroma Forestry Machinery Technicum and the A. F. Pisemskii Museum of Local Lore (Pisemskii was born in Chukhloma Raion). [29–775–2]

CHUKHNO, ANDREI VASIL'EVICH. Born Sept. 12 (25), 1904. Chairman (1928–68) of the Kommunisticheskii Maiak Kolkhoz (one of the leading farms in the Northern Caucasus), Georgievsk Raion, Stavropol' Krai. Hero of Socialist Labor (1957). Member of the CPSU since 1929.

Chukhno was granted a personal pension in 1968. He was a deputy to the second through fourth convocations of the Supreme Soviet of the USSR and a delegate to the Twenty-first Congress of the CPSU. Chukhno has been awarded two Orders of Lenin, the Order of the October Revolution, and various medals.

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CHUKHNOVSKII, BORIS GRIGOR'EVICH. Born Mar. 28 (Apr. 9), 1898, in St. Petersburg; died Sept. 30, 1975, in Moscow. Soviet polar aviator; colonel. Member of the CPSU from 1932.

Chukhnovskii graduated from the school for naval pilots in Oranienbaum in 1917. During the Civil War of 1918–20 he served as chief of naval aviation in the combat operations of the Volga-Caspian Flotilla and took part in the operations that moved the base of the Baltic Fleet from Helsingfors to Kronstadt in 1918.

Chukhnovskii's first arctic flight, to Novaia Zemlia, was made in 1924. (Ia. I. Nagurskii made the first flight to Novaia Zemlia.) The purpose of the flight was to conduct hydrographic work and to escort the ships of the Kara Expedition. He flew in the search for U. Nobile's expedition in 1928, in an ice reconnaissance of the Northern Sea Route between 1929 and 1932, and in the search for S. A. Levanevskii's crew in 1937 and 1938. Between 1933 and 1936, Chukhnovskii and R. L. Bartini designed the DAR airplane, a long-range arctic reconnaissance plane.

During the Great Patriotic War of 1941–45, Chukhnovskii flew as a naval pilot in the combat operations of the Northern Fleet. After the war he was a polar aviator in the Main Northern Sea Route Administration. Chukhnovskii was awarded the Order of Lenin, three Orders of the Red Banner, and various medals.

REFERENCE
Vinogradov, S. F. *V derznovennom polete*. Moscow, 1975.

[29–775–4]

CHUKHRAI, GRIGORII NAUMOVICH. Born May 23, 1921, in Melitopol'. Soviet motion-picture director. People's Artist of the RSFSR (1969). Member of the CPSU since 1944.

In 1953, Chukhrai graduated from the department of directing of the All-Union State Institute of Cinematography, where he studied under S. I. Iutekevich and M. I. Romm. One of the leading directors of the postwar cinema, he has made a number of significant films that have gained popularity throughout the Soviet Union and the world; several of his films have won prizes at international film festivals. His most outstanding works have been *The Forty-first* (1956, based on the novella by B. A. Lavrenev), *Clear Sky* (1961), and *Memory* (1970). Chukhrai's *Ballad of a Soldier* (1959) was awarded the Lenin Prize in 1961. From 1966 to 1971, Chukhrai worked at the All-Union State Institute of Cinematography.

Chukhrai has been awarded five orders and several medals.

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Zorkaia, N. *Portrety*. Moscow, 1966. [29–776–1]

CHUKHROV, FEDOR VASIL'EVICH. Born July 2 (15), 1908, in the city of Egor'evsk, Moscow Oblast. Soviet mineralogist and geochemist. Academician of the Academy of Sciences of the USSR (1970; corresponding member, 1953). Member of the CPSU since 1953.

Chukhrov graduated from the Moscow Geological Prospecting Institute in 1932. From 1936 to 1956 he worked at the Institute of Geological Sciences of the Academy of Sciences of the USSR, where he was appointed deputy director in 1950. In 1956 he became director of the Institute of the Geology of Ore Deposits, Petrography, Mineralogy, and Geochemistry of the Academy of Sciences of the USSR.

Chukhrov's main works deal with the mineralogy of ore deposits and the geochemistry of ore-forming processes. He established the science of natural colloids and developed the principles of the theory of the typomorphism of minerals. He contributed to the development of the mineralogy and geochemistry of the supergene zone: he conducted research on the mineralogy of the oxidation zone of sulfide deposits and studied clay minerals, iron oxides, and sulfur isotopes. He is the editor of the multivolume reference work *Minerals*, which has been published since 1960 using the crystallochemical classification of minerals that he developed.

Chukhrov received the State Prize of the USSR in 1951. He has also been awarded the Order of Lenin, three other orders, and several medals.

Chukhrovite, a sulfate-fluoride of calcium, aluminum, and rare-earth elements, was named in honor of Chukhrov.

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"K 60-letiiu F. V. Chukhrova." *Geologiia rudnykh mestorozhdenii*, 1968, no. 5. [29–776–2]

CHUKOCH'E, a lake in the delta of the Kolyma River, in the Yakut ASSR. Lake Chukoch'e has an area of 120 sq km. It is shallow and has an irregular shoreline. The lake is fed by snow and rain and is linked with the nearby Lake Maloe Chukoch'e (area, 55 sq km) by a channel. Lake Chukoch'e is connected by a series of channels and lakes with Lake Nerpich'e and the left branch of the Kolyma River. [29–755–1]

CHU-KO LIANG. Born 181; died 234. Chinese military and state figure of the Three Kingdoms period.

Chu-ko Liang was the son of a small-scale landowner. In 207 he joined the service of Liu Pei, who was fighting Ts'ao Ts'ao for power in China. In 221, Liu Pei founded the Shu kingdom and made Chu-ko Liang his chief counselor. As such, Chu-ko Liang waged war against the Wei kingdom while maintaining friendly relations with the Wu kingdom. He subjugated several southwestern tribes. The military accomplishments of Chu-ko Liang are celebrated in the classic Chinese novel *The Three Kingdoms* (14th century). [29–539–1]

CHUKOVSKII, KORNEI IVANOVICH (real name, Nikolai Vasil'evich Korneichukov). Born Mar. 19 (31), 1882, in St. Petersburg; died Oct. 28, 1969, in Moscow. Soviet Russian writer, critic, literary scholar, and translator. Doctor of philology (1957).

Chukovskii was expelled from a *Gymnasium* in Odessa in the fifth grade because of his social origin (his mother was a peasant). He subsequently worked and studied on his own. He began his journalistic career in 1901, publishing essays on contemporary writers that were later collected in such books as *From Chekhov to Our Times* (1908) and *Faces and Masks* (1914). Although sharp and penetrating, Chukovskii's literary portraits at times exhibited excessive subjectivity and paradoxicality of judgment. In *Nat Pinkerton and Modern Literature* (1908), he mocked petit bourgeois literature with great skill.

In 1916, M. Gorky invited Chukovskii to work at the Parus Publishing House and advised him to write for children. Chukovskii's fairy tales in verse "Moidodyr" (1923), "The Giant Roach" (1923), "Mukha-tsokotukha" (1924; under the title "The Fly's Wedding"), "Barmalei" (1925), and "Aibolit" (1929; under the title "The Adventures of Aibolit") were elegant, witty, and free of didacticism. They quickly found their way into the hearts of young readers. Chukovskii's painstaking study of children's speech, ability to create words, and psychology resulted in *Little Children* (1928), republished later as *From Two to Five* (21st ed., 1970).

Chukovskii dealt with the legacy of N. A. Nekrasov in *Nekrasov as Artist* (1922), the collection of articles *Nekrasov* (1926), and the 1927 edition of Nekrasov's *Complete Collected Poems*. His work on Nekrasov culminated in his definitive study, *The Mastery of Nekrasov* (1952; Lenin Prize, 1962).

A translator for many years, Chukovskii was the first to acquaint Russian readers with W. Whitman's *Leaves of Grass* (1907). He analyzed contemporary methods of translation in *Principles of Artistic Translation* (1919) and *High Art* (1968). In his literary and historical memoirs, such as *Contemporaries* (1962) and *Chekhov* (1967), Chukovskii drew vivid portraits of Russian cultural figures. He also worked extensively as an editor.

Chukovskii received an honorary doctorate in literature from Oxford University in 1962. Many of his books have been translated into languages of the USSR and foreign languages. Chukovskii was awarded the Order of Lenin, three orders of the Red Banner of Labor, and various medals.

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V. V. ZHDANOV [29–743–3]

CHUKOVSKII, NIKOLAI KORNEEVICH. Born May 20 (June 2), 1904, in Odessa; died Nov. 4, 1965, in Moscow. Soviet Russian writer. Son of K. I. Chukovskii.

N. K. Chukovskii graduated from the Leningrad Institute for the History of Arts in 1930 and was first published in 1922. He wrote biographical novellas about famous navigators and novellas and novels about the Civil War, such as *Glory* (1935), *The Village of Kniazhii Ugol* (1936) and *Yaroslavl'* (1938). Chukovskii's most significant work is his novel *The Baltic Sky* (1954; film with the same title, 1961), which describes the courage of the pilots of the Baltic Fleet who defended Leningrad during the siege. In his novellas and short stories "Mésalliance" (1963), "Little Girl Life" (1965), and "Bloomed the Wild Strawberries" (1965), Chukovskii treats moral and ethical problems in a psychologically authentic way. Chukovskii was awarded the Order of the Red Banner of Labor and various medals.

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CHUKURY, a geological term for the hilly moraine ridges deposited by ancient glaciers in the Zaalai Range in the southern Alai Valley. [29–755–4]

CHULAKI, MIKHAIL IVANOVICH. Born Nov. 6 (19), 1908, in Simferopol'. Soviet composer, teacher, and figure in the music

world. People's Artist of the RSFSR (1969). Member of the CPSU since 1943.

In 1939, Chulaki graduated from the Leningrad Conservatory, where he had studied composition with V. V. Shcherbachev. From 1937 to 1939 he was associated with the Leningrad Philharmonic Society, first as director and later as artistic director. He was deputy chairman of the Committee for the Arts of the Council of Ministers of the USSR in 1951 and 1952 and assistant head of the Central Board for the Arts under the Council of Ministers of the USSR from 1952 to 1955.

Chulaki was with the Bolshoi Theater from 1955 to 1959 and from 1963 to 1970, first as director and later as artistic director. He began teaching at the Leningrad Conservatory in 1933, and in 1948 he accepted a teaching post at the Moscow Conservatory, where he was named a professor in 1962.

Chulaki's finest works are the ballets *The Tale of the Priest and His Worker, Blockhead* (1940), based on the narrative poem by A. S. Pushkin; *The False Fiancé* (1946), based on the play by C. Goldoni; and *Youth* (1947), based on themes from N. A. Ostrovskii's novel *How the Steel Was Tempered*. Other notable works are the Symphony No. 2 (1945), *Symphonic Concerto* (1959), and the orchestral work *Songs and Dances of Old France* (1959). In addition to articles on music, Chulaki has written the book *Instruments of the Symphony Orchestra* (1950), which has been reprinted many times.

Chulaki was a deputy to the sixth and seventh convocations of the Supreme Soviet of the RSFSR. He received the State Prize of the USSR in 1947, 1948, and 1950. Chulaki has been awarded three orders and various medals. [29–756–2]

CHULKOV, MIKHAIL DMITRIEVICH. Born 1743 or 1744 in Moscow; died there Oct. 24 (Nov. 4), 1792. Russian writer and journalist.

Chulkov was one of the *soldatskie deti* (children not from the *dvorianstvo* [nobility] who were educated in regimental schools and allowed to enter military service at the same level as members of the *dvorianstvo*). He was an actor, a court servant, and a Senate official; he obtained hereditary nobility in 1779.

Chulkov's works were oriented toward the common reader. His collection of short stories and novellas *The Mocker, or Slavonic Tales* (parts 1–5, 1766–89) contained picaresque works and works dealing with magic and chivalry. It represented the first use of Slavic mythology in Russian literature. Chulkov later systematized Slavic mythology in special mythological dictionaries, the most complete of which was *The ABC of Russian Superstitions* (1786).

Chulkov's *The Comely Cook, or The Adventures of a Debauched Woman* (1770, unfinished) was the first Russian picaresque novel written from the viewpoint of a woman. Chulkov published a number of 18th-century folk and professionally composed songs in *A Collection of Various Songs* (parts 1–4, 1770–74), which was supplemented and republished by N. I. Novikov in 1780 and 1781. (Parts 1–3 were reissued as *The Works of M. D. Chulkov*, vol. 1, St. Petersburg, 1913.) He published the journals *I to i s'o* (1769) and *Parnasskii shchepetil'nik* (1770) and took part in the journalistic polemic Novikov conducted with Catherine II on the nature of satire. In the last years of his life, Chulkov worked on *A Historical Account of Russian Commerce* (vols. 1–7, 1781–88), a detailed collection of legislative acts and other documents dealing with trade.

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V. P. STEPANOV [29–757–2]

CHUL'MAN, an urban-type settlement in the Yakut ASSR, under the jurisdiction of the Neriungri city soviet. Chul'man is situated on the Chul'man River of the Lena River basin, on the Amur-Yakutsk highway, 402 km north of the Bol'shoi Never railroad station on the Trans-Siberian Railroad and 40 km north of the Berkakit railroad station on the Tynda-Berkakit line. Coal is mined in the area, and the settlement has a state regional power plant and an enterprise serving motor-vehicle transportation. [29–761–1]

CHULPAN (pen name of Abdul-Khamid Suleiman ogly Iunusov). Born 1893 in Andizhan; died 1938. Soviet Uzbek writer.

Chulpan studied in a *madrasa* and later in a Russian school for local nationalities. He began his literary career in 1914. His prerevolutionary works, including the novella *Doctor Mukhammed"iar* (1914) and short stories, are deeply pessimistic. Chulpan's works of the Soviet period reveal contradictions in the author's ideology and approach to literature. Bourgeois nationalist sentiments are apparent in the poetry collections *The Awakening* (1922), *Springs* (1924), and *Secrets of the Dawn* (1926).

In the latter 1920's, Chulpan repudiated his errors, abandoned his delusions, and recognized the historical and social superiority of the new reality. The evolution of his world view found expression in the romantic drama *Iarkin-Oi* (1920; 2nd version, 1926), the novel *By Night and by Day* (part 1, 1936), and his plays. *Saz* (1931), a collection of verse, celebrates the October Revolution of 1917 and the successful building of socialism in Uzbekistan. Chulpan translated into Uzbek the works of A. S. Pushkin and N. V. Gogol, Shakespeare's *Hamlet*, the plays of C. Gozzi and C. Goldoni, and V. V. Ivanov's *Armored Train 14–69*.

WORKS
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M. R. RAKHMANOV [29–759–1]

CHULUTYN-GOL, a river in Mongolia; the main tributary of the Ider River of the Selenga basin. The Chulutyn-Gol flows into the Ider from the right. It is 415 km long and drains an area of approximately 20,000 sq km. The river rises on the northern slopes of the Khangai. High water occurs in the summer. The mean flow rate is estimated to be 25 cu m per sec. The Chulutyn-Gol freezes over for five or six months. It is nonnavigable. [29–759–2]

CHULYM, a city and the administrative center of Chulym Raion, Novosibirsk Oblast, RSFSR; situated on the Chulym River. Chulym has a railroad station on the Barabinsk-Novosibirsk line, 131 km west of Novosibirsk. The city has a creamery and enterprises serving railroad transportation. [29–760–2]

CHULYM, a river in Novosibirsk Oblast, RSFSR. The Chulym is 392 km long and drains an area of 17,900 sq km. It rises in the swamps of the Baraba Steppe, and its lower course passes through Lakes Sargul' (34.6 sq km) and Urium (84.1 sq km) before emptying into Lake Malye Chany. The Chulym is fed mainly by snow. High water occurs between mid-April and early November. The river is frozen from December to March, and the ice breaks up in April or early May. The Kargat is a right tributary of the river. The city of Chulym is situated on the Chulym. [29–760–1]

CHULYM, a river in Krasnoiarsk Krai and Tomsk Oblast, RSFSR; a right tributary of the Ob'.

The Chulym is 1,799 km long and drains an area of 134,000 sq km. It is formed by the confluence of the Belyi Iius and Chernyi Iius rivers, which rise in the Kuznetskii Alatau. From its source to the city of Achinsk the river flows through mountains, but from Achinsk to Tegul'det it flows first between high banks and then through the Chulym-Enisei Basin, where it branches and frequently shifts course. The Chulym then flows over a floodplain up to 10 km wide, where it forms numerous lakes and oxbows; the channel, which is up to 1,200 m wide, has many branches.

The Chulym is fed primarily by snow, with high water occurring between May and July. The mean flow rate is 785 cu m per sec, with a maximum rate of 8,220 cu m per sec (131 km from the mouth) and a minimum rate of 108 cu m per sec. The river freezes over in early November, and the ice breaks up in late April or early May; ice jams often occur in the spring. The average sediment discharge is 68 kg per sec, and the river carries a sediment load of 2.1 million tons per year. The largest tributaries are the Serezh, Uriup, Kiia, and Iaia on the left and the Kemchug, Chichkaiul, and Bol'shoi Ului on the right.

The Chulym is used for floating timber. The river is navigable for a distance of 1,173 km from the mouth; however, the river bars and the twisting course make navigation difficult. The cities of Nazarovo, Achinsk, and Asino are situated on the Chulym. [29–759–3]

CHULYM-ENISEI BASIN (also Enisei-Chulym Basin), the northern part of the vast intermontane Minusinsk Depression in the southern part of Krasnoiarsk Krai. The basin is bounded on the east by spurs of the Vostochnyi Saian, on the west by the Kuznetskii Alatau, on the north by the Solgon Ridge, and on the south by the Batenevskii Ridge. The terrain consists mainly of rolling hills, with *melkosopochnik* in the south (*see* MELKOSOPOCHNIK). Elevations range from 170 m to 500–550 m.

The basin is composed mainly of sandstones, conglomerates, shales, and extrusive rocks of the Paleozoic and Mesozoic, during which deposits of brown coal were formed. The Enisei River flows along the eastern margin of the basin, and the Chulym River runs through the central and western parts. Characteristic of the area are broad hollows and a large number of lakes, including Lakes Shira and Bele. Typical grass steppes have developed in the south on common and southern chernozems; forest steppes are found in the north and in the foothills on alkaline chernozems and gray forest soils. The Chulym-Enisei Basin is an important agricultural region of Krasnoiarsk Krai. [29–760–3]

CHULYMTSY, a Turkic-speaking territorial group that lived along the middle and lower course of the Chulym River, a tributary of the Ob'. Russians referred to the Chulymtsy as the Chulym Tatars. The group was formed in the 17th and 18th centuries when several Turkic groups had advanced eastward after the fall of the Siberian Khanate. These groups and, partly, Teleut and Enisei Kirghiz mixed with small numbers of Selkups and Ket. The Chulymtsy led a settled way of life, having adopted agriculture and nonnomadic livestock raising from local Russian peasants. The descendants of the Chulymtsy intermingled with the Khakass and with Russians.

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Potapov, L. P. *Proiskhozhdenie i formirovanie khakasskoi narodnosti.* Abakan, 1957. [29–760–4]

CHULYSHMAN, a river in the Altai, in Gorno-Altai Autonomous Oblast. The Chulyshman is 241 km long and drains an area of 16,800 sq km. In its upper course it flows across the Chulyshman Plateau, passing through a series of lakes, the largest of which is Dzhulukul' (area, 29.5 sq km). It then enters a deep valley between the Chulyshman Plateau and the Ulagan Plateau. The river empties into Teletskoe Lake. It is fed by mixed sources, chiefly by snow; high water occurs between May and September. The mean flow rate is 158 cu m per sec. The river freezes over between late October and early December, and the ice breaks up between late March and early May. The principal tributary of the Chulyshman is the Bashkaus. [29–760–5]

CHULYSHMAN PLATEAU, an upland plain in the eastern Altai, between the Chulyshman River valley on the southwest and the Shapshal Range on the northeast. In the western and southern parts of the Chulyshman Plateau, massifs composed of crystalline schists and granites rise to a maximum elevation of 3,148 m above the generally flat surface, whose average elevation is 2,000–2,200 m. The Chulyshman Plateau is drained by right tributaries of the Chulyshman River, including the Chul'cha and the Shavla. Larch and nut pine–larch taiga grow on the slopes of the plateau to elevations of 2,000 m; stony mountain tundra is found at higher elevations. [29–760–6]

CHUM, the Russian name of a portable dwelling used by the Nentsi of the European part of the USSR and by the peoples of Siberia, including the Ket, Northern Yakuts, Oroki, Evenki, Nganasani, and Tuvinians-Todzhintsy.

The *chum*, built of 30 to 50 poles, was conical, with a round or slightly oval base and a floor diameter of 3 to 8 m. In the winter it was covered with sewn hides of reindeer, Manchurian deer, or elk, and in the summer, with boiled birch bark or, sometimes, canvas or burlap. The entrance was covered with hides in the winter and coarse fabric in the summer. In the center of the *chum* was a hearth. On both sides of the entrance were the sleeping areas; birch bark, willow mats, and dry grass were spread on the floor and reindeer hides were placed on top. With the transition of the nomadic peoples to a settled way of life, the *chumy* gradually fell into disuse and were replaced in some places by tents. [29–761–2]

CHUMACHESTVO, a special form of trade and goods conveyance in the Ukraine and in southern Russia. *Chumachestvo* grew out of the salt trade in the second half of the 16th century in the Dnieper region, to which salt was brought from the Black Sea coast, the Crimea, and Galicia.

Initially the haulers and traders known as *chumaki* were primarily cossacks; later they included state peasants and, less frequently, serfs and townspeople. Beginning in the 17th century the *chumaki* dealt not only in salt but in dried fish, handicrafts, and lumber. They transported their goods on ox-drawn wagons (*mazhi*) and, until the end of the 18th century, rode under an elected ataman in armed convoys of 100 or more wagons to protect themselves against attack by Crimean Tatars.

As a result of the decline of the feudal-serf system and the development of trade, *chumachestvo* became a major rural occupation in southern Russia by the mid-18th century. Grain shipped abroad from southern ports, such as Odessa, came to be the principal commodity traded.

A source of primitive accumulation of capital, *chumachestvo* widened the socioeconomic differences among the peasant and cossack masses. Such prominent Ukrainian merchants and landowners as the Tereshchenkos and Kharitonenkos came from the ranks of the *chumaki*. A topic in Ukrainian folklore and in the works of such Ukrainian writers as T. G. Shevchenko and G. P. Danilevskii, *chumachestvo* ceased to exist by the 1870's and 1880's as a result of the development of rail and water transport.

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CHUMAKOV, MIKHAIL PETROVICH. Born Nov. 1 (14), 1909, in the village of Ivanovka, in what is now Volyn' Raion, Orel Oblast. Soviet microbiologist and virologist. Academician of the Academy of Sciences of the USSR (1960; corresponding member, 1948). Member of the CPSU since 1940.

Chumakov graduated from the First Moscow Medical Institute in 1931. He was director of the D. I. Ivanovskii Institute of Virology of the Academy of Medical Sciences of the USSR from 1950 to 1954. He was director of the academy's Institute of Poliomyelitis and Viral Encephalitides (founded on his initiative) from 1955 to 1972; he served as scientific director of the institute from 1972 to 1976.

Chumakov's work has mainly been devoted to the etiology, immunology, laboratory diagnosis, epidemiology, prophylaxis, and treatment of human viral diseases. Among the diseases he has studied are Russian spring-summer and mosquito-borne encephalitides, poliomyelitis, enteroviral diseases, measles, influenza, and trachoma. Chumakov discovered several viruses that are pathogenic for man and developed a theory of hemorrhagic fevers. He assisted in the development of vaccines for poliomyelitis, measles, Russian spring-summer and Japanese B encephalitides, and other diseases. He also helped organize mass immunization campaigns against poliomyelitis, which resulted in the rapid eradication of poliomyelitis epidemics in the USSR and many other countries.

Chumakov has been awarded three orders, several medals, the Lenin Prize (1963), the State Prize of the USSR (1941), and the D. I. Ivanovskii Prize of the Academy of Medical Sciences of the USSR (1953). He became a member of the Leopoldina German Academy of Naturalists in 1969.

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Sharov, A. I. *Pervoe srazhenie: Povest' o virusologakh*, 3rd ed. Moscow, 1963. [29–763–2]

CHUMIZA (*Setaria italica maxima*), an annual cultivated subspecies of foxtail millet (family Gramineae). The erect, nearly cylindrical stem varies in height from 25 cm to 2 m. The leaves, which are broadly lanceolate and pointed, measure 25–65 cm in length. The inflorescence is a spicate panicle, and the fruit is a grain.

This foxtail millet subspecies is cultivated in Korea, China, India, Mongolia, Japan, the USSR, and other countries. In the USSR it is grown in the Byelorussian SSR, the Ukrainian SSR, the republics of Middle Asia, the Kazakh SSR, the Georgian SSR, the Northern Caucasus, and the Far East. It is cultivated on small plots. Chumiza is used as a food crop in the form of groats and flour and as a feed crop in the form of grain, hay, and green feed.

The plant is drought resistant and thermophile. It grows well in chernozems, gray forest soils, and soddy podzols. Germination occurs at a temperature of 5°C; the shoots are sensitive to frost. Three varieties are distinguished based on the length of the vegetative period: early varieties, with a vegetative period of 100 to 110 days; average varieties, with a vegetative period of 110 to 130 days; and late varieties, with a vegetative period of more than 130 days.

For plantings raised for grain, the seeds are sown in wide rows 45–60 cm apart. Continuous drilling is used if the crop is to be used as hay or green chop. The rate for wide-row sowing is 10–12 kg/hectare (ha); the seed rate in continuous drilling is 14–20 kg/ha. The depth of seeding is 2.5–4.5 cm. Chumiza is grown with vetch, clover, and other legumes. The crop is harvested for grain during the phase of waxy ripeness or at the beginning of the phase of complete maturity. Harvesting for hay is done at the beginning of panicle formation, and harvesting for green feed takes place ten to 14 weeks earlier. The yield per ha is 250–300 centners of green mass, 50–70 centners of hay, and 15–30 centners of grain. One hundred kg of green mass contain 17.5 feed units and 1.8 kg of digestible protein. In 100 kg of hay there are 55 feed units and 5.4 kg of digestible protein. Green mass, hay, and silage may be fed to cattle, sheep, and horses. The grain may be fed to all agricultural animals.

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Spravochnik po kormoproizvodstvu. Moscow, 1973.
A. P. MOVSISIANTS [29–765–1]

CHUMYSH, a river in Altai Krai and Kemerovo Oblast, RSFSR; a right tributary of the Ob'. The Chumysh River is 644 km long and drains an area of 23,900 sq km. It rises in the Salair Ridge at two sources, the Kara-Chumysh and the Tom'-Chumysh. The upper course has many rapids; near the mouth the river divides into two branches. The Chumysh is fed primarily by snow. The mean flow rate 74 km from the mouth is 146 cu m per sec. The river freezes in the first half of November and opens up in the second half of April. It is used to float timber. The river is navigable for 196 km to the Zakharovo landing [29–766–2]

CHUNA (called the Uda River in the upper course), a river in Irkutsk Oblast and Krasnoiarsk Krai, RSFSR; right headstream of the Taseeva River in the Enisei basin. The Chuna River is 1,203 km long and drains an area of 56,800 sq km. It rises in the Uda Range of the Vostochnyi Saian. The upper course flows through a narrow intermontane valley; the lower course flows through the Central Siberian Plateau. As the river intersects traps, it forms the Tiumenets, Voron, Arakan, and Kosoi rapids. It is fed mainly by rain and snow. The mean flow rate is 300 cu m per sec. The Chuna freezes in late October or November, and the ice breaks up in late April or May. The river is used to float timber, and there is local navigation. The city of Nizhneudinsk is on the Chuna. [29–766–3]

CHUNATUNDRA, a mountain massif on the Kola Peninsula, west of Lake Imandra; located in Murmansk Oblast, RSFSR. The massif rises to an elevation of 1,114 m at Mt. Ebruchorr. It is part of the Lapland preserve. [29–767–1]

CH'UN CH'IU, a period of the Eastern Chou in China that lasted from 722 B.C. to 481 B.C.; named after the *Ch'un ch'iu* (Spring and Autumn Annals), which chronicled the events of these years.

During the Ch'un Ch'iu period, the kingdoms and principalities that had been formed from early Chou fiefs became in fact independent states embroiled in internecine strife. Because many of the nobles perished in the strife and the large kingdoms gained strength at the expense of the smaller ones, the institution of hereditary fiefs and the aristocracy itself were weakened. In the conquered, escheated, or newly acquired lands of the large kingdoms, regions and prefectures were created and placed under the leadership of officials trained by the central government. [29–768–1]

CHUNCHON, a city in South Korea, in the Soyang River valley (Pukhan River basin). Capital of Kangwon-do (Kangwon Province). Population, 121,000 (1970). Chunchon, a transportation junction, manufactures textiles, food products, and mineral fertilizers. [29–782–1]

CHUNGJU, a city in South Korea, in North Chungchong Province. Population, more than 50,000. Chungju is a transportation junction. It produces textiles, including silk, foods and spices, and tobacco products, and chemicals, including mineral fertilizers. Machinery is also manufactured. [29–781–7]

CHUNGKING (also Ch'ungch'ing), a city in Southwest China, in Szechwan Province. Forms a series of terraces on the slope of a promontory at the confluence of the Chialing Chiang and the Yangtze River. Population, approximately 5 million (including rural areas under the city's jurisdiction; 1974). Chungking is a river port that handles more than 6 million tons of freight annually. It is connected by water with Shanghai and by railroad with Paochi, in Shensi Province, and with the seaport of Chanchiang, in Kwangtung Province. The city has an airport. There is a bridge across the Yangtze at Chungking.

Chungking developed as a major industrial center during the Sino-Japanese War, when factories were evacuated to the city from the eastern regions between 1938 and 1945; since that time industry has undergone further development. Approximately 10 million tons of coal are mined annually in the Chungking area; the substantial electric power industry includes two fossil-fuel-fired steam power plants and a hydroelectric power system on the Lungch'i Ho.

In 1970, Chungking's complex of integrated iron and steel plants produced 1.5 million tons of pig iron and 1.2 million tons of steel. The city's diversified machine-building industry manufactures hydroturbines, equipment for the power-engineering industry, machine tools, pneumatic and drilling equipment, construction machinery, ships, bearings, agricultural machinery, and instruments. The chemical industry is represented by plants producing plastics, chemical fibers, toxic chemicals, and pharmaceuticals. The building-materials industry is represented by cement factories. The city also has mills for the production of wool and silk fabrics, a meat-packing plant, a cannery, a butter factory, a tea factory, and flour mills. I. M. FEDOROV

Chungking is first mentioned in the 11th century B.C., when Chiangchou, the capital of the kingdom of Pa (Pah), stood on the site of the modern city. In 316 B.C. the kingdom of Pa was incor-

porated into the Ch'in state, and Chiangchou became a district capital. In 1189 the city received its present name. Long a major commercial center of Southwest China, Chungking was opened to foreign trade in 1891, after which it was used by the capitalist nations as a base from which to penetrate the economy of Szechwan and neighboring provinces. From 1913 to 1929 the city was called Pahsien. In October 1938 the Japanese captured Hank'ou, where the nationalist government had been located since late 1937; from the fall of Hank'ou until early 1946, Chungking was the capital of China. The city was freed from Kuomintang rule by the People's Liberation Army of China on Nov 30, 1949.
[29–767–7]

CHUNHYANG-JON ("Tale of Chunhyang"; also known as *Fragrance of Spring*), an anonymous late 18th-century Korean tale of the romance between a girl of the lower class and a noble youth. Certain passages of the work criticize contemporary Korean society. The tale has survived in different versions. The libretto of the Korean opera *Chunhyang-jon* is based on the tale.

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CHUNI (singular, *chunia*), *lapti* made from hemp cord.
[29–767–3]

CHUNIA, a river in Krasnoiarsk Krai, RSFSR, a right tributary of the Podkamennaia Tunguska. The Chunia River is 727 km long and drains an area of 70,500 sq km. It is formed at the confluence of the Iuzhnaia Chunia and Severnaia Chunia rivers. The river flows over the Central Siberian Plateau and is full of rapids, including Chunskii Zamok. It is fed by snow and rain. High water is in May and June, and flooding occurs in summer and, especially, in fall. The mean flow rate is about 435 cu m per sec. The Chunia freezes in October, and the ice breaks up in May. Right tributaries are the Paimbu, Verkhnii Chunku, and Nizhnii Chunku; left tributaries are the Kimchu, Mutorai, and Tychany. The river is navigable by boats of shallow draft.
[29–768–2]

CHUNIRI (also *chunir*), a Georgian (primarily Svanetian) bowed stringed folk instrument. The *chuniri* has a wooden drumlike body covered on one side by a leather membrane. The instrument's flat neck passes through the body, terminating at the bottom in a supporting leg and at the top in a spade-shaped pegbox. The short bow is arched. The two or three horsehair strings are tuned to a third or to a second and third. The *chuniri* is used in ensemble playing with the *changi* (a plucked stringed instrument) to accompany singing and dancing; improved versions of the instrument are used in the folk orchestras of the Georgian SSR.

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Beliaev, V. *Ocherki po istorii muzyki narodov SSSR*, fasc. 2. Moscow, 1963. Pages 271–72. [29–767–5]

CHUNIZHEKOV, CHALCHIK ANCHINOVICH. Born Oct. 29 (Nov. 10), 1898, in the *urochishche* (locality) of Kuium, in what is now Gorno-Altai Autonomous Oblast; died July 1, 1973, in Gorno-Altaisk. Soviet Altai writer.

The son of a peasant, Chunizhekov was first published in 1925. In the narrative poem *Tuudi* (1947) he depicted the *skazitel'* (singer of epic folk songs) N. U. Ulagashev. In the autobiographical novella *Munduzak* (1962; Russian translation, 1964), Chunizhekov described life in the Altai during the early years of Soviet power.

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Katash, S. S. *Literaturnye portrety*. Novosibirsk, 1971. [29–767–4]

CHUNSKII, an urban-type settlement and the administrative center of Chunskii Raion, Irkutsk Oblast, RSFSR. Chunskii is situated on the Chuna River in the Enisei River basin. It has a railroad station (Chuna) on the Taishet-Lena line, 808 km northwest of Irkutsk. A logging combine, a logging and timber distribution establishment, and enterprises serving railroad transportation are found in the settlement. [29–767–6]

CHUPA, an urban-type settlement in Loukhi Raion, Karelian ASSR. Chupa is a landing on Chupa Bay of the White Sea, 4 km from the Chupa railroad station on the Murmansk-Leningrad line. The Karelsliuda Ore-dressing Combine, a logging and timber distribution establishment, and a fish-processing plant are located in Chupa. [29–768–3]

CHUPAKHOVKA, an urban-type settlement in Akhtyrka Raion, Sumy Oblast, Ukrainian SSR; situated 29 km from the Akhtyrka railroad station. Chupakhovka has a sugar refinery. [29–768–4]

CHUPROV, ALEKSANDR ALEKSANDROVICH. Born Feb. 6 (18), 1874, in Mosal'sk, in what is now Kaluga Oblast; died Apr. 19, 1926, in Geneva. Russian statistical theorist; founder of the modern system of teaching statistics. Corresponding member of the Russian Academy of Sciences (1917), member of the International Statistical Institute, corresponding member of the Royal Economic Society and Royal Statistical Society in London. Son of A. I. Chuprov.

A. A. Chuprov graduated from the faculty of physics and mathematics of Moscow University in 1896 and studied economic sciences in Germany in 1901. His study of Marxist philosophy had a profound influence on the formation of his materialist views. From 1902 to 1917, Chuprov headed the department of statistics at the St. Petersburg Polytechnic Institute. He organized a seminar on statistics that trained many Russian statisticians; the participants in the seminar came to be known as Chuprovtsy. In 1917, Chuprov emigrated.

In his dissertation *Essays on the Theory of Statistics* (1909), Chuprov developed a number of original ideas on causality, probability, and the law of large numbers. His scientific work was concerned primarily with problems and methods of the stochastic (probabilistic) theory of statistics, which he attempted to place on a materialist foundation. He fought against the Machism, German neo-Kantianism, and American neopositivism that had crept into the theory. Chuprov contrasted these schools of thought to the ideas of the Russian scholars P. L. Chebyshev and A. A. Markov, in particular their method of mathematical expectations.

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CHUPROV, ALEKSANDR IVANOVICH. Born Feb. 6 (18), 1842, in Mosal'sk, in what is now Kaluga Oblast; died Feb. 24 (Mar. 8), 1908, in Moscow. Russian bourgeois economist, statistician, and journalist. Corresponding member of the St. Petersburg Academy of Sciences (1887).

The son of a priest, Chuprov graduated from the faculty of law at Moscow University in 1866. From 1878 to 1899 he was a professor of political economy and statistics at the university. A founder of Russian statistics, he wrote numerous works on political economy, the agrarian question, and the economics of railroad transport. He organized the Society for the Dissemination of Technical Knowledge in 1869 and the Statistics Divison of the Moscow Juridical Society in 1882.

Chuprov was the leading exponent of the liberal Narodnik (Populist) school of bourgeois economics, which called for partial agrarian reforms—such as the improvement of farming techniques, the organization of cottage artels, and the resettlement of the peasantry—that would leave intact the peasant commune and the ownership of land by the gentry. He edited the liberal Populist collection *The Influence of Harvests and Grain Prices on Certain Aspects of the Russian National Economy* (1897), which was sharply criticized by V. I. Lenin (see *Poln. sobr. soch.*, vol. 3, p. 207, note; p. 311, note).

Chuprov took part in the *zemstvo* (district and provincial self-government) movement and was a frequent contributor to the newspaper *Russkie vedomosti*.

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[29–769–1]

CHUQUET, NICOLAS. Fifteenth-century French mathematician.

In his treatise on arithmetic and algebra *Triparty en la science des nombres*, which was written in 1484 and published in Rome in 1881, Chuquet introduced negative and zero exponents. Chuquet's notation is close to modern usage (*see* MATHEMATICAL SYMBOLS).

REFERENCE
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[29–1564–2]

CHUQUICAMATA, a city in northern Chile, in Antofagasta Province. Population, 28,800 (1966). Chuquicamata is situated at an elevation of approximately 3,000 m. It has a railroad station. Copper ores are mined and dressed and copper is smelted in the city. [29–743–1]

CHUQUICAMATA, the world's largest copper deposit, located in northern Chile, in the Central Andes at an elevation of 2,840 m, 240 km northeast of the city of Antofagasta. The total geological reserves of commercial ores are estimated at about 900 million tons, with an average copper content of 0.99 percent (1978). Chuquicamata, a hydrothermal deposit of porphyry copper, is confined to a large meridional intrusion (20 km long and 3 to 4 km wide) of porphyritic monzonite. The commercial ores connected with the thick (more than 300 m) zone of oxidation form a steep stockwork that is 0.8 km wide and about 3 km long.

Three submeridional zones are distinguished in the Chuquicamata deposit: the western, the central, and the eastern zones. The western zone, which consists of copper-molybdenum ores, is 100 to 200 m wide and is the most intensively mineralized. It is composed of quartz-sericite rocks and quartzites; metalliferous minerals are represented (in addition to oxidized minerals) by pyrite, chalcocite, enargite, molybdenum, and chalcopyrite. The central zone, which consists of copper ores, is characterized by intensive kaolinization of porphyries and the development of chalcopyrite-chalcocite ores. The eastern zone consists of complex ores. The rocks are chloritized, and chalcopyrite is developed. Bornite, sphalerite, and galena are found less often.

The Chuquicamata deposit has been worked since 1915. By 1952, 4.6 million tons of copper had been extracted; 420,000 tons were mined in 1974. V. I. STAROSTIN [29–742–5]

CHUR, an urban-type settlement in Iakshur-Bod'ia Raion, Udmurt ASSR, on the Chur River, a tributary of the Izh River. Chur has a railroad station on the Izhevsk-Igra line, 44 km northwest of Izhevsk. Limestone is quarried and processed in the settlement, and wood products are manufactured. A silicates plant was under construction in 1978. [29–769–2]

CHURCH, ALONZO. Born June 14, 1903, in Washington, D.C. American logician and mathematician.

Church was a professor at Princeton University from 1947 to 1967, when he became a professor of mathematics and philosophy at the University of California at Los Angeles.

Church's works deal with various branches of logic. He developed the notion of separating the concept of function from that of set. In 1936 he advanced the fundamental hypothesis of the theory of computable functions; now known as Church's thesis, it states that every effectively computable function is general recursive (*see* RECURSIVE FUNCTION). In 1935, Church adduced an example of an undecidable queue problem, and in 1936 he proved that the decision problem for predicate calculus is unsolvable. These results greatly influenced the development of mathematical logic. Church also made an important contribution to the development of combinatory logic and carried out research in logical semantics and modal logic.

WORKS
In Russian translation:
Vvedenie v matematicheskuiu logiku, vol. 1. Moscow, 1960.
[29–333–2]

CHURCHILL, LORD RANDOLPH (Randolph Henry Spencer-Churchill). Born Feb. 13, 1849, in Blenheim, near Woodstock, Oxfordshire; died Jan. 24, 1895, in London. British political figure.

The third son of the seventh duke of Marlborough, Churchill was elected to Parliament in 1874 as a member of the Conservative Party. Criticizing the party leadership's policies, Churchill deemed it necessary for the Conservatives to adapt to new historical conditions, in particular by appealing to the working class, which had received the right to vote. Churchill was a supporter of colonial expansion, and in 1885–86 he was secretary of state for India and chancellor of the exchequer. [29–334–6]

CHURCHILL, WINSTON LEONARD SPENCER. Born Nov. 30, 1874, in Blenheim, near Woodstock, Oxfordshire; died Jan. 24, 1965, in London. British statesman; a leader of the Conservative Party.

Churchill was a descendant of the dukes of Marlborough and a son of Lord Randolph Churchill. He was educated at the privileged Harrow school and at the military academy at Sandhurst. From 1896 to 1898 he served in India and took part in the suppression of an uprising on the Northwest Frontier. Churchill saw action in the Sudan in the campaign that led to the conquest of the country by British troops. He was a war correspondent in South Africa during the Boer War (1899–1902).

Churchill left military service to enter politics. In 1900 he was elected to Parliament as a Conservative. In 1904 he switched to the Liberal Party for careerist reasons. He was under-secretary for the colonies from 1906 to 1908, president of the board of trade from 1908 to 1910, and home secretary in 1910–11; in 1911 he sent troops against striking Welsh miners. Churchill became first lord of the admiralty in 1911. In World War I he initiated the Dardanelles Operation of 1915, the failure of which led to his resignation (1915). In 1917–18 he was minister of munitions in Lloyd George's cabinet.

Churchill served as secretary for war and as air minister from 1919 to 1921. In this period Churchill, whom V. I. Lenin characterized as the most bitter enemy of Soviet Russia (see *Poln. sobr. soch.*, 5th ed., vol. 41, p. 350), was one the main organizers of the anti-Soviet intervention. As colonial secretary (1921–22), he approved the use of the air force for the suppression of the national liberation movement in the colonies. In the 1920's, as the Liberal Party lost its political power, Churchill returned to the Conservative Party, to whose political philosophy and policies he

had always been close. He was a Conservative member of Parliament from 1924 until the end of his life.

From 1924 to 1929, Churchill was chancellor of the exchequer in S. Baldwin's cabinet. As a result of Churchill's efforts, the pound sterling was restored to the gold standard (1925), a move aimed at restoring London's role as the center of world finance. In the 1930's Churchill vigorously opposed the foreign policy of Baldwin and N. Chamberlain; he considered their policy of appeasing the fascist aggressors as short-sighted and extremely risky. In September 1939, after Great Britain entered World War II, Churchill was appointed first lord of the admiralty in Chamberlain's government. In May 1940, after Chamberlain's resignation, Churchill became prime minister in a coalition government. He headed a radical reorientation of the whole country for war against Germany and the other countries of the fascist bloc.

On June 22, 1941, after Germany's attack on the USSR, Churchill, realizing that Great Britain could not avoid defeat in the war without a military alliance with the USSR, announced his support for the struggle of the Soviet people. The Churchill government signed an agreement with the USSR on joint actions against fascist Germany (July 1941) and a treaty of alliance in the war against Germany (May 1942). Subsequently, however, his government procrastinated in meeting its treaty obligations, in particular, on the pledge to open a second front. Churchill participated in the Tehran Conference (1943), the Yalta Conference (1945), and the Potsdam Conference (1945).

Churchill resigned after the defeat of the Conservatives in the parliamentary elections in July 1945. As leader of the opposition in Parliament, Churchill assumed leadership of the campaign to unleash the cold war. In a speech delivered on Mar. 5, 1946, in the presence of US president H. Truman in Fulton, Mo., Churchill called for the formation of a military and political alliance of Great Britain and the USA against the USSR and the people's democratic countries. Churchill was again prime minister from 1951 to 1955. In these years Great Britain played an active role in the rearming of West Germany and in the forming of imperialist military blocs. In 1955, Churchill, now at an advanced age, resigned from office and abandoned active political life.

Churchill is also known as a publicist and as the author of historical works and of memoirs. He was awarded the Nobel Prize for literature in 1953.

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V. G. TRUKHANOVSKII [29–334–7]

CHURCHILL, a city in Canada, in northeastern Manitoba. Population, 1.6 million (1971). A seaport on the western shore of Hudson Bay, at the mouth of the Churchill River, Churchill is the terminus of a railroad branch line. It has a grain elevator and is a grain-shipping point. The city was founded in 1688. [29–334–4]

CHURCHILL (until 1965, Hamilton), a river in Canada, on the Labrador Peninsula. The Churchill River drains a large group of lakes in central Labrador. It empties into Lake Melville, which is linked by a channel with Hamilton Inlet of the Atlantic Ocean. The Churchill is 560 km long and drains an area of 80,000 sq km. Waterfalls include Churchill Falls and Muskrat Falls; among the river's rapids are the Mouni. The mean flow rate is 1,558 cu m per sec. There are several hydroelectric plants on the river. [29–334–3]

CHURCHILL, a river in Canada. The Churchill River flows out of Methy Lake in Saskatchewan and empties into Hudson Bay. The river is 1,600 km long and drains an area of 282,000 sq km. Its course consists of a chain of lakes separated by rapids. The many large lakes in the Churchill system, such as Reindeer Lake, Northern Indian Lake, Southern Indian Lake, and Lac La Ronge, cause the flow to be well regulated. The Beaver River is a large right tributary of the Churchill. The Churchill River is fed by snow and rain, and high water occurs in spring and summer. The mean flow rate is 1,200 cu m per second. The river freezes over for about eight months. A hydroelectric plant is located on the Churchill River at Island Falls, and the port of Churchill is situated at the river's mouth. [29–334–2]

CHURCHILL FALLS (until 1965, Grand Falls), a waterfall in the upper course of the Churchill River in Canada, on the Labrador Peninsula. Churchill Falls is formed by the river's crossing of the precipitous edge of a plateau. The falls have a drop of about 75 m. A hydroelectric plant with a total installed capacity of 2.5 megawatts has been built at Churchill Falls. [29–334–5]

CHURIKOVTSY, an ethicoreligious movement in Russia, part of the temperance movement. The Churikovtsy were named for their founder, I. A. Churikov, a merchant from Samara (born 1862; died after 1930). Churikov preached moral and religious salvation through rejection of alcoholic beverages and smoking. His followers claimed that he possessed the power to cure drunkenness. The Churikovtsy had some influence among the urban lower classes of St. Petersburg and Moscow.

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CHURINGA, a sacred object of certain Australian tribes. Churingas are flat, decorated pieces of wood or stone that were kept in special hiding places and used in religious rites. They were regarded as totemic incarnations. Ornamented pebbles similar to churingas have been uncovered at habitation sites of the Mesolithic Azilian culture. [29–770–1]

CHURKIN, NIKOLAI NIKOLAEVICH. Born May 9 (21), 1869, in the village of Dzhalal-Ogly (present-day Stepanavan, Armenian SSR); died Dec. 27, 1964, in Minsk. Soviet composer and folklorist. People's Artist of the Byelorussian SSR (1949).

Churkin graduated from M. M. Ippolitov-Ivanov's composition class at the Tbilisi Music School in 1892. He worked as a music teacher from 1892 to 1914 in Baku, Kaunas, and Vilnius. He moved to Byelorussia in 1914 and lived in Minsk from 1935. Churkin collected musical folklore, including more than 3,000 examples of Byelorussian folk music and dances, many of which were published in collections in 1910, 1949, and 1959. Churkin was the first to attempt a Soviet Byelorussian opera, *The Liberation of Labor* (1922), and he originated national genre symphonic music, for example, *Byelorussian Pictures* (1925). His other works include the children's radio opera *The Mitten* (1940) and the musical comedy *Song of Berezina* (1947). He also wrote works for symphony orchestra, wind orchestra, folk-instrument orchestra, and instrumental chamber ensemble (including 11 quartets), as well as choral works and songs set to the words of Soviet poets.

Churkin was awarded three orders and several medals.

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CHURRIGUERA, a family of Spanish architects and sculptors of the 17th and 18th centuries. The most famous family member was José Benito Churriguera (born Mar. 21, 1665, in Madrid; died there Mar. 2, 1725), after whom the Spanish version of the baroque style—the Churrigueresque—was named. José combined baroque techniques with Gothic and plateresque motifs in his buildings, altars, and retables. He used fanciful architectural ornament (curved, wavy cornices and columns) and abundant

sculptural decoration. José's works include the retable of the Church of San Estéban in Salamanca (1693–96), a palace in Madrid (after 1689; now the San Fernando Royal Academy of Fine Arts, rebuilt in 1774), and the town of Neuvo Baztán (1709–13; palace, church, and factory). José's brothers, Joaquin (1674–1724) and Alberto (1676–1740), worked in Salamanca. [29–770–3]

CHURSIN, SERAFIM EVGEN'EVICH. Born Dec. 27, 1905 (Jan. 9, 1906), in Voronezh. Soviet military commander; admiral (1964). Member of the CPSU since 1929.

The son of a worker, Chursin joined the navy in 1926 and graduated from the M. V. Frunze Naval School in 1931. He completed special courses for command personnel in 1932, and he graduated from the Higher Military Academy in 1954. During the Great Patriotic War of 1941–45, Chursin commanded a submarine brigade in the Pacific Fleet until 1943 and in the Black Sea Fleet beginning in 1944. After the war he commanded the Danube Naval Flotilla from 1948 to 1952 and the Caspian Naval Flotilla in 1954 and 1955. He was appointed chief of staff of the Black Sea Fleet in 1955, first deputy commander of the fleet in 1956, and commander in 1962.

Chursin became a consulting professor at the Naval Academy in 1969, and in 1971 he retired. He was a deputy to the seventh convocation of the Supreme Soviet of the USSR. Chursin has been awarded four Orders of Lenin, the Order of the October Revolution, three Orders of the Red Banner, two Orders of the Red Star, and various medals. [29–770–4]

CHU SHIH-CHIEH. Chinese mathematician of the 13th century.

In his treatise *Precious Mirror of the Four Elements*, Chu described a method for solving numerical equations similar to Horner's method and presented methods for forming equations. Chu developed a notation for equations of higher degree in four unknowns and solved a number of problems that reduce to such equations. [29–541–2]

CHU SI-GYONG (pen name, Han Hin-saem). Born Dec. 22, 1876, in Pongsan District, Hwanghae-do (Hwanghae Province); died July 27, 1914. Korean scholar and thinker.

After graduating from the Pai Jai School, Chu worked for the newspaper *Tongnip shinmun*. In the late 19th century he led the movement to spread the use of the Korean language and to unify its writing system. He played a major role in the development of Korean linguistics. After joining the educational movement, Chu wrote patriotic articles that called for the independence and democratic development of the country.

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CHUSOVAIA (upper course, Poludennaia Chusovaia), a river in Sverdlovsk and Perm' oblasts of the RSFSR (with its source in Cheliabinsk Oblast); a left tributary of the Kama. The Chusovaia is 592 km long and drains an area of 23,000 sq km. It originates in the Central Urals. The upper course flows through a broad valley. The middle course flows through a narrow canyon-like valley or a broader valley with gentle slopes. In its lower reaches, the Chusovaia is a typical flatland river. It empties into Chusovaia Bay of the Kama Reservoir. The river is fed by mixed sources, with snow predominating. High water lasts from mid-April to mid-June. The mean flow rate is 222 cu m per sec. The greatest flow rate is 4,570 cu m per sec, and the lowest, 8.4 cu m per sec. Six or seven flash floods occur each summer. The Chusovaia freezes between late October and early December and opens up in April or early May. Ice jams, which raise the water level as much as 2.8 m, are typical in the lower course.

The principal tributaries are the Mezhevaia Utka, Serebrianka, Koiva, and Us'va, on the right, and the Revda and Lys'va, on the left. The Chusovaia is used extensively for water supply: water from the Volchikhinskoe Reservoir (37 sq km) is transported to the Verkhnii Iset' Reservoir, which supplies the Sverdlovsk area. There are 15 smaller reservoirs on the tributaries of the Chusovaia. Timber can be floated on the river for about 500 km. The Chusovaia is navigable from the city of Chusovoi. The cities of Pervoural'sk and Chusovoi are located on the river, which is a popular tourist area.

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Iastrebov, E. V. *Po reke Chusovoi*, [2nd ed.]. [Sverdlovsk] 1963. [29–771–2]

CHUSOVOI, a city under oblast jurisdiction in Perm' Oblast, RSFSR, on the western slope of the Central Urals, on the Chusovaia River near the mouth of the Us'va River, 136 km northeast of Perm'. Junction (Chusovskaia) for railroad lines to Perm', Nizhnyi Tagil, and Solikamsk. Population, 59,000 (Jan. 1, 1977). Chusovoi has metallurgical and machine-repair factories, as well as plants for the manufacture of reinforced-concrete structures and metal products. The city also has a milk plant, a food-processing combine, railroad-transport enterprises, and a housebuilding combine. The Chusovles Association is located in the city. Chusovoi has an evening industrial technicum, a medical school, and a museum of local lore. [29–771–3]

CHUSOVOI METALLURGICAL WORKS, one of the oldest plants in the Urals, located in the city of Chusovoi, Perm' Oblast. The USSR's leading fully integrated enterprise for the production of ferrovanadium, the Chusovoi Metallurgical Works is a major supplier of complex shaped sections, quality spring strips, and finished automotive springs.

The works was founded in 1879 by a French joint-stock company and produced commercial metal until the October Revolution in 1917. It was nationalized in 1918. The workers of the enterprise were active in the revolutionary movement. A mass meeting to protest against the Lena massacre was held at the works in 1912, and one of the largest strikes in the Urals took place there in 1914.

During the Civil War and Military Intervention of 1918–20, the Chusovoi Metallurgical Works filled military orders, producing steel armor for armored trains and river vessels. During the Soviet period, the works was completely modernized. In the 1930s, a blast furnace, a new model 370 section mill for rolling spring strips, a model 800 billet mill, and a ferroalloy pilot plant were put into operation. During the Great Patriotic War of 1941–45, the works produced special ammunition for the needs of the front; a sintering plant, a new blast furnace, and the first Bessemer plant in the Urals were put into operation.

Between 1950 and 1980, two open-hearth furnaces, a new ferroalloy plant, and a new automotive-spring plant were built. Between 1966 and 1975, the output of pig iron increased by 20 percent, the output of steel increased by 16 percent, and the output of finished rolled products increased by 13 percent.

I. N. GUBAIDULLIN [29–772–1]

CHUST, a city (since 1969) under oblast jurisdiction; the administrative center of Chust Raion, Namangan Oblast, Uzbek SSR. Population, 31,000 (1974). Chust is located on the northern edge of the Fergana valley, 12 km north of the Chust railroad station (on the Kokand-Uchkurgan line). The city has a cotton-cleaning plant and a factory for the production of confectioneries. Artistic goods and traditional knives of the local peoples are also produced. [29–772–2]

CHUST SETTLEMENT, a settlement dating from the Bronze Age (beginning of the second and end of the first millennia B.C.), located near the city of Chust, Namangan Oblast, Uzbek SSR. Excavations by V. I. Sprishevskii and others, conducted between 1950 and 1961, revealed part of a defensive system, the remains of dwellings, refuse pits, and burials. Characteristic finds included painted pottery, with black geometric designs on a red background, as well as objects made of bronze, stone, or wood and molds for the casting of weapons. The Chust settlement is typical of the agricultural population of the Fergana Valley (the Chust culture).

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CHU TEH. Born Nov. 6, 1886, in Ilung District, Szechwan Province; died July 6, 1976, in Peking. Chinese military, state, and political figure.

Chu Teh graduated from a military school in the city of K'unming. He joined the revolutionary organization T'ung-meng Hui in 1909 and subsequently took part in the Hsinhai Revolution of 1911–13. From 1922 to 1925 he studied in Germany, where he joined the Communist Party of China (CPC) in 1922. In 1925 and 1926 he was in the USSR. He was an organizer and leader of the Nanch'ang Uprising of 1927.

Chu Teh became a candidate member of the Central Committee of the CPC in 1930, commander of the Chinese Red Army in 1931, and a member of the Central Committee and the Politburo of the Central Committee of the CPC in 1934. From 1934 to 1936 he was a leader of the Long March, and in 1937 he was appointed commander of the Eighth Army. Chu Teh served as a secretary of the Central Committee of the CPC from 1945 to 1956 and commander of the People's Liberation Army of China from 1945 to 1954.

Chu Teh was vice-chairman of the People's Republic of China (PRC) from 1949 to 1954. From 1955 to 1965, when military ranks were abolished in the PRC, he held the title of marshal of the PRC. From 1956 to 1969 he was a member of the Standing Committee of the Politburo of the Central Committee of the CPC; he again became a member in 1973. In 1959 he was named chairman of the Standing Committee of the National People's Congress of the PRC. During the Cultural Revolution Chu Teh came under attack by the Red Guards.

V. I. ELIZAROV [29–539–2]

CHUTKIKH, ALEKSANDR STEPANOVICH. Born Aug. 2 (15), 1903, in the village of Pavelets, in what is now Skopin Raion, Riazan' Oblast. Soviet innovator in light industry. Member of the CPSU since 1950.

Chutkikh spent most of his career at the Krasnokholmskii Worsted Combine in Moscow—from 1922 to 1958. Between 1927 and 1930, without leaving work, he completed evening courses at a general-education school. He served as deputy foreman in a textile shop from 1937 to 1950 and as technical foreman from 1950 to 1958. He has received a personal pension since 1958.

In 1949, Chutkikh initiated socialist competition of work brigades for high-quality production. As a total master of his work specialty, he serviced 34 (instead of the usual 24) wide looms. Chutkikh was a deputy to the third and fourth convocations of the Supreme Soviet of the USSR. He received the State Prize of the USSR in 1949.

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T. A. DMITRIENKO [29–773–1]

CHUTOVO, an urban-type settlement and the administrative center of Chutovo Raion, Poltava Oblast, Ukrainian SSR. Chutovo is on the Kiev-Kharkov highway, 12 km from the Skorokhodovo railroad station on the Poltava-Kharkov line. The settlement has an industrial combine, a feedlot sovkhoz, and a pedigree stock farm. [29–773–2]

CHUTSKAEV, SERGEI EGOROVICH. Born Mar. 6 (18), 1876, in the village of Sugat, in Kamyshlov District, Perm' Province; died Mar. 1, 1944, in Sverdlovsk. Soviet state and party figure. Member of the Communist Party from 1903.

The son of a railroad employee, Chutskaev was a student at the University of St. Petersburg in 1896, when he became associated with the St. Petersburg League of Struggle for the Emancipation of the Working Class. He studied at the University of Heidelberg in Germany from 1902 to 1904. He was named a member of the Ekaterinburg committee of the RSDLP in 1905 and later became a member of the Ural'sk oblast committee of the RSDLP. He was arrested and exiled several times.

After the February Revolution of 1917, Chutskaev became a member of the Orenburg committee of the RSDLP and a member of the Orenburg soviet. In 1918 he was chairman of the Ekaterinburg soviet, a member of the Ural'sk oblast soviet, and deputy chairman of the Ural'sk oblast extraordinary commission (cheka). In August 1918, Chutskaev became a member of the collegium of the People's Commissariat of Finance, deputy people's commissar of finance, and a member of the Minor Council of People's Commissars of the RSFSR. In 1921 and 1922 he was deputy chairman and then chairman of the Siberian Revolutionary Committee and a member of the Siberian Bureau of the Central Committee of the RCP(B). He was a candidate member of the Presidium of the Central Control Commission of the ACP(B) in 1923 and 1924. Between 1924 and 1927 he was a member of the Presidium of the Central Control Commission, a candidate member of the Secretariat of the Central Control Commission, and deputy people's commissar of the Workers' and Peasants' Inspectorate of the USSR.

Chutskaev was chairman of the Far East Krai Executive Committee of the ACP(B) and a member of the bureau of the krai committee between 1927 and 1929. From 1929 to 1933 and from 1935 to 1938 he was a member of the Presidium of the Central Executive Committee of the USSR. He was plenipotentiary of the USSR in Mongolia from 1933 to 1935. Chutskaev was a delegate to the Twelfth through Seventeenth Congresses of the party. He was elected a member of the Central Control Commission at the Twelfth through Fourteenth Congresses, a candidate member of the Central Committee at the Fifteenth and Sixteenth Congresses, and a member of the Central Auditing Commission of the ACP(B) at the Seventeenth Congress. Chutskaev was a member of the All-Russian Central Executive Committee and of the Central Executive Committee of the USSR.

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Lenin, V. I. *Poln. sobr. soch.*, 5 ed. (see Index Volume, part 2, p. 484.) [29–776–3]

CHUVAL, an open hearth that was placed against a wall and had a straight flue mounted above it. The *chuval* was used until the 1920's and 1930's by certain peoples of, for example, Siberia (the Yakuts, the Khanty, and the Mansi) and the Volga Region (the Bashkirs). The hearth was constructed of unhewn stones or of clay-coated logs. The flue consisted of thin clay-coated poles and was topped by a chimney. [29–704–8]

CHU VALLEY, part of the valley of the Chu River. The Chu Valley, situated in the river's middle course, extends from the Boam Gorge in the southeast to the eastern edge of the Muiunkum Desert in the northwest, in the Kirghiz SSR and the Kazakh SSR. It measures approximately 200 km in length and ranges in width from 15 km in the southeast to 100 km in the northwest. Elevations range from 500 to 1,200 m. The climate is distinctly continental, with a frost-free period of as much as 180 days. Precipitation totals 250–400 mm annually, mainly in the spring. Almost all of the Chu Valley's territory is cultivated and irrigated. The main crops are sugar beets, grains, and fruit, including grapes. The city of Frunze is located in the south. [29–741–2]

CHUVANS, one of the Yukaghir groups. In the 17th century, the Chuvans were nomads who wandered in the region of the upper Anadyr' River and along the Malyi Aniui River; they engaged in hunting, fishing, and reindeer herding. In the 18th century, under pressure from the Chukchi, some of the Chuvans moved to the Kolyma River and became russianized; the remaining Chuvans were assimilated by the nomadic Koriaks (Chavchyv) and the Chukchi. [29–704–9]

CHUVASH (self-designation, Chuvash), a nationality in the USSR, numbering 1,751,400 persons (1979 census), of whom 887,700 live in the Chuvash ASSR. Large groups of Chuvash also inhabit the Tatar and Bashkir ASSR's and Ul'ianovsk, Kuibyshev, and Saratov oblasts, where they migrated in the 17th and 18th centuries. The Chuvash living in Siberia and Middle Asia settled there in the 19th and 20th centuries. Anthropologically, the Chuvash combine Europeoid and Mongoloid elements. They speak Chuvash, and the believers among them are Orthodox.

Prior to their conversion to Christianity in the mid-18th century, the Chuvash adhered to tribal religions.

In the opinion of most scholars, the major role in the ethnogenesis of the Chuvash was played by the Turkic-speaking Volga-Kama Bulgars, who in the last quarter of the first millennium A.D. moved into the forest-steppe regions on the right bank of the Volga, where they mixed with local Finno-Ugric tribes. After the destruction of Bulgaria on the Volga by the Mongol-Tatars, the mass migration of Bulgar Suvars (or Suvaz, from whom the name "Chuvash" is derived) to the right bank of the Volga in the 13th and 14th centuries intensified the turkization of the local tribes. The Chuvash lands were annexed by the Kazan Khanate in the second quarter of the 15th century.

The Chuvash nationality, which essentially evolved in the 15th century, comprises two basic ethnographic groups: the upstream Chuvash, or Vir'ial, in northwestern Chuvashia and the downstream Chuvash, or Anatri, in northeastern and southern Chuvashia. The area between them is inhabited by a transitional group, the middle-downstream Chuvash (Anat Enchi), who are linguistically close to the Vir'ial but whose mores are similar to those of the Anatri. The overwhelming majority of the Chuvash who live outside the Chuvash ASSR belong to the downstream group. The Chuvash inherited from their Bulgar ancestors farming techniques, handicrafts, and many other aspects of material and spiritual culture.

The inclusion of Chuvashia in the Russian state in 1551, freeing the Chuvash from the oppression of the Kazan Khanate, was of great importance for the subsequent development of the Chuvash people. The Chuvash adopted from the Russians more advanced implements, architectural and clothing styles, and other elements of culture. Despite the national oppression of the tsarist government and local bourgeoisie and the forcible Christianization, the Chuvash kept alive their language, indigenous culture, rich folklore, music, and applied art, and they created their own written literature. Before the establishment of Soviet power the Chuvash lived in rural communes, preserving vestiges of the patriarchal system in their social and family life.

In the Soviet period the Chuvash have made great strides in economic and cultural development. The Chuvash ASSR has become one of the country's most important industrial areas and a region with an advanced socialist agriculture. The Chuvash have developed into a socialist nation as a result of the victory of socialism. A national intelligentsia has emerged. Among the traditional folk arts that continue to flourish are choral singing, embroidery, artistic weaving, and wood carving. (For more information on the history, economy, and culture of the Chuvash *see* CHUVASH ASSR.)

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P. V. DENISOV [29–705–1]

CHUVASH, the language of the Chuvash, spoken in the Chuvash ASSR and, beyond its borders, mainly in the Tatar and Bashkir ASSR's and in Ul'ianovsk, Kuibyshev, Orenburg, Saratov, and Penza oblasts of the RSFSR. According to the 1970 census the language is spoken by 1,694,000 people.

Chuvash is a Turkic language with two dialects: the Upstream, or Vir'ial, dialect ("o" dialect) and the Downstream, or Anatri, dialect ("u" dialect), which are divided into subdialects. Distinctive phonetic features include the relatively long vowels *a, e, ï, i, u, ü*, which contrast with the short vowels *ă* and *ĕ*. The consonants *r* and *l* correspond to Turkic *z* and *sh*. Morphological characteristics include the plural affix *-sem* instead of the *-lar* or *-ler* typical of most Turkic languages; the presence of the demonstrative pronouns *ku* (this) and *leshĕ* (that); and the past tense verb form ending in *-nă* or *-nĕ*. The predominant Common Turkic and native Chuvash vocabulary has been enriched by borrowings from other Turkic languages and also from Arabic, Iranian, Mongolian, Russian, and the Finno-Ugric languages.

The literary language is based on the Downstream dialect. The first printed grammar and translations into Chuvash appeared in the 18th century. The writing system, based on the Russian alphabet, was not widely accepted, however. In 1871–72, I. Ia. Iakovlev created a new Russian-based Chuvash alphabet that played an important role in the development of the Chuvash written language.

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L. S. LEVITSKAIA [29–721–2]

CHUVASH AUTONOMOUS SOVIET SOCIALIST REPUBLIC (Chăvash Avtonomillĕ Sovetlă Sotsializmla Respubliki, Chuvashia), a part of the RSFSR. The Chuvash ASSR was formed on Apr. 21, 1925, superseding the Chuvash Autonomous Oblast, which had been established on June 24, 1920. It is situated in the eastern part of the East European Plain, almost entirely on the right bank of the Volga, between two of the river's tributaries, the Sura and Sviiaga. Area, 18,300 sq km. Population, 1,281,000 (Jan. 1, 1977). Chuvashia is divided into 21 raions and has nine cities and six urban-type settlements. The capital is Cheboksary.

Constitution and government. The Chuvash ASSR is a socialist state of workers and peasants and an autonomous Soviet socialist republic. Its present constitution was adopted by the Eighth Extraordinary Session of the Supreme Soviet of the Chuvash ASSR on May 31, 1978. The highest bodies of state power are the unicameral Supreme Soviet of the Chuvash ASSR, composed of 200 deputies elected by constituencies with equal populations for terms of five years, and its Presidium. The Supreme Soviet forms the government, the Council of Ministers of the Chuvash ASSR. The republic sends 11 deputies to the Soviet of Nationalities of the Supreme Soviet of the USSR. Local bodies of state power include city, raion, settlement, and village soviets of people's deputies, elected by the population for terms of 2½ years.

The Supreme Soviet elects the Supreme Court of the Chuvash ASSR for a five-year term. The Supreme Court is composed of two judicial divisions, one hearing criminal and the other civil cases, and the Presidium of the Supreme Court. The procurator of the Chuvash ASSR is appointed by the procurator-general of the USSR for a term of five years.

Natural features. The republic's right-bank region is occupied by the Volga Upland. In the northeastern part of the upland, the Chuvash Plateau, lying at an elevation of 175 m to 227 m, descends precipitously toward the Volga. The plateau is crisscrossed by ravines and gullies, whose density may be as much as 0.5–0.9 km per sq km. The left bank, or Trans-Volga Region, is a plain (elevation 50–70 m) with sandy knolls of fluvioglacial origin, swamps, and peat bogs. The climate is moderately continental, with fairly cold winters and warm summers. The temperature averages −12.7°C in January and 19.3°C in July. About 70 percent of the annual precipitation of 450–500 mm falls during the warm period. The growing season lasts 180 days.

All the republic's rivers drain into the Volga, which flows through Chuvashia for 127 km and whose principal tributaries are the Sura, Tsivil', and Anish. The south is drained by tributaries of the Sura (Bezdna, Kiria, Menia) and of the Sviiaga (Kubnia, Bula). There are lakes on the river floodplains, as well as karst lakes. Among the larger lakes are the Shikhazanskoe and Siutkul'.

About 70 percent of the republic's territory is covered by soddy

podzolic and gray forest soils, commonly found in the north and on the watersheds. Leached chernozems, occupying 20 percent of the republic's area, are found in the Trans-Sura Region and in the southeast. With the exception of the Trans-Volga Region, which belongs to the southern taiga subzone, the republic lies in the forest-steppe zone. Forests, found chiefly in the Sura and Trans-Volga region, cover 32 percent of the territory. The most common trees are pine, spruce, birch, oak, and linden. Wildlife includes the brown bear, wolf, fox, lynx, marten, raccoon dog, muskrat, squirrel, marmot, and elk.

Population. The Chuvash constitute the bulk of the population. The 1979 census showed that the republic was inhabited by 887,700 Chuvash, 338,100 Russians, 37,600 Tatars, 20,300 Mordovians, Ukrainians, and Mari.

Over the years the population of Chuvashia has increased from 891,000 in 1926 to 1,078,000 in 1939, 1,098,000 in 1959, and 1,224,000 in 1970. The average population density is 70 persons per sq km. The proportion of urban dwellers increased from 5 percent in 1926 to 45 percent in early 1977. The main cities are Cheboksary, Alatyr', Mariinskii Posad, Tsivil'sk, and Iadrin. The cities of Novocheboksarsk, Kanash, Shumerlia, and Kozlovka were founded in the Soviet period.

Historical survey. Relics of the middle Paleolithic, Mesolithic, and Neolithic have been discovered in Chuvashia. Finno-Ugric tribes arrived in the area at the end of the Neolithic. At the beginning of the Bronze Age (end of the third millennium B.C.) tribes of the Fat'ianovo culture migrated into Chuvashia from the southwest. They practiced livestock raising and hoe farming and made copper and bronze tools. In the early Iron Age (first millennium B.C.) the primitive communal system began to disintegrate among the tribes living in the area.

The tenth century A.D. saw the rise of the first state in the Middle Volga Region, Bulgaria on the Volga. Conquered by the Mongol Tatars in the 1230's, the state was included in the Golden Horde in 1241. The Chuvash nationality evolved in the 15th century through the mingling of Bulgars, who had moved into northern Chuvashia, and Finno-Ugric tribes. The Chuvash engaged in farming, apiculture, and, to a lesser extent, livestock raising, hunting, and fishing. After the Golden Horde broke up in the early 15th century, the Kazan Khanate emerged to rule over the Chuvash and other nationalities, all of whom had to pay tribute to the Tatar feudal lords. A considerable part of the Chuvash feudal nobility—centurion (*serbiu*) and decurion (*vonbiu*) princes and *tarkhans*—entered the service of the Tatars.

In 1551 the Chuvash voluntarily joined Russia, and the next year they helped Russian troops conquer Kazan. The fortified cities that were built, notably Cheboksary (first mentioned in chronicles in 1469 and founded as a fortified city in 1555), Alatyr', Tsivil'sk, and Iadrin, soon became trade and artisan centers. The incorporation of Chuvashia into Russia was a progressive event inasmuch as it freed the Chuvash working masses from the oppression of the Kazan feudal lords and put an end to devastating wars and raids by nomadic tribes. In the second half of the 16th and in the 17th centuries, as the Chuvash moved into the southern regions of the present-day republic, the area under cultivation expanded. Moreover, farming methods improved under the influence of the Russian peasantry. The Chuvash began to excel in woodworking and the processing of hides, wool, and fiber. Leather, tallow-making, and distilling enterprises were established in the cities of Chuvashia in the latter half of the 17th century; from the late 18th century they employed hired laborers.

The Chuvash peasants, who paid the *iasak* tax in money and kind and performed labor services, were gradually enserfed. In the 1720's the *iasak*-paying Chuvash were assigned to the category of state peasants, and the *iasak* was replaced by a poll tax and quitrent. The Chuvash were forcibly Christianized in the middle of the 18th century. The Chuvash peasants were exploited by moneylending tradesmen, Russian and Tatar merchants, and the Chuvash patriarchal feudal nobility. In the 16th and 17th centuries Chuvashia was administered by the Prikaz Kazanskogo Dvortsa; in the early 18th century it was divided between Kazan and Nizhny Novgorod provinces; and by the administrative reform of 1775 it became part of Kazan and Simbirsk provinces. The Chuvash working masses resisted feudal serfdom and national oppression and fought in the peasant wars led by S. T. Razin (1670–71) and E. I. Pugachev (1773–75).

The general crisis and decline of feudal serfdom in the first half of the 19th century also affected Chuvashia. In the early 19th century one-fourth of the Chuvash peasants were placed under the jurisdiction of the Office of Appanages, which administered the landed property belonging to the imperial family. The reforms introduced by P. D. Kiselev from 1837 to 1841 only intensified feudal oppression and increased the burden of requisitions for maintaining the bureaucracy. Peasant discontent, initially manifested in sporadic disturbances in 1841, escalated the next year into a full-scale armed uprising, sometimes called the Akramovo War. The uprising, which involved some 10,000 Chuvash and Mari, was suppressed.

Throughout much of the first half of the 19th century industry was limited to 15 *votchina* manufacturing establishments (*see* VOTCHINA INDUSTRY) producing leather, cloth, and other goods, as well as a glass and cloth factory. By about 1850 there were some 150 spinning, brick-making, copper-smelting, and other small enterprises. After the abolition of serfdom, capitalism developed more slowly in Chuvashia than in central European Russia, and the region became a source of agricultural raw material for the Central Industrial Zone. The post-Reform period saw the stratification and impoverishment of the peasantry. By the 1890's kulaks constituted more than 10 percent of the peasants; middle peasants, about 35 percent; and poor peasants, 55 percent. About 2 percent of the peasants owned no land. The kulaks opened small handicraft enterprises or became tradesmen, while the poor peasants hired themselves out as seasonal laborers in the local logging industry or migrated in search of seasonal employment. Capitalist factory production expanded somewhat in the late 19th and early 20th centuries. In 1913 there were 29 large and more than 400 small industrial enterprises. Together, industry and transport employed 6,000 workers.

The first Marxist circles were organized between 1902 and 1904 in Alatyr', Tsivil'sk, Cheboksary, and Iadrin. During the Revolution of 1905–07 in Russia, Bolshevik groups operated in several places in Chuvashia, and a united Social Democratic organization, calling itself Kurmysh-Iadrin-Vasil'sursk, was founded. There were large workers' strikes at the locomotive repair shops and railroad depot in Alatyr', at the Efremov Sawmill in Cheboksary, and at other mills. Armed peasant uprisings broke out in the Russian village of Ivanovo (1905) and in the Chuvash villages of Abashevo, Pervoe Semenovo (1906), and Chemeevo (1907). T. S. Krivov, who was of Chuvash peasant descent, took an active part in the revolution, joining the RSDLP in 1905. In 1913, 23 peasant villages in Iadrin District rebelled against Stolypin's agrarian reform aimed at resettling peasants on farmsteads.

The development of capitalism and expanding contacts between the Chuvash and the Russians and other nationalities contributed to a rise in the material and spiritual culture of the Chuvash people. Primary schools for the Chuvash were established by the Ministry of Education, the *zemstvos* (district and provincial governing bodies), and church parishes. In 1870 the tsarist government reluctantly allowed Chuvash to become the language of instruction in primary schools. Major credit for the spread of learning among the Chuvash belongs to I. N. Ul'ianov, the inspector of public schools of Simbirsk Province, and I. Ia. Iakovlev, the inspector of Chuvash schools of the Kazan School District. In 1868 Iakovlev founded the Simbirsk Chuvash School, which graduated more than 1,000 teachers before the October Revolution of 1917. He also developed an alphabet and a written language and published books in Chuvash (711 such books were published before 1917).

After the February Revolution of 1917, soviets were organized almost immediately in Cheboksary and Alatyr' and in June in Iadrin. Several soviets of peasants' deputies were also formed. The Cheboksary soviet, headed by K. Ia. Grasis and dominated by Bolsheviks, published the newspaper *Cheboksarskaia Pravda*. The Great October Socialist Revolution opened a new era in the history of the Chuvash people, permitting free political, economic, and cultural development. Soviet rule was established in Cheboksary on Oct. 30 (Nov. 12), 1917, in Iadrin in November, in Alatyr' and Tsivil'sk in January 1918, and in *volost* (small rural district) centers and villages by March. The Commissariat for Chuvash Affairs was established under the Kazan Provincial Soviet on Mar. 7, 1918, and the Chuvash Department of the Peo-

ple's Commissariat of Nationalities of the RSFSR was formed in May.

The struggle for the establishment of Soviet power was headed by groups of Bolsheviks who formed party organizations in late 1917 and in the first half of 1918. Among the most dedicated fighters for the establishment and consolidation of Soviet power were I. G. Kadykov (killed by the counterrevolutionaries in July 1918), A. S. Kosyrev, I. G. Filippov, and I. K. Skripkin. In 1918 district committees of the RCP(B) were established in Cheboksary, Iadrin, Tsivil'sk, and Alatyr'. By this time Bolshevik cells were active in many *volosts* and villages. Chuvash sections of the Kazan and Simbirsk provincial committees of the RCP(B) were formed in November 1918. In the Civil War of 1918–20, Chuvash working people fought at the front against the White Guards and interventionists and supplied the Red Army with food, uniforms, and wood for the railroads. V. I. Chapaev, the legendary division commander, and P. P. Lebedev, the chief of the Field Staff of the Red Army, were born in Chuvashia, and the army commander S. D. Pavlov was of Chuvash origin.

The First All-Russian Congress of Chuvash Communists, held in February 1920, discussed the question of Chuvash autonomy within the Soviet state. On June 24, 1920, V. I. Lenin and M. I. Kalinin signed the decree of the All-Russian Central Executive Committee and the Council of People's Commissars of the RSFSR establishing the Chuvash Autonomous Oblast. Cheboksary was designated the administrative center of the oblast, which was formed out of seven districts in Kazan and Simbirsk provinces. Soon thereafter, the Revolutionary Committee of the Chuvash AO was formed under the chairmanship of D. S. El'men'. By a resolution of the Organizational Bureau of the Central Committee of the RCP(B), a provisional oblast committee of the RCP(B) was established for the Chuvash AO on July 1, 1920.

The First Oblast Party Conference, held on Oct. 6–9, 1920, completed the establishment of the oblast party organization. The First Oblast Congress of Trade Unions (Sept. 6–7, 1920) and the First Oblast Conference of the Russian Communist League of Youth (October 1920) formed oblast trade union and Komsomol organizations. At the First Congress of Soviets of the Chuvash AO, held on Nov. 7–11, 1920, the administrative organization of the oblast was completed and an oblast executive committee was elected. The Soviet government and the working people of Moscow and Moscow Province extended massive aid to the Chuvash population during the famine of 1921–23. On Apr. 21, 1925, the Chuvash AO was transformed into the Chuvash ASSR. In June 1925 part of Alatyr' District, including the city of Alatyr', was detached from Ul'ianovsk Province and added to the republic. In 1927 the republic was subdivided into regions. From 1929 to 1936 it was part of Nizhny Novgorod (Gorky) Krai.

During the prewar five-year plans the de facto inequality of the Chuvash people was overcome, and the Chuvash socialist nation was formed through the implementation of the Leninist nationality policy, the support of the Russian and other fraternal peoples of the USSR, socialist industrialization, the collectivization of agriculture, and a cultural revolution. Woodworking, chemical, and food enterprises were built, and by 1940 the gross output of large industry was 9.5 times that of 1913. The Kanash-Cheboksary Railroad was built in 1939. In 1940 the republic's kolkhozes included 85.5 percent of the peasant households and 97.5 percent of the sown area. The living standard of the working people improved, and illiteracy was eradicated. A Chuvash working class and intelligentsia evolved. In 1935 the republic was awarded the Order of Lenin for outstanding achievements in economic and cultural development.

In the Great Patriotic War the Chuvash people acquitted themselves honorably in fulfilling their duty to their homeland. The title of Hero of the Soviet Union was conferred on 75 soldiers from Chuvashia, and some 54,000 persons were awarded orders and medals. More than 20 industrial enterprises were relocated here from the western and central regions of the country. New successes were achieved during the postwar five-year plans, when many workers in industry and agriculture were awarded orders and medals of the USSR. The title of Hero of Socialist Labor was conferred on 58 persons, including S. K. Korotkov on two occasions. In 1970, in honor of the 50th anniversary of its autonomy, Chuvashia was awarded the Order of the October Revolution for its achievements in communist construction. In 1972 the republic received the Order of Friendship of Peoples on the occasion of the 50th anniversary of the formation of the USSR.

V. D. DIMITRIEV

Economy. Socialist construction has transformed Chuvashia into a republic with a diversified industry and a well-developed agriculture.

INDUSTRY. Between 1941 and 1976 the republic's industrial output increased by a factor of 42, compared to a factor of 18 for the USSR as a whole. The republic has more than 200 industrial enterprises. Table 1 shows the output of selected industrial goods.

The heat and power plants in Cheboksary, Novocheboksarsk, Alatyr', Kanash, and Shumerlia are part of the Unified Power Grid of the European USSR. In 1978 construction was under way on a second large heat and power plant in Cheboksary and on the Cheboksary Hydroelectric Power Plant on the Volga.

The machine-building industry, predominantly labor-intensive, produces relays, contactors, magnetic exchanges, and other low-voltage apparatus, instruments for controlling and regulating technological processes, electric meters, electric actuating devices, cables, tools, and technological equipment. Also produced are shuttleless looms, specialized motor vehicles and vans, spare parts for tractors and motor vehicles, and power loaders. Most of the machine-building enterprises are located at Cheboksary, Kanash, Alatyr', and Shumerlia. Experimental models of the T-330 tractor have been assembled at the industrial tractor plant under construction at Cheboksary.

The chemical industry specializes in the manufacture of toxic chemicals, dyes, paints and varnishes, polymer products, and household chemicals. Light industry is represented by a cotton combine, a hosiery and knitwear factory, the Rassvet Clothing Production Association (Cheboksary), hemp plants, two footwear factories, and the Pakha Tĕrĕ National Embroidery Factory (Al'geshevo). The food industry, which processes mainly local raw materials, includes the meat-packing combines of the Chuvashmiasoprom Association in Cheboksary, Alatyr', and Ka-

Table 1. Output of selected industrial products

	1940	*1950*	*1960*	*1970*	*1976*
Electricity (million kW-hrs)	35.2	88.1	292.7	1,157	1,275
High-voltage electric equipment (million rubles)	—	—	—	—	10.1
Low-voltage electric equipment (million rubles)	—	—	—	60	76.6
Instruments, means of automation, and spare parts (million rubles)	—	—	3.2	20.8	33.2
Shuttleless looms (units)	—	—	—	—	4,000
Spare parts for tractors and motor vehicles (million rubles)	—	—	—	59	85.9
Washing machines (thousand units)	—	—	56	434	265
Lumber (thousand cu m)	369	536	855	731	590
Construction bricks (million units)	21.7	25.9	192.3	305.1	317.2
Cotton fabrics (million m)	0.04	8.6	90.1	117.3	111.7
Hosiery (million pairs)	0.2	4.4	7.1	35.3	35.9
Kitted underwear (million units)	0.05	0.09	0.6	17.6	18.2
Leather footwear (thousand pairs)	184	329	1,280	1,866	2,168
Butter (thousand tons)	0.6	1.3	2.6	4.9	6.9

nash, a powdered milk plant in Vurnary, a flour-milling combine and macaroni factory in Cheboksary, and breweries, distilleries, and enterprises of the Chuvashkrakhmalob"edinenie in Ial'chiki, Pervomaiskoe, and Kovali. The lumber and wood-products industry is concentrated in the Sura Region and along the Volga. The woodworking enterprises produce furniture, wood chips, skis and other sports equipment, and musical instruments. The construction industry, based in Novocheboksarsk, produces precast reinforced concrete, bricks, *keramzit*, ceramic blocks, and other structural members and construction materials.

AGRICULTURE. Both crop farming and animal husbandry are well developed. Of the 1,052,700 hectares (ha) of agricultural land in 1976, arable land covered 847,100 ha, hayfields 50,600 ha, and pastures 138,400 ha. That year there were 41,700 ha of irrigated lands, of which 29,200 ha were plowland, and 16,100 ha were drained land. The republic's 210 kolkhozes and 96 sovkhozes (Jan. 1, 1977) had at their disposal more than 10,000 tractors, about 3,000 grain-harvesting combines, and 7,600 trucks. See Table 2 for the distribution of the sown area.

Table 2. Sown acres
(hectares)

	1913	1940	1976
Total sown area	582,500	663,500	831,000
Grain	564,800	525,200	473,700
Potatoes	4,400	52,100	80,800
Industrial crops	7,600	11,800	3,300
Vegetables	100	4,600	4,700
Fodder	600	69,800	267,500

The main grain crops are spring wheat, barley, and rye, although buckwheat and peas are also grown. Industrial crops include hops, grown in the northeast, hemp, and makhorka (Indian tobacco). Between 1971 and 1975 the annual grain harvest averaged 839,300 tons, representing an 8 percent increase over the 1966–70 harvests. Concurrently, the yield of hops increased by 65 percent, averaging 19,800 centners between 1971 and 1975. In 1976 the grain harvest totaled 1.12 million tons, and orchards and berry plantings covered 17,200 ha.

Table 3. Livestock[1]

	1916	1941	1961	1977
Cattle	174,000	160,000	273,000	495,000
cows	117,000	102,000	154,000	216,000
Pigs	136,000	95,000	281,000	457,000
Sheep and goats	590,000	510,000	621,000	459,000

[1]At the beginning of each year

Agriculture is increasingly tending toward animal husbandry. (See Table 3 for data on the increase in the number of livestock.) Between 1940 and 1976 the output of meat rose from 15,000 tons to 68,300 tons (dressed weight), milk from 116,000 tons to 420,800 tons, eggs from 46 million to 213.1 million, and wool from 659 tons to 1,236 tons. In accordance with the resolution On Measures for the Further Development of Agriculture in the Nonchernozem Zone of the RSFSR, adopted by the Central Committee of the CPSU and the Council of Ministers of the USSR in 1974, livestock raising complexes and state and interkolkhoz mixed feed plants are being built in Chuvashia.

In 1976 state purchases amounted to 194,900 tons of grain, 158,000 tons of potatoes, 30,300 tons of vegetables, 1,952 tons of hops, 684 tons of makhorka, 83,200 tons of livestock and fowl (liveweight), 218,000 tons of milk, 107.3 million eggs, and 958 tons of wool.

TRANSPORTATION. The operational length of the railroads was 429 km in 1976. The main railroad lines cross in Kanash, forming a major railroad junction. The lines connect Kanash with Alatyr', Arzamas, Kazan, and Cheboksary. In 1976 there were 9,100 km of highways, of which 2,100 km were paved. The Volga and Suva are used for shipping; Cheboksary is the largest port on the Volga. The republic is crossed by several oil and gas pipelines that run from Western Siberia and the Middle Volga Region to the Central and Northwestern economic regions.

Chuvashia exports to other regions of the USSR machinery, chemical products, fabrics, clothing, and hops, and it imports chiefly industrial equipment, agricultural machinery, metals, and fuel.

REGIONAL DIFFERENCES. The Northern Region, the industrial heartland of Chuvashia, has machine-building, metalworking, chemical, textile, woodworking, and food industries. The northern industrial construction enterprises serve the entire republic. Grain, potatoes, and hemp are grown, and the production of hops, vegetables and fruit is highly mechanized. The region's livestock farms raise beef and dairy cattle, hogs (specialized complexes), and poultry. The main cities are Cheboksary, Novocheboksarsk, Kanash, Shumerlia, Kozlovka, Mariinskii Posad, Tsivil'sk, and Iadrin.

The Southeastern Region is predominantly a crop farming area producing large quantities of grain for the market. Beef and dairy cattle and hogs are also raised. Industry is limited to textile manufacture, food processing, and the repair of agricultural machinery.

The Southwest, which includes the Sura Region, has machine-building, food, forestry, and woodworking industries, many of them located in Alatyr'. The region is divided by the Sura River into the grain-growing steppe Trans-Sura region and the forested Sura Region. Other crops include Indian tobacco, hemp, and potatoes.

STANDARD OF LIVING. The republic's inhabitants are enjoying a steadily rising living standard. Between 1965 and 1976 the average monthly wage of workers increased by a factor of 1.6 and the remuneration of kolkhoz members doubled. The retail commodity turnover of state and cooperative trade, including food services, increased by a factor of 2.6 between 1966 and 1976, reaching 872 million rubles. From 1965 to 1976 the volume of consumer services increased by a factor of 5 in urban areas and a factor of 8.5 in rural areas. About 600,000 sq m of new housing are built each year by the state, the kolkhozes, or private individuals.

P. A. SIDOROV

Public health. In 1913 medical care in the area now included in the republic was provided by 40 doctors, 74 intermediate medical personnel, and 19 hospitals with 486 beds (0.6 per 10,000 population). In the years of socialist construction the incidence of infectious diseases has been greatly reduced, and trachoma and smallpox, formerly widespread, have been eradicated. In 1977 there were 118 hospitals with 14,000 beds, or 10.9 beds per 1,000 population, compared to 3,000 beds, or 2.8 per 1,000 population, in 1940. The republic had 2,901 doctors in 1977, or one for 442 inhabitants, compared to 351 doctors, or one for 3,100 inhabitants, in 1940. The number of intermediate medical personnel increased from 2,400 in 1940 to 11,744 in 1977. Doctors are trained at the medical department of Chuvash University, and intermediate medical personnel are graduated from medical schools in Cheboksary and Kanash. There are six sanatoriums for children and adults.

The main tourist routes follow the Volga and Sura rivers. There is a tourist hotel in Cheboksary and a tourist center on the Sura River.

Education and cultural-educational institutions. In the 1914–15 school year the 463 general-education schools on the territory of the present-day republic had an enrollment of 29,900 students and the area's two specialized secondary schools were attended by 140 students. By the 1977–78 school year there were 783 general-education schools of all types with 67,700 students, 27 vocational-technical schools with more than 13,600 students, and 23 specialized secondary schools with 23,300 students. Some 15,700 students attended higher educational institutions, namely Chuvash University, an agricultural and a pedagogical institute, and a correspondence department of the Moscow Cooperative Institute, all in Cheboksary. In 1976 the republic's 346 preschool institutions were caring for 48,300 children.

As of Jan. 1, 1977, there were five theaters and 722 public libraries with 8.4 million book and magazine holdings. The principal museums, located in Cheboksary, are the Chuvash Republic Art Gallery and the Chuvash Republic Museum of Local Lore with its affiliates, the V. I. Chapaev Museum and a literary muse-

um. Kanash also has a museum of local lore. There are 1,100 clubs, about 1,200 stationary motion-picture projection units, and 60 extracurricular institutions. (*See below*: Music and Theater.)

Scientific institutions. The republic's research institutions, all founded in the Soviet period, include the Scientific Research Institute of Language, Literature, History, and Economics (founded 1928), the All-Union Scientific Research and Design Technological Institute of Relay Construction (1961), the Chuvash Laboratory of the Scientific Research Institute of National Schools under the Ministry of Education of the RSFSR (1972), and the Chuvash State Agricultural Experiment Station (1925). Research is also conducted at the I. N. Ul'ianov Chuvash State University, the I. Ia. Iakovlev Chuvash State Pedagogical Institute, and the Chuvash Agricultural Institute.

Press, radio, and television. In 1979 the Chuvash Publishing House published 207 titles of books and pamphlets totaling 2.1 million copies. The republic newspapers are *Kommunizm yălavĕ* (The Banner of Communism), issued in Chuvash since 1918; the Russian-language *Sovetskaia Chuvashia* (Soviet Chuvashia, since 1917) and *Molodoi kommunist* (The Young Communist, since 1925); and *Pioner sassi* (The Call of the Pioneer), published in Chuvash since 1931. Seven magazines are published, among them the miscellany *Druzhba* (Friendship), founded in 1941.

In addition to the three programs of All-Union Radio, transmitted 60 hours daily, there are local radio broadcasts in Chuvash and Russian (2½ hours daily). Central Television broadcasts are relayed for 22.6 hours daily, and local television broadcasts, in Chuvash and Russian, are on the air three hours daily.

Literature. Chuvash oral folk poetry includes epics, historical and everyday-life songs and narratives, fairy tales, and legends. The earliest efforts to collect Chuvash folklore date from the 18th century. The first literary works were produced in the mid-19th century by the historian, folklorist, and ethnographer S. M. Mikhailov (1821–61). A distinctive national literature emerged in the 1870's on the basis of the written language developed by the educator I. Ia. Iakovlev (1848–1930). Its founders, I. I. Ivanov (1848–85) and I. N. Iurkin (1863–1943), were essentially portrayers of mores. The poet M. F. Fedorov (1848–1904), who helped shape the literary language, advocated critical realism.

Revolutionary democratic poetry appeared in the early 20th century. Among the contributors to the first Chuvash newspaper, *Khipar* (News), published from January 1906 to July 1907, were the satirist and playwright M. F. Akimov (1884–1914), the revolutionary poet Tair Timki (T. S. Semenov, 1889–1916), N. I. Polorussov-Shelebi (1881–1945), and G. A. Korenkov (1884–1958). The highest achievement of prerevolutionary national poetry, the narrative poem *Narspi* (1908) by the Chuvash classic author K. V. Ivanov (1890–1915), criticized patriarchal and feudal social values. The poem was staged, and an opera was based on its plot. N. Shubossinni (N. V. Vasil'ev, 1884–1942) drew on folk motifs in creating his realist narrative poem *Tale of Iantrak* (1908).

Chuvash literature was able to develop freely only afer the victory of the October Revolution of 1917. Verse reforms were introduced by the founder of Soviet Chuvash poetry and the communist poet M. Sespel' (M. K. Kuz'min, 1899–1922), who wrote about the October victory and the regeneration of the Chuvash people. The lyrics of I. E. Akhakh (1898–1920) and G. V. Tal-Mrza (1895–1921) extolled the revolutionary fighter and the Civil War soldier. Satirical motifs appeared in the epics of I. E. Tkhti (1889–1938) and the short stories of I. I. Muchi (1895–1946). A national dramaturgy was founded by F. P. Pavlov (1892–1931), M. F. Akimov-Arui (1895–1972), and N. S. Efremov (born 1895), whose traditions were developed in the plays of I. S. Maksimov-Koshkinskii (1893–1975) and P. N. Osipov (born 1900).

Prose came into its own in the mid-1920's. The short stories and novellas of D. V. Isaev (1905–30), M. D. Trubina (1888–1956), S. F. Fomin (1903–36), and M. N. Danilov-Chaldun (1894–1944) dealt with the revolutionary renewal of the countryside, the emergence of new mores and a new morality, and the development of the public-spirited woman.

The literary, artistic, and sociopolitical monthly *Suntal* (The Anvil), founded in 1924 and renamed *Yălav* (The Banner) in 1946, published such important works as the narrative poems *Under the Yoke* (1931) by S. V. El'ger (1894–1966) and *Twenty-six* (1930) by P. P. Khuzangai (1907–70), the novella *Village in Flames* (1929) by Isaev, the plays of manners by Osipov, the short stories of Fomin and Danilov-Chaldun, and the poems of N. T. Vasianka (born 1903), I. S. Tuktash (1907–57), and V. E. Mitta (1908–57).

In the 1930's, as Chuvash literature moved toward socialist realism, the socialist changes in the country were analyzed in greater depth. Among the gifted young writers who began their careers in the 1930's were Ia. G. Ukhsai (born 1911), L. Ia. Agakov (1910–77), A. F. Talvir (1909–1979), A. D. Kalgan (born 1911), I. N. Ivnik (1914–42), A. A. Eskhel' (born 1914), M. Uip (M. D. Shumilov, 1911–70), and A. E. Alga (1913–77). The industrialization of the country was the subject of the poem-essay *Magnetic Mountain* (1933) by Khuzangai and the plays *Noise* (1931) by N. S. Aizman (1905–67) and *Might* (1932) by Agakov. The collectivization of the Chuvash countryside was depicted in the novel *Uphill* (1929–64) by V. I. Krasnov-Asli (born 1900), the novella *Bull's Ravine* (1931) by Tuktash, and the plays *New Wave* (1933) by Osipov and *On the March* (1930) by Trubina. Themes from history and revolutionary history were treated in El'ger's novella *At Dawn* (1940), Krasnov-Asli's novella *The Struggle With the Whites* (1929), and the plays *Sadur and Ilem* (1933) by Maksimov-Koshkinskii, *Aidar* (1937) by Osipov, and *Tudimer* (1940) by Ukhsai. Children's literature flourished.

During the Great Patriotic War several fine patriotic lyrical epic works were produced: the narrative poems *Tania* (1942) by Khuzangai, *The Soldier's Mother* (1943) by Uip, *The Pioneer From Kiev* (1944) by S. Shavla (1910–76), and *The Eagle* (1944) by Eskhel'. Other outstanding wartime works were the novella *Partisan Murat* (1943) by Agakov and the plays of Aizman and Maksimov-Koshkinskii.

Since the war Chuvash writers have celebrated the combat and labor feats of the Soviet people in poetry and prose. The theme is sensitively rendered in such narrative poems as Ukhsai's *Old Man Kel'buk* (1951), *The Pass* (1952), and *Star of My Childhood* (1973), Khuzangai's *Aptraman's Family* (1957), and Alga's *My Countrymen* (1959). Outstanding novels and novellas devoted to this theme include *Village Among White Willows* (1951) by K. S. Turkhan (born 1915), *The Pilots* (books 1–2, 1952–57) by V. L. Sadai (born 1926), *The Golden Bee* (1964) by V. S. Alendei (born 1919), *Heroes Never Just Disappear* (1968) by D. A. Kibek (born 1913), *Salambi* (1954) by A. S. Artem'ev (born 1924), Agakov's *Soldiers' Children* (1961) and *Hope* (1971), and *The People of the Village of Shurgely* (1957) by V. V. Ukhli (born 1914).

A number of fine historical novels and novellas have been produced, notably *On the Buinsk Road* (1954) by Talvir, *Black Bread* (1962) by N. F. Il'bekov (born 1915), *The Sviiaga Flows Into the Volga* (1960–67) by Turkhan, *The Snare* (1952) by F. E. Uiar (born 1914), *The Bridge* (1964–66) by V. Paimen (1907–73), and *Living a Lifetime Is Not Like Crossing a Field* (parts 1–4, 1959–71) by N. F. Mran'ka (1901–73). Historical plays include *Entip* (1958) by V. T. Rzhanov (born 1915) and *October Wave* (1957) by Kalgan.

Lenin and the friendship of peoples have inspired Khuzangai's narrative poems *House in Gorki* (1952) and *Generous Heart* (1960) and lyrics by Ukhsai, Alga, A. A. Vorob'ev (1922–76), G. A. Efimov (born 1928), V. I. Davydov-Anatri (born 1917), and A. A. Galkin (born 1928). These themes are also developed in the play *The Waves Pound the Shore* (1969) by N. T. Terent'ev (born 1925). The life of the contemporary working class and rural workers is portrayed in the novels *Flooding of the Tsivil'* (1966) by A. V. Emel'ianov (born 1932), *Foundation* (1964) by Talvir, and *We Are Young Only Once* (1972) by G. V. Krasnov (born 1936), as well as in short stories by A. N. Lazareva (born 1917), I. G. Grigor'ev (born 1924), and M. N. Iukhma (born 1936).

Prominent literary critics and scholars include M. Ia. Sirotkin (1908–70), I. D. Kuznetsov (born 1906), V. A. Dolgov (born 1906), V. Ia. Kaniukov (born 1926), E. V. Vladimirov (born 1922), G. Ia. Khlebnikov (born 1932), and N. S. Dedushkin (born 1915). Many Chuvash works have been translated into other languages of the USSR and into foreign languages. The Writers' Union of Chuvashia was founded in 1934.

N. S. DEDUSHKIN and V. IA. KANIUKOV

Architecture, fine art, and decorative applied art. Archaeological

sites dating from the Paleolithic have been discovered in Chuvashia. The tribes of the Fat'ianovo, Timber-frame, and Abashevo cultures left behind fortified and unfortified settlements (pit houses, dwellings of logs or pisé) and burial grounds and kurgans. Remains of Volga Bulgar settlements, built between the tenth and 12th centuries, include a castle in the village of Tigashevo, unfortified settlements in the Bula, Tsivil', and Sura river basins, and a small town near the village of Bol'shaia Taiaba.

After Chuvashia's voluntary union with Russia in the middle of the 16th century, the Russian strongholds of Alatyr', Cheboksary, Tsivil'sk, and Iadrin gradually developed into urban centers modeled on Russian cities. Cheboksary acquired the five-domed Vvedenskii Cathedral (1657) and imposing mansions such as the Zeleishchikov House (17th century) and the Solovtsov House (mid-18th century). The influence of Russian folk architecture spread to the countryside in the second half of the 19th century. Chuvash peasant dwellings typically had a storeroom with a separate entrance and a *las'*, or summer house, that later became the kitchen. Window casings and shutters, gate and wicket posts, and cornices were decorated with planar, relief, applied, or openwork carving, employing geometric or floral designs.

Large public buildings have been erected in the Soviet period. Noteworthy examples in Cheboksary include the House of Soviets (1940, architect M. M. Bazilevich), the Agricultural Institute (1957, architect E. E. Kalashnikova), the Chuvash Theater of Music and Drama (1961, architect A. P. Maksimov), and the Elektrik Palace of Culture (1964, architect A. P. Korol'kov), which incorporates decorative motifs from Chuvash folk art. Large residential districts of multistory, large-panel apartment houses have been built in Cheboksary and Novocheboksarsk. Modern houses, farm structures, and public buildings are changing the appearance of Chuvash villages.

The most highly developed Chuvash folk applied arts are patterned weaving, embroidery, beadwork, and wood carving. In weaving, the traditional color scheme consisted of red rhomboid designs on a white ground or multicolored designs on a red ground. Embroidery was used to adorn clothing and ritual objects. A dense stitch (*nabor*) was employed in embroidering headbands (*masmak*), towels (*surban*), belt pendants (*sar, iarkach*), shawls (*khul'chi*), bridal veils, and kerchiefs. Shirts were embroidered with slanting (*kosaia stezhka*) and outline stitches (*rospis'*). The main colors were black (outline) and red with touches of yellow, green, and blue. Headdresses, belt tassels, and purses were embroidered with bands, which were also used to make necklaces. Furniture and such domestic articles as ladles, shaft-bows, and distaffs were decorated with carving, including fluted and sculptural carving. Fine art did not appear until the Soviet period, when the first works were produced by the painters M. S. Spiridonov, N. K. Sverchkov, and Iu. A. Zaitsev, the sculptor G. S. Spiridonov, and the stage designer K. M. Vasil'ev.

Chuvash art has been developing intensively since the 1960's. Especially noteworthy are the thematic canvases of N. P. Karacharskov, N. V. Ovchinnikov, and R. F. Fedorov, the portraits of P. G. Grigor'ev, the landscapes of E. A. Vdovicheva and V. S. Gurin, and the still lifes of R. M. Ermolaeva and V. L. Nemtsev. The leading graphic artists and book illustrators are V. I. Ageev, I. T. Grigor'ev, V. E. Emel'ianov, and A. A. Ereikina. Poster art is represented by O. I. Filippov. Fine work is also being done in sculpture (Iu. I. Ksenofontov), monumental decorative art, and stage design. The traditions of folk embroidery are carried on by E. I. Efremova at the artistic embroidery factory in the village of Al'geshevo near Cheboksary.

B. M. SHIMAREV (architecture) and
N. A. URGALKINA (art)

Music. Chuvash folk songs are monophonic and encompass a great variety of genres. Among the oldest are daily life songs (cradle, children's, lyric, drinking, humorous, dance, and round-dance songs), ritual songs, work songs, and songs about social evils or historical events. The most popular songs of the Soviet period are songs about the new mores and kolkhoz life, as well as lyric young people's songs. Chuvash music is generally based on the pentatonic scale, although diatonic scales with semitones are also encountered. A free variable meter is characteristic. Folk instruments include the *shakhlich* (pipe), the *shapar* (bagpipe made of bull's bladder), the *sarnai* (goatskin bagpipe), the *kesle* (gusli), the *varkhan* and *palnai* (reed instruments), the *parappan* (drum), and the *khankarma* (tambourine). The fiddle and the accordion have become popular in modern times.

The first published collection of Chuvash folk music was V. A. Moshkov's *The Music of Chuvash Songs*, issued in Kazan in 1893. It was followed by two collections entitled *Examples of Chuvash Folk Tunes With Texts*, published in Simbirsk in 1908 and 1912. The finest Soviet collections are S. M. Maksimov's *Songs of the Upstream Chuvash* (1932) and *Chuvash Folk Songs* (1964). Many songs are collected by V. P. Vorob'ev, G. G. Liskov, T. P. Paramonov, and Iu. A. Iliukhin. The best-known folk singers are G. F. Fedorov and I. G. Vdovina, whose repertoires include between 800 and 900 songs. The collection *Chuvash Folk Songs: 620 Songs and Melodies Recorded From Gavril Fedorov's Performances* was published in 1969.

Professional music appeared after the October Revolution of 1917, when the first Chuvash works were composed by F. P. Pavlov, Maksimov, V. P. Vorob'ev, and Liskov. In the 1930's G. V. Vorob'ev wrote a symphony (1939, completed by N. I. Peiko) and several suites for piano. A major contribution to the development of Chuvash music was made by the Russian musicians I. V. Liublin, S. I. Gaber, and especially V. M. Krivonosov, who composed the first Chuvash musical comedy, *Joy* (1935), as well as cantatas and orchestral and chamber works. The Leningrad composer V. G. Ivanishin wrote the first Chuvash symphony (1936) and the opera *Narspi* (1940).

Some of the best Chuvash vocal music—songs, choral works, and arrangements—has been written by F. M. Lukin, G. Ia. Khirbiu, G. S. Lebedev, A. G. Orlov-Shuz'm, and A. N. Togaev. Outstanding works for chorus and orchestra include F. S. Vasil'ev's oratorios *Samana* (The October Epoch, 1965) and *Lenin on the Volga* (1970) and his suite *Frontline Sketches* (1975), A. V. Aslamas' oratorio *Lenin* (1952) and the poem *In Memory of the Poet* (1957), Khirbiu's *Patriotic Oratorio* (to M. Sespel's verses; 1970), and the cantatas *Song of Glory* by V. A. Khodiashev (1950), *Song of Chuvashia* by A. A. Petrov (1971), and *Ivan Iakovlev* by T. I. Fandeev (1968).

Postwar symphonic music is best represented by A. M. Tokarev's three symphonies (1967, 1970, and 1974), Fandeev's symphony (1954), M. A. Alekseev's three symphonies (1961, 1964, and 1971) and his *Chuvash Capriccio* (1962), F. S. Vasil'ev's *War Symphony* (1975), his symphonette (1953), and his tone poem *Aidar* (1970), A. A. Petrov's symphony (1962), Aslamas' *Cosmic Symphony* (1974), and works by Khirbiu, Khodiashev, and A. G. Vasil'ev. These composers also produced instrumental pieces, concerti for solo instruments and orchestra, and chamber compositions.

In 1959 the republic's drama theater was reorganized as the Chuvash Theater of Music and Drama, and in 1969 the company was divided into a music and a drama group. Over the years the theater's opera company has given outstanding performances of F. S. Vasil'ev's *Shyvarman'* (The Water Mill, 1960) and *Khamar''ial* (Countrymen, 1962), Aslamas' *The Interrupted Waltz* (1963), *Sespel'* (1971), and *The Sacred Oak Grove* (1976), Khirbiu's *Narspi* (1967), and Orlov-Shuz'm's *Stellar Path* (1969). The theater has also staged Vasil'ev's ballets *Sarpige* (1970) and *Arziuri* (The Ghost, 1975) and musical comedies and operettas, notably Orlov-Shuz'm's *When the Bird Cherry Blossoms* (1949) and Fandeev's *Three Weddings* (1953) and *Happiness* (1963). Other noteworthy works include the operas *The Singer* (1971) and *Salambi* (1974) by Aslamas, *Chakka* by A. G. Vasil'ev (1972), and *Narspi* by I. Ia. Pustyl'nik (1952) and the ballets *Uline* by Alekseev (1960), *Zora* by Tokarev (1960), and *The Wonderful Embroideress* by Khodiashev (1971).

The leading singers are I. V. Vasil'ev, Honored Artists of the Chuvash ASSR A. I. Toksina and A. G. Kazakova, and Honored Artists of the RSFSR and People's Artists of the Chuvash ASSR T. I. Chumakova and M. I. Denisov. Prominent choral conductors include F. P. Pavlov, Honored Art Worker of the Chuvash ASSR V. P. Vorob'ev, People's Artist of the RSFSR F. M. Lukin, Honored Art Worker of the RSFSR G. S. Lebedev, and Honored Artist of the RSFSR and People's Artist of the Chuvash ASSR A. G. Orlov-Shuz'm. Musical performances are given regularly by the Chuvash Music Theater, the philharmonic

society (founded 1936), the State Song and Dance Ensemble of the Chuvash ASSR (1924), the chorus of Chuvash Radio and Television (1943), and the House of People's Creativity (1936). The Composers' Union of the Chuvash ASSR was founded in 1940. Musical training is offered by the Cheboksary Music School (1929) and 40 secondary music schools. IU. A. ILIUKHIN

Theater. Before the October Revolution dramatic elements were to be found in oral folklore and in games and rituals. A professional theater emerged in the first years of Soviet rule. In 1918 a group of students, Red Army soldiers, and employees staged A. N. Ostrovsky's *You Can't Always Live as You Like* in Kazan. Subsequently known as the Chuvash Soviet Traveling Theater, the group included the future playwright and prominent man of the theater I. S. Maksimov-Koshkinskii, P. N. Osipov, O. I. Yrzem, and K. M. Vasil'ev. The founding of the theater promoted the rise of a national dramaturgy; among the first Chuvash plays to be produced were M. F. Akimov-Arui's *Untimely Death* (1918) and F. P. Pavlov's *On Trial* (1919). The development of a national theater owed much to the concurrent mastery of the realist traditions of the Russian theater and dramaturgy. The Kazan company's repertoire included plays by A. N. Ostrovsky, N. V. Gogol, L. N. Tolstoy, Molière, Schiller, and V. Hugo. During the struggle with the interventionists in 1919, Chuvash drama groups performed in Simbirsk, Ufa, and Kazan.

After the formation of the Chuvash Autonomous Oblast in 1920, the theater was transferred from Kazan to Cheboksary, where it staged Pavlov's *In the Village* (1922), *Narspi* (based on K. V. Ivanov's narrative poem, 1923), and P. N. Osipov's *Kuzhar* (1926). A number of fine productions from the second half of the 1920's and early 1930's developed the character of the contemporary man fighting for a new life: Osipov's *Cursed Tribe* (1927), M. D. Trubina's *On the March* (1931), Maksimov-Koshkinskii's *Sadur and Ilem* (1933), N. F. Pogodin's *The Aristocrats* (1934), V. M. Kirshon's *The Miraculous Alloy* (1935), and A. E. Korneichuk's *Platon Krechet* (1935). The theater company was joined by graduates of the Chuvash music and theater technicum, notably I. O. Molodov, L. F. Semenov, B. A. Alekseev, and E. V. Shornikova. In 1933 the theater was designated an academic theater.

Among the theater's outstanding productions of the 1930's and 1940's were Osipov's *Aidar* (1935), a stage adaptation of N. A. Ostrovskii's novel *How the Steel Was Tempered* (1937), M. Gorky's *Lower Depths* (1938), Shakespeare's *Othello* (1943), and N. S. Aizman's *Liza Korotkova* (1943). V. I. Lenin was portrayed on the Chuvash stage for the first time in 1947 in Pogodin's *Man With a Gun*, with B. A. Alekseev playing the leading role. The directors E. A. Tokmakov, G. V. Parne, and K. I. Ivanov did much to build up the theater at that time. The theater was periodically augmented by graduates of the Chuvash Studio of the State Institute of Theatrical Art and the Ostrovskii Leningrad Theatrical Institute.

In 1959 the theater was reorganized as the Chuvash Theater of Music and Drama and named in honor of the poet K. V. Ivanov. In 1969 the company was divided into the Music Theater and the K. V. Ivanov Academic Drama Theater. Among the most successful productions of the postwar years were V. T. Rzhanov's *Entip* (1950), N. T. Terent'ev's *What Is Happiness?* (1957), *The Cuckoo Cuckoos* (1960), and *The Waves Pound the Shore* (1971), a stage adaptation of Ch. Aitmatov's *My Little Poplar in the Red Scarf* (1965), Gorky's *The Old Man* (1968), Shakespeare's *Twelfth Night* (1970), N. P. Ankilov's *The Soldier's Widow* (1972), F. García Lorca's *Blood Wedding* (1974), and I. A. Petrova's *Telei and Ilem* (1977). The theater performed in Moscow in 1974.

In addition to the K. V. Ivanov Academic Drama Theater, the republic has a Russian drama theater (founded 1922), a Chuvash young people's theater (1933), and a puppet theater (1943). In 1977 the leading performers of the Chuvash drama theater were People's Artist of the USSR A. K. Urgalkin, People's Artist of the RSFSR V. K. Kuz'mina, Honored art Worker of the RSFSR V. N. Iakovlev, and Honored Artists of the RSFSR O. I. Irzem, E. N. Nikitin, and V. I. Rodionov. In 1969, L. N. Rodionov (People's Artist of the Chuvash ASSR) was appointed the theater's principal director, a post he had previously held from 1941 to 1947. F. A. ROMANOVA

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CHUVASH UNIVERSITY (full name, I. N. Ul'ianov Chuvash University), a university founded in Cheboksary in 1967. Its nucleus was the Volga branch of the Moscow Power Engineering Institute, established in 1930. The university was named in honor of I. N. Ul'ianov at the time of its founding.

In 1978 the university comprised eight departments: machine building, electrical engineering, industrial electrification, physics and mathematics, chemistry, economics, history and philology, and medicine. It also had evening, correspondence, and preparatory divisions, a graduate school, 60 subdepartments, and a scientific research center. The research center's staff of 350 scientists, engineers, and technicians contracts to do research on topics related to the specializations of the various departments. There is also a publishing department and a library with 700,000 volumes.

In the 1977–78 academic year the university had an enrollment of about 9,000 students and a teaching staff of 600, including 32 professors and doctors of sciences and 257 docents and candidates of sciences. The university publishes collections of articles on selected topics. From 1968 to 1977 it trained some 8,700 specialists. S. F. SAIKIN [29–721–1]

CHUVIAKI, soft leather slippers without heels, worn by various Caucasian peoples. [29–728–3]

CHU YÜAN-CHANG (reign title, Hung-wu). Born 1328 in Anhwei Province; died 1398 in Nanking. Chinese emperor from 1368; founder of the Ming Dynasty.

Chu Yüan-chang was the son of a landless tenant farmer. As a boy he became a Buddhist monk. In 1352 he joined the insurgent detachment of the wealthy townsman Kuo Tsu-hsing, who had raised a rebellion in Central China against the Mongol Yüan Dynasty. In 1355, Chu Yüan-chang became the main leader of a patriotic uprising in that region (*see* RED TURBANS REBELLION OF 1351–68). He united most of Central, East, and South China under his authority by annexing territories under the control of other rebel leaders, and in January 1368, Chu Yüan-chang proclaimed himself emperor. In the same year his forces took control of Tatu (Peking), which was the capital of the Yüan Empire, and overthrew the Mongol dynasty.

During the reign of Chu Yüan-chang, a number of measures were adopted in order to restore the economy of the country, especially agriculture, and to correct the widespread abuses of the civil service apparatus. Massive repression was directed against all who expressed dissatisfaction with the new dynasty.

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CHUZHAK, NIKOLAI FEDOROVICH (real surname Nasimovich). Born 1876 in Nizhny Novgorod (now Gorky); died Sept. 3, 1937, in Leningrad. Figure in the revolutionary movement; journalist; literary critic. Member of the CPSU from 1904.

The son of a craftsman, Chuzhak joined the revolutionary movement in 1896. He emigrated in 1904 and worked in Geneva on the editorial staff of the newspaper *Proletarii.* He joined the military organization of the St. Petersburg committee of the RSDLP in late 1905 and edited the newspaper *Kazarma.* In 1906, Chuzhak was a delegate to the first conference of military and combat organizations of the RSDLP in Tammerfors.

Chuzhak was arrested in 1906 and was sent to a settlement in Irkutsk Province in 1908. After the February Revolution of 1917 he became a member of the Irkutsk unified committee of the RSDLP and editor of the journal *Rabochaia Sibir'.* Between 1918 and 1922 he was editor of such newspapers as *Krasnoe znamia* in Vladivostok, *Dal'nevostochnyi put'* in Chita, and *Vlast' truda* in Irkutsk; head of the press department in the Far East Bureau of the Central Committee of the RCP(B); and, during the Kolchak regime, a member of the Bolshevik underground.

Beginning in late 1922, Chuzhak worked in Moscow and belonged to LEF. He was one of the architects of the association's basic tenets, which held that "art is life construction" and which were oriented toward what was called the "literature of fact." Between 1926 and 1932 he was editor of publications of the All-Russian Society of Former Political Prisoners and Exiles. The author of a number of works on the history of the revolution, Chuzhak also researched Siberian literature and wrote *Siberian Poets and Their Works* (1916) and *The Siberian Theme in Poetry* (1922).

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CHUZIK, a river in Tomsk Oblast, RSFSR; left headstream of the Parabel' River in the Ob' basin. The Chuzik River is 382 km long and drains an area of 9,000 sq km. It flows through the Vasiugan Plain. The river is fed by various sources but predominantly by snow. The mean flow rate 73 km from the mouth is 30.5 cu m per sec. The Chuzik freezes in late October or November, and the ice breaks up in late April or early May. It is used for floating timber. The river is navigable for 210 km from the mouth. [29–740–1]

CIAMICIAN, GIACOMO. Born Aug. 25, 1857, in Trieste; died Jan. 1, 1922, in Bologna. Italian organic chemist.

Ciamician became a professor at the University of Padua in 1887 and at the University of Bologna in 1889. His main research was devoted to the chemistry of pyrrole. In 1898, Ciamician began investigating photochemical reactions in organic chemistry; for example, he studied the splitting of acetone and the conversion of *o*-nitrobenzaldehyde into *o*-nitrobenzoic acid by the action of light. He also dealt with problems of the biochemistry of plants, such as alkaloid conversions and the formation of glucosides.

Ciamician was a member of the Académie des Sciences, and he became a foreign member of the St. Petersburg Academy of Sciences in 1912.

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CIANO, COUNT GALEAZZO. Born Mar. 18, 1903, in Livorno (Leghorn); died Jan. 11, 1944, in Verona. State and political figure in fascist Italy, diplomat. Son-in-law of the fascist dictator B. Mussolini.

Ciano entered diplomatic service in 1925, and from 1936 to 1943 he was foreign minister. During World War II—as a result of the disastrous military situation for Italy and the onset of crisis for the fascist regime—Ciano in late 1942 joined the faction of the Italian ruling circle that favored a separate peace treaty. In February 1943, Ciano was removed from his ministerial post. He joined a conspiracy against Mussolini, and on July 25, 1943, he voted in the Grand Council of Fascism to remove Mussolini from power. After the occupation of Italy by fascist German troops (September 1943), Ciano was interned in Germany and handed over to the fascist authorities of the puppet Italian Socialist Republic that had been formed in northern Italy. Ciano was sentenced by a fascist military tribunal and executed by firing squad. [29–544–3]

CICERUACCHIO (nickname of Angelo Brunetti). Born 1800 in Rome; died Aug. 10, 1849, in Ca' Tiepolo, Rovigo. Italian revolutionary.

Ciceruacchio worked as a drayman in Rome. In 1846 and 1847 he helped organize mass protests in Rome that forced Pope Pius IX to implement certain liberal reforms. During the Revolution of 1848–49, Ciceruacchio took part in the defense of the Roman Republic. After the fall of the republic in July 1849, he and G. Garibaldi set out to aid revolutionary Venice, which was under siege by Austrian troops. On the way there, Ciceruacchio and his companions, including his sons Luigi and 13-year-old Lorenzo, were captured by the Austrians and shot. [29–666–1]

ÇIFTLIK, in the Ottoman Empire:

(1) A tract of land held by a peasant that could be worked with one team of oxen. In the late 16th century peasant holders of *çiftliks* became sharecropping tenants.

(2) A feudal holding, originally a grant, that was given to feudal lords on condition that they pay a tithe to the treasury or provide one soldier for the sultan's army. In the late 16th century it became a hereditary holding. In the first half of the 19th century the *çiftlik* was a large estate of a member of the gentry. [29–660–6]

ÇILDIR, a lake in northeastern Turkey. Lake Çıldır occupies an area of 120 sq km and has depths to 42 m. It is located on the Kars Plateau of the Armenian Highland, in an intermontane depression with an elevation of 1,959 m; it is ringed by lava flows. The lake is drained by the Kars River (Araks River basin). It freezes over in winter. [29–565–5]

CILLI, ALESSANDRO. Dates of birth and death unknown. Native of Pistoia, Italy.

From 1594 to 1615, Cilli was a singer in the choir of the king of Poland and a secret political agent of the duke of Tuscany at the Polish court. He wrote a work that described the events of the early 17th century in the Polish-Lithuanian Commonwealth (Rzeczpospolita) and Russia. The second part of Cilli's work dealt with the First False Dmitrii, with whom he was acquainted. [29–594–4]

CIMA, GIOVANNI BATTISTA (also Cima da Conegliano). Born circa 1459 in Conegliano, Treviso Province; died there 1517 or 1518. Italian Renaissance painter of the Venetian school.

Cima's early career was influenced by Bellini and Antonello da Messina. Later influences were Giorgione and Titian. Cima's paintings were characterized by a rich golden palette, majestic simplicity of human forms, and subtle expression of the poetic bond between nature and man. Examples are *The Baptism* (1494, Church of San Giovanni in Bragora, Venice), *The Entry Into the Temple* (Picture Gallery, Dresden), and *Annunciation* (1495, Hermitage, Leningrad).

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Menegazzi, L. *Cima da Conegliano: Catalogo Mostra di Treviso*. Venice, 1962. [29–595–2]

CIMABUE, GIOVANNI (real name, Cenni di Peno). Born circa 1240; died circa 1302. Italian painter, representative of the Florentine school of the late 13th century.

Cimabue worked in Assisi, Pisa, and Florence. Despite a number of innovations reminiscent of the work of Cavallini, Cimabue's art as a whole developed within the framework of Byzantine tradition. Examples of his work are a cycle of frescoes in the Upper Church of St. Francis (c. 1290, Assisi), *Crucifix* (c. 1285, Uffizi Gallery, Florence), *Crucifix and Madonna* (1295, Santa Croce Museum, Florence), and the large altarpiece *Madonna Enthroned* (c. 1285, Uffizi Gallery). Cimabue's paintings are distinguished by monumentality, compositional symmetry, precision of line, and refinement and decorativeness of palette. There is gold striation on the garments, and two-dimensional and three-dimensional renderings of figures and faces are combined.

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Battisti, E. *Cimabue*. Milan, 1963. [29–595–3]

CIMAROSA, DOMENICO. Born Dec. 17, 1749, in Aversa, near Naples; died Jan. 11, 1801, in Venice. Italian composer; a leading representative of the *opera buffa*.

The son of a stonemason, Cimarosa was orphaned at an early age. He studied at the conservatory of Santa Maria di Loreto in Naples. From 1787 to 1791 he was court composer at St. Petersburg, where his operas *Le vergine del sole* and *Cleopatra* and his ballet *La felicità inaspettata* were staged. Cimarosa became *Kapellmeister* in Vienna in 1792 and *maestro di capella* in Naples in 1793. In 1799 he took part in an uprising of Neapolitan patriots and wrote the anthem of the Parthenopean Republic. Among his numerous *opere buffe*, *Il matrimonio segreto* (1792) is universally renowned. Cimarosa also composed *opere serie*, including *Gli orazi e curiazi* (1796).

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CIMPOI, a Moldavian folk instrument. A mouth-blown bagpipe, the *cimpoi* consists of a reservoir in the form of a sheepskin bag and three wooden pipes: a blowpipe, a melody pipe, and a drone pipe. The conical melody pipe is in one piece and has seven finger holes. The drone pipe, which sounds a continuous bass tone, is made in three joints and is tuned to the interval of a fourth or an octave of the melody pipe. The *cimpoi* is used to play melodies embellished by melismata, trills, and appoggiaturas (*see* ORNAMENTATION). The instrument produces a powerful, shrill tone of an unvarying timbre.

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CINQUECENTO, a term used to designate the artistic culture of Italy between 1500 and 1600, as well as the culture of the High Renaissance (1490–1520).

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CIOMPI, wool carders and other hired workers in cloth-making shops in Florence and various other Italian cities in the 14th century. The *ciompi* constituted approximately 25 percent of the population of Florence. They worked 14–16 hours a day; their extremely low wages were in reality reduced further by a harsh system of fines and did not amount to a living wage. Shop owners had the right to discharge *ciompi* from their jobs without warning. The *ciompi* were not guild members and therefore had no political rights. Their ranks were replenished by impoverished peasants and artisans.

In 1345 a spontaneous strike of the *ciompi* took place in Florence, and in 1371 there were disturbances in Perugia and Siena.

In 1378 the *ciompi* of Florence mounted a revolt, which was joined by small-scale artisans; the revolt lasted from June 22 to August 31. The most important demands of the *ciompi* were for a 50-percent increase in wages and the granting of political rights—the securing of one-fourth of the seats in the government and the post of gonfalonier of justice, the formation of a *ciompi* guild (which would have granted the *ciompi* full citizenship), the formation of a people's militia, and the establishment of equality of all inhabitants of the city. The rebels seized the palace of the podesta, drove the government from its residence, and formed a new government composed of three *ciompi*, three small-scale artisans, and three members of the *popolo grasso* (rich urban upper class). The *ciompi* formed a people's militia and a *ciompi* guild. The *popolo grasso* managed to have Michele di Lando, who had been a wool carder and overseer of hired workers prior to the revolt, made head of the government. With Michele di Lando in power, they were able to organize a starvation blockade of the city; the owners of the cloth-making shops, which had been closed since the first days of the revolt, refused to open their shops, and the *ciompi* were thus left wihtout any means of earning a living.

In August 1378, having ascertained that Michele di Lando had betrayed them, the *ciompi* formed a new revolutionary government (called the Eight Saints of the People of God), headed by the wool carder Bartolo di Jacopo. They tried to seize power, demanding that the old government submit to the new. Michele di Lando helped the *popolo grasso* bring troops up to the city. At this stage of the revolt the small-scale artisans, frightened by the radical nature of the *ciompi* program, deserted the *ciompi*. The revolt was suppressed, and its leaders were executed.

The *ciompi* revolt demonstrated the relatively high (for the 14th century) level of political consciousness of the Italian preproletariat, which was the first in European history to demand political rights and thus paved the way for the concept of universal equality.

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V. I. RUTENBURG [29–681–2]

ĆIPIKO, IVO. Born Jan. 13, 1869, in Kaštel Novi, Dalmatia; died there Sept. 23, 1923. Serbian writer.

Ćipiko graduated from a forestry school in 1890 and worked as a forestry officer until 1909. During the Balkan Wars of 1912–13 he was a military correspondent. In his short-story collections, such as *Seaside Souls* (1899) and *By the Sea* (1911), the novel *For Bread* (1904), and the drama *On the Border* (1910), Ćipiko depicted the life of Dalmatian peasants and their struggles with moneylenders, landowners, and Austrian bureaucrats. He introduced the figure of the peasant rebel into Serbian literature in the novel *Spiders* (1909; Russian translation, 1958). His search for moral ideals was expressed in his poetization of the "natural man," who resists the hypocrisy of bourgeois society. Ćipiko's notes and diaries from the front, *Impressions of the War of 1912* (1914) and *From the Days of War* (1917), are marked by a spirit of antimilitarism.

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Gligorić, V. "I. Ćipiko." In his book *Srpski realisti*, 5th ed. Belgrade, 1968. [29–612–7]

CIPRIANI, AMILCARE. Born Oct. 18, 1844, in Anzio; died May 2, 1918, in Paris. Italian revolutionary and socialist.

Cipriani took part in the Revolution of 1859–60 in Italy, the campaigns of Garibaldi in the 1860's, and the anti-Turkish uprising of 1866–69 on Crete. He was a colonel in the army of the Paris Commune of 1871. Cipriani was sentenced to death after the Commune was crushed, but the sentence was commuted to life imprisonment at hard labor in New Caledonia. He was freed by the amnesty of 1881.

In the 1880's Cipriani served a prison term in Italy. He took part in the congress of the Second International in Zürich in 1893 and the congress in London in 1896. In 1897 he served as a volunteer on the Greek side in the war between Greece and Turkey. Cipriani was a contributor to *L'Humanité*, a newspaper founded by J. Jaurès. [29–613–3]

CIREBON (also Tjirebon, Cherebon), a city and port in Indonesia, on the northern coast of the island of Java. Population, 179,000 (1971). Cirebon is an important transportation junction. The city produces cigars and cigarettes, textiles, leather, building materials, and concentrated phosphorites. [29–220–1]

CIUCURENCU, ALEXANDRU. Born Sept. 27, 1903, in Tulcea; died Dec. 27, 1977, in Bucharest. Rumanian painter. Corresponding member of the Rumanian Academy; People's Artist of the Socialist Republic of Rumania.

Ciucurencu studied in Bucharest with C. Ressu at the School of Fine Arts from 1921 to 1928. He also studied in Paris with A. Lhote in 1931–32. Ciucurencu painted cheerful light-filled landscapes and still lifes. He also produced dramatic paintings on heroic themes from national history (*Ana Ipătescu*, 1949; *Olga Bancic on a Scaffold*, 1959—both in the Art Museum of the Socialist Republic of Rumania, Bucharest), portraits, and genre scenes (*The Laundress*, Art Museum of the Socialist Republic of Rumania). Ciucurencu was awarded the State Prize of Rumania.

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Oprescu, G. *A. Ciucurencu.* Bucharest, 1963.
A. Ciucurencu (album). Bucharest, 1965. [29–755–2]

CIULEI, LIVIU. Born July 7, 1923, in Bucharest. Rumanian stage director, artist, and actor. Honored Artist of the Socialist Republic of Rumania (1958).

Ciulei graduated from the Architectural Institute and the Drama Conservatory in Bucharest in 1946. He began his stage career as a designer. He joined the Municipal Theater in Bucharest (since 1961, the L. Sturdza-Bulandra Theater) in 1948 as a designer and actor; he later became a stage director, and he headed the theater from 1962 to 1972. Ciulei has designed and played the leading roles in a number of his own productions. In 1958 he played V. I. Lenin in Pogodin's *Man With a Gun*. His other roles have included Treplev in Chekhov's *The Seagull* and Protasov in Gorky's *Children of the Sun*. He has staged Nash's *The Rainmaker* (1957), Gorky's *Children of the Sun* (1960) and *The Lower Depths* (1975), and Brecht's *The Threepenny Opera* (1964).

Ciulei began working in motion pictures in 1951. His films, which have proved highly significant for the development of Rumanian cinematography, include *Eruption* (1959), *Waves of the Danube* (1959; in Soviet release, *The Turbulent River*), and *The Forest of the Hanged* (based on the novel by L. Rebreanu; 1964). [29–756–3]

ČIURLIONIS, MIKALOJUS KONSTANTINAS. Born Sept. 10, (22), 1875, in Varėna, now in the Lithuanian SSR; died Mar. 28 (Apr. 10), 1911, in Pustelnik Mińsk, now in Poland. Lithuanian painter and composer.

Čiurlionis studied painting at the drawing school of J. Kauzik from 1902 to 1905 and at the Warsaw School of Fine Arts with K. Stabrauski in 1905. He studied music at the Warsaw Institute of Music and the Leipzig Conservatory. He joined the association World of Art in 1911. A proponent of symbolism, Čiurlionis based his aesthetics on the "national romance" of Lithuanian folklore, and his later works reflect his conception of music and the visual arts as being analogous.

Čiurlionis' paintings, in which the images are abstracted and symbolic, show a distinctive use of color and a subtle silvery palette. They transport the viewer into the world of fairy tales (the triptych *Fairy Tale* and the series *A Tale of Kings*, both 1907), fantastic visions and mysticism (the series *The Creation of the World*, 1904–06, and the series *Signs of the Zodiac*, 1907), and folk notions and superstitions (the three series *Spring*, 1907, *Winter*, 1907, and *Žemaite Crosses*, 1909). Čiurlionis' paintings show an affinity with his musical compositions, such as *Sun Sonata* (1907), *Spring Sonata* (1907), *Sea Sonata* (1908), and *Star Sonata* (1908). All the paintings mentioned are in the Čiurlionis Gallery in Kaunas.

Čiurlionis wrote the first Lithuanian symphonic poems, *In The Forest* (1900) and *The Sea* (1907), and chamber works, piano compositions, and adaptations of folk song.

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Venclova, A. *M. K. Čiurlionis.* Vilnius, 1961. [29–785–2]

CIVITAVECCHIA, a city in central Italy, in Lazio Region, on the Tyrrhenian Sea. Population, 44,200 (1971). A seaport for Rome, Civitavecchia handled 4.7 million tons of freight in 1973. It is linked by ferry with the island of Sardinia. Industries include petroleum refining and the production of building materials. [29–547–2]

CLASS RANKS, in the USSR, special ranks awarded to employees in the various bodies of the Procurator's Office. The statute on class ranks of employees in the Procurator's Office of the USSR was adopted by the Presidium of the Supreme Soviet of the USSR on Oct. 28, 1980 (*Vedomosti Verkhovnogo Soveta*

SSSR, 1980, no. 45, art. 950). The Presidium of the Supreme Soviet of the USSR confers the ranks of state councillor of justice and state councillor of justice classes I, II, and III. The other ranks—including councillor of justice and junior councillor of justice—are awarded by the procurator-general of the USSR. Members of the Procurator's Office who hold class ranks must wear uniforms with identifying insignia during the performance of their official duties. [29–612–6]

CLICHÉ, a means of expression whose repeated use in speech or literature (mainly in fiction) is perceived as a symptom of stereotyped thought or alleged (but not genuine) stylistic beauty.

Fashionable words, phrases, sentences, themes, plots, and stock images, as well as the very inertia of the devices of "ready-made artistry," influence everyone who uses language. Clichés are most often found in formulaic artistic speech, for example, the stock metaphor "black gold" (in reference to slaves, coal, and oil), and in some title formats, such as the use of "when" to begin a title or the use of a series of three nouns in the nominative case. The danger of cliché lurks in many of the "author's excursions" into childhood found in modern Soviet literature, in series of images of roses and nightingales in Turkic poetry, and in the use of rhymes of the type *moia—ne taia*. An uncritical acceptance of clichés hinders creative individuality, making the writer and any speaker the victim of an inertia of style.

In various spheres of communications—daily life, science, publicist writing, and literature—the relation among clichés, genuinely expressive language, and stylistically neutral elements of language (which may likewise be constantly repeated in speech) is not always the same. A sensitive artist always finds ways to transform clichés. In literature, for example, the fashionable word *okoem* (vista) is surrounded with subtle irony in a line by the poet A. Mezhirov: *Vladyki i tsari gliadiat za okoem* (Rulers and tsars gaze beyond the vista). The tendency of a cliché to gain currency and become a general "rule" is at odds with the writer's desire to create his personal "poetic rules" and to achieve "novelty of material and device" (V. V. Mayakovsky, *How Are Verses Made?*). The boundaries between formulaic units of artistic language and common linguistic phraseology free from banality of usage are fluid. Thus, the expression *nevooruzhennym glazom* (with the naked eye) can still be taken as a cliché, but dictionaries have already recorded the transformation into a stylistically neutral phrase.

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[Grigor'ev, V. P.] "Khudozhestvennaia rech'." In *Kniga o russkom iazyke*. Moscow, 1969. V. P. GRIGOR'EV [29–1448–2]

CLINOMETER, a very simple geodetic instrument that is used to measure the slope angles of a terrain. A typical clinometer (see Figure 1) consists of a circular metal casing (1) and a sighting tube (2) that is fastened to the casing. The casing contains a graduated disk (3) on a spindle; attached to the disk is a weight that hangs

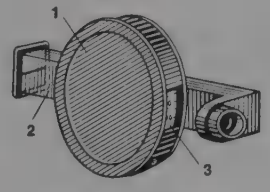

Figure 1. A clinometer

plumb, keeping the disk in a constant position. Other forms of clinometers are also available. The precision with which slope angles are determined by means of a clinometer does not exceed 0°2. [29–1768–1]

CLOCK, ASTRONOMICAL, a highly accurate clock used in astronomical observations. The accurate determination of time is essential to the solution of most problems of astrometry, as well as problems in other areas of astronomy.

From ancient times to the 15th century astronomical time was measured with sundials, sandglasses, or water clocks. Clocks with gear-wheel mechanisms were first used in astronomical observations in 1484. Owing to the primitive nature of the regulating devices, however, these clocks did not provide accurate readings. The pendulum clock, which was invented in 1657 by C. Huygens, came to be widely used by time services. The impracticability of using pendulum clocks on ships at sea provided the stimulus for the development of the chronometer, which, although not as accurate as the pendulum clock, was accurate enough for use on oceangoing expeditions.

The principal requirement made of an astronomical clock is that its regulating device—in a pendulum clock, the pendulum—maintain a period of oscillation that is extremely stable. If the acceleration of gravity is constant, the period of a pendulum is a function of the length of an equivalent simple pendulum, the amplitude of its motion, and the density of the medium in which it swings.

Variations in these quantities have a considerable effect on clock rate. A 1-micrometer change in the length of an equivalent simple pendulum—usually caused by temperature variations—will result in a change in clock rate of 0.04 sec over a 24-hour period. To minimize the influence of temperature, pendulum rods are made of materials with low expansion coefficients, various compensating devices are used, and the clocks are placed in isothermal chambers.

The amplitude of the pendulum of an astronomical clock does not usually exceed 120′. A change of 0′.1 alters the clock rate by 0.011 sec per day. To eliminate the influence of changes in ambient density, either the pendulum or the entire clock is placed in a partially evacuated vessel.

The Riefler clock, the first to employ a detached-lever escapement, was used in the late 19th and early 20th centuries; its variation in clock rate did not exceed ±0.01 sec/day. A Shortt pendulum clock with a variation in clock rate not exceeding ±0.01 sec/day was designed in 1910. The basic feature of this clock is its use of two pendulums. The master, or free, pendulum, which performs no mechanical work, is located in a glass cylinder in which the pressure is maintained at 20 mm Hg. The cylinder is installed in a room in which a constant temperature is maintained year round. All the mechanical work needed to trigger the clock's mechanism is supplied by the secondary, or slave, pendulum, the swing of which is synchronized with that of the master pendulum by a special electrical system. The secondary pendulum produces pulses that maintain the oscillation of both pendulums.

The most accurate pendulum clock is the Fedchenko clock, which has an isochronous pendulum suspension that assures a stable amplitude of swing. The accuracy of this clock is comparable to that of the best quartz clocks. Quartz clocks, which appeared in the 1940's and 1950's, are considerably more accurate than astronomical observations, but only for relatively brief periods of time. Because of the aging of the quartz plate, quartz clocks cannot determine a uniform time scale independently. Quartz clocks have revolutionized accurate time-measurement and timekeeping, which are accomplished by comparing the readings of several quartz clocks and those of astronomical observations.

As a result of advances in science and technology, the accuracy attained in astronomical clocks is no longer unique. The transmission of time signals by radio and television has enabled regular checks of the reference clocks at astronomical observatories against the best clocks of the official unified time service and thus has made possible a considerable increase in the reliability of the reference clocks. E. A. IUROV [29–103–2]

CLOCK AND WATCH INDUSTRY, a branch of instrumentation that includes production of timepieces for everyday use, such as wristwatches, pocket watches, alarm clocks, table clocks, wall clocks, floor clocks, and public clocks for buildings and enterprises, as well as technical and specialized timepieces for transportation, timing devices, timers, chronographs, time-delay relays, and various types of clock movements used as precision drives.

The production of clocks was initially a cottage industry. The first clockmaker's shop was established in Paris in 1453. The industrial production of pocket watches with a mainspring movement was begun in Germany in the 16th century. The clock and

watch industry was also established in Switzerland in the late 16th and early 17th centuries. The mechanized production of clocks and watches began in the second half of the 19th century in Switzerland, Germany, Japan, and the USA. In Russia, the cottage production of tower clocks was established by the 15th century, and the production of chronometers and deck clocks for the Russian Navy was organized in the late 19th century in St. Petersburg. In prerevolutionary Russia, clocks and watches for everyday use were assembled from imported parts at plants belonging primarily to the Swiss firms of P. Bouret, Moser, and Langendorf.

In the USSR, the production of very simple weight-driven pendulum clocks and the assembly of alarm clocks, partially from imported parts, were organized in the early 1920's at the Aviapribor factory in Moscow. The core of the clock and watch industry was created in 1929 and 1930 when the First and Second Moscow watch factories were established. The production of pocket watches totaled 42,000 units in 1931 and increased to 192,000 units in 1935. In 1940 the USSR had three watch factories, two factories for the production of jewels for movements, and one factory for the production of wooden clock cases.

During World War II the clock and watch industry converted to defense production, but the manufacture of clocks and watches for everyday use was restored as early as 1944. From 1944 to 1952, watch and clock factories were constructed in Serdobsk, Yerevan, Petrodvorets, and Uglich, a scientific research institute was established for the clock and watch industry, and a design bureau was organized for the machine tool industry. The production of mainsprings, elinvar alloy hairsprings, ruby movement jewels, and watch lubricants was initiated, which made it possible to produce several very popular lines of clocks and watches: Pobeda, Zvezda, Salyut, and Molniia. Subsequent expansion of the selection of clocks and watches available and the improvement of labor efficiency through mechanization, automation, and specialization have made the USSR better able to satisfy the country's demand for clocks and watches and to export its products.

In the mid-1970's, the USSR widely exported Chaika, Zaria, Slava, Raketa, and Poljot mechanical wristwatches and Slava and Sevani alarm clocks. In 1975 there were more than 15 specialized production enterprises for the manufacture of specific types of clocks and watches: the Penza Watch Factory produces women's wristwatches, the First Moscow Watch Factory produces men's wristwatches, the Orel Clock Factory produces table, wall, and alarm clocks, and the Yerevan Clock Factory produces alarm clocks.

Production has increased for clocks and watches equipped with additional devices, such as calendars and self-winding mechanisms, and for electric contactless and electronic watches, including wristwatches with digital and analogue displays. The production of specialized equipment and tools has been organized for the manufacture of time-measurement devices. The modern clock and watch industry, as a branch of precision industry, has several distinctive characteristics resulting from the small size of the parts manufactured and the industry's requirements for high precision. Special high-precision equipment is used, including automatic transfer machines that handle indexing for several production operations at one machining station or perform individual operations separately on multiposition automatic machines. The latter arrangement is characteristic of assembly operations, such as in the assembly of the gear wheel system of a clock or watch movement. The industry uses materials with special physical and chemical properties and extremely precise dimensions. The development of clock and watch production is shown in Table 1.

During the ninth five-year plan (1971–75), production quality was improved and the assortment of clocks and watches available was expanded. The output of class 1 clocks and watches has risen from 18 to 50 percent, and the production of watches with calendars, self-winding mechanisms, and other additional features reached 5.9 million items in 1975. The production of quartz-crystal watches with analogue and digital displays has been initiated; this required the production of integrated microcircuits, quartz-crystal oscillators, and miniature magnets and batteries, both within the clock and watch industry and in the electronics and electrical engineering industries. Labor productivity in the clock and watch industry during the period increased by a factor of more than 1.5.

Among the socialist countries, the clock and watch industry is most developed in the German Democratic Republic and Czechoslovakia, which produced 10 million and 2 million clocks and watches, respectively, in 1975. Clocks and watches are produced in small quantities in Hungary and Rumania.

The world production of wristwatches and pocket watches in 1974 totaled 230 million items, including 89 million in Switzerland, 32 million in Japan, 9 million in the Federal Republic of Germany, 24 million in the USA, and 17 million in France. Production is increasing for electronic wristwatches with analogue and digital displays (primarily in Japan) and digital quartz-crystal wristwatches (in the USA). The best-known firms are Seiko Time Corporation, Citizens Watch Company, Ltd., and Orient in Japan, Omega Watch Corporation, Longines-Wittnauer Watch Company, and Montres Rolex S.A. in Switzerland, Dill (Junghans) in the Federal Republic of Germany, Timex Corporation and Bulova Watch Company in the USA, and LIP in France.

K. M. BRITSKO [29–73–7]

CLOCK DRIVE, in astronomy, a mechanism of a telescope mounting designed to rotate the telescope at a constant speed about its polar axis—one turn for each sidereal day—to allow the telescope to track a celestial body being observed. [29–76–2]

CLOCKS AND WATCHES, devices for measuring the passage of time in seconds, minutes, and hours. Clocks and watches are classified as timepieces, which category also includes chronometers, timing devices, timers, time-delay relays, and combination devices, such as a watch combined with a stopwatch. Time can be measured by means of regular translatory motion, rotary motion, or periodic oscillations; the measure of time will be, respectively, the distance traveled, the angle of rotation, or the number of oscillations.

The first device used by man to measure time was the sundial. The gnomon was already used as a primitive clock in the middle of the third millennium B.C. Time was reckoned by sundials with horizontal and vertical faces in ancient Egypt and Greece. Ulug Beg constructed a sundial approximately 50 m high in Samarkand in the first half of the 15th century. Clocks with vertical faces became common in Europe in the Middle Ages; examples have been preserved in Moscow, for example, on the building of the Institute of Historical Archives and the old building of Moscow State University.

In the second and first millennia B.C., water clocks, as well as sundials, were built in India, Egypt, China, and Greece. The water clocks showed the time during the day and at night. Primitive water clocks consisted of a vessel with a scale graduated in units of time. Water fell drop by drop into the vessel from a tank filled to the top from an external source. The constant water pres-

Table 1. Production of consumer clocks and watches in the USSR
(thousand units)

	1940	1950	1960	1970	1975
Wristwatches	210	1,532	16,302	21,743	31,271
Pocket watches	606	618	219	421	596
Alarm clocks	349	1,120	6,536	13,956	17,372
Wall, table, and floor clocks and chess timers	1,631	4,296	2,981	4,051	5,826
Total	2,796	7,566	26,038	40,171	55,065

sure in the tank guaranteed a regular rate of filling of the vessel and an even rise in the water level, which was indicated by the scale. Circa 150 B.C., Ctesibius devised a water clock that became the prototype of timepieces used in many countries until the 18th century. Regular motion was the basis of operation of several other types of clocks, including the sand clock.

The first reference to a mechanical clock is contained in a Byzantine anthology of the late sixth century A.D. Some historians ascribe the invention of the mechanical clock to Pacificus of Verona (early ninth century); others give credit to the monk Gerbert (later Pope Sylvester II), who is alleged to have made a weight-driven tower clock for the city of Magdeburg, Germany, in 966. This was not a mechanical clock in the modern sense, but rather a water clock that used mechanisms to drive auxiliary devices, such as the striking mechanism, but not to measure time. It is known with certainty that a mechanical tower clock of simple design was built in Milan in 1335. Between 1348 and 1364, Giovanni Dondi in Italy built a clock that, in addition to counting time, reproduced the motion of the sun, the moon, and five planets. In 1354 the clock of the cathedral of Strasburg was installed; it played music and had a calendar and moving figures. The first tower clock in Russia was built in the Moscow Kremlin in 1404 by the monk Lazarus the Serb. It was driven by weights and featured a striking device and a planetary movement. Tower clocks were installed in many Russian cities from the 15th to 17th centuries.

The first mechanical clock with a verge escapement appeared in the 14th century. In comparison with water clocks, the new clocks were an advance, but their precision was still no better than 30 min/day, and until the 16th century they had only a single hand. Circa 1510, P. Henlein of Nuremberg first used a steel spring in place of weights and built a pocket watch with a verge escapement. Because of imperfections in the springs and in the verge mechanism, which did not have a natural period of oscillation, the readings of the clocks depended largely on the degree to which the spring was wound. In 1525, J. Zech of Prague proposed the fusee, a device designed to even out the force of the spring over time, thus making it possible to improve the precision of clocks with mainsprings. Even though their precision was not of a high order, clocks with verge escapements were highly reliable and continued in use until the end of the 19th century.

Galileo's discovery of the isochronism of the small oscillations of a pendulum—that is, that the period of oscillation does not depend on the amplitude—was enormously important for improving the precision of clocks. Circa 1640, Galileo proposed a new escapement, which resembled that of the modern chronometer, but his idea was not put into practice. C. Huygens is rightly considered the inventor of the modern mechanical clock; he first used a pendulum as a clock regulator in 1657. Pendulum clocks, even with an imperfect verge escapement, could reduce the daily error to 5–10 sec. In 1675 the English clockmaker W. Clement proposed replacing the verge escapement with a pallet mechanism that was a primitive variation of the anchor, or recoil, escapement. This mechanism has been kept to the present day in simple wall clocks with pendulums. A new advance in clockmaking was made by the Englishman G. Graham, who invented the deadbeat escapement, which had a considerably smaller energy loss than Clement's design.

In 1675, Huygens proposed a spiral spring and balance to regulate oscillations. The balance is a wheel with a solid metal (usually brass) rim, secured on a steel spindle; one end of the thin spiral spring (hairspring) is secured to the spindle of the balance wheel, and the other is attached to a fixed support. When set in motion, the system oscillates about its axis; the balance wheel's moment of inertia and the rigidity of the hairspring determine the system's period of oscillation. Such an oscillatory system has a natural period of oscillation; it is sufficiently reliable for operation when a watch is worn or a clock is moved.

The use of the balance regulator in spring-driven clocks demanded further improvements in escapements. Until the end of the 19th century, the cylinder escapement invented by Graham in the early 18th century was widely used in pocket watches. The detached lever escapement became widespread in the second half of the 19th century and has continued in use in all portable clocks, including wristwatches and pocket watches, to the present day. With the improved precision of clock mechanisms, minute hands were added to pocket watches in the late 17th century, and from circa 1760 second hands were added to clocks and watches.

Changes in the temperature of the environment have a significant effect on the accurate running of pendulum clocks, especially those with balance mechanisms. Over a 24-hour period in which the temperature changes by 1°C, the change in the length of a steel pendulum causes an error of 0.5 sec, and the change in a wooden pendulum induces an error of 0.2 sec; the corresponding error is about 11 seconds for a clock with a balance mechanism and steel hairspring, caused primarily by changes in the spring's rigidity.

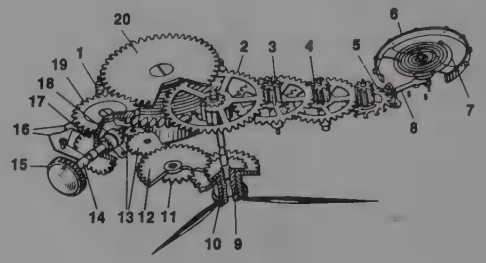

Figure 1. Diagram of the mechanism of a mechanical wristwatch: (1) barrel, (2), (3), and (4) main gear train, (5) escape wheel, (6) balance, (7) hairspring, (8) pallet, (9) minute hand pinion, (10) hour wheel, (11) minute wheel pinion, (12) minute wheel, (13) setting wheels, (14) winding shaft, (15) winding button, (16) setting and clutch levers, (17) winding pinion, (18) ratchet clutch, (19) winding wheel, (20) ratchet wheel

In the mid-18th century several types of pendulums were devised in which temperature error was compensated. The French clockmaker P. Leroy proposed the use of a bimetal to achieve temperature compensation of the balance regulator in 1761. Balances of this type with compensation weights on the rim are used in modern marine chronometers. In the late 18th century the Russian engineer I. P. Kulibin proposed an original design for a bimetallic balance. In the late 19th century and early 20th centuries, the Swiss physicist C. E. Guillaume invented Invar, an alloy with a coefficient of linear expansion close to zero (for pendulums), and elinvar, an alloy with a minimal coefficient of thermoelasticity (for hairsprings). The use of the new alloys in clocks and watches in conjunction with compensation devices virtually eliminated the effect of temperature on the running of mechanical clocks. For example, even without a compensation device, a clock with an Invar pendulum has a temperature error of less than 0.05 sec per 24 hours per 1°C, and the corresponding error for a wristwatch with an elinvar hairspring is less than 0.5 sec. Such accuracy is entirely satisfactory for clocks and watches designed for general use.

In 18th-century Russia the outstanding engineers Kulibin, T. I. Voloskov, and L. Sabakin worked on refinements of the clock, in particular, escapement design and methods of temperature compensation. Kulibin made a series of unique clocks. One example, preserved in the Hermitage, was in the form of an egg with figures that automatically performed intricate movements as the clock struck; another—a pocket planetary watch—had seven indicators showing the hour, minute, second, day of the week, month, phase of the moon, and sunrise and sunset. In 19th-century Russia the engineers D. I. Tolstoi and I. P. Nosov worked successfully on refinements of clocks and watches. The clockmaker brothers I. N. Butenop and N. N. Butenop completely modernized the musical clock of the Spasskaia Tower of the Moscow Kremlin in 1851 and 1852 (*see* KREMLIN CHIMES).

A somewhat arbitrary distinction is made between everyday and specialized clocks and watches, depending on the purpose of the timepiece. The former include wristwatches, pocket watches, table clocks, wall clocks, street clocks, and tower clocks, which differ in their conditions of use. Specialized clocks and watches include timepieces used underwater, traveling clocks, and antimagnetic clocks. There is a large group of specialized work clocks, including signal clocks, portal time clocks, medical clocks, and program clocks. Modern clocks and watches are classified by type of oscillatory system as pendulum, balance, tuning fork,

quartz-crystal, and quantum types. Because the oscillations in a clock may be maintained and readings given from different energy sources and by different methods, clocks and watches are also classified as mechanical, electric contact, electric contactless, and electronic (such as quartz-crystal watches with digital display by liquid crystals) types. AC clocks constitute a special category. They are classified as secondary timepieces; the role of the primary timepiece is played by the power plant generator. Conventional clocks may also serve as primary timepieces; they are usually highly accurate and transmit electric pulses to secondary clocks by wire every 30 or 60 sec.

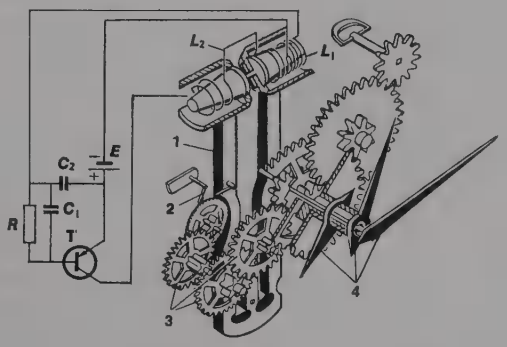

Figure 2. Diagram of the mechanism of a tuning fork clock: (*T*) transistor, (*R*) resistor, (C_1) and (C_2) capacitors, (L_1) release winding, (L_2) pulse winding, (*E*) power supply (galvanic cell), (1) tuning fork, (2) ratchet mechanism, (3) gear train, (4) hour, minute, and second hands

The most common clocks and watches are those driven mechanically by springs or weights. The principal units in a modern mechanical clock or watch (Figure 1) are a drive source, a system of gear wheels, an escapement, a regulator, the hand assembly, and a winding mechanism. A spring (the drive source) turns the barrel (1) in which it is located and through it a system of gear wheels (2, 3, 4, 5). The rate of rotation of the gear wheels depends on the period of oscillations in the balance-hairspring system (6, 7). The number of teeth on the gear wheels and the period of oscillation of the balance are so designed that one gear wheel (2) makes one rotation per hour and another gear wheel (4) makes one rotation per minute; the minute hand and second hand are connected, respectively, to the shafts of the two gear wheels. In practice, the minute hand is not directly connected to the shaft of the first gear wheel (2), but rather to a pinion (9), which makes it possible to shift the hand independently of the gear wheels (2, 3, 4, 5). The first gear wheel (2), through a gear train (9, 11, 12), moves the hour wheel (10), to which the hour hand is attached. During winding, rotation of the winding button (15) is imparted through a shaft (14), a clutch (18), and gears (17, 19, 20) to the shaft on which the spring is wound. When the hands are to be shifted, the winding button (15) is drawn out, and the clutch (18) is moved away from the winding pinion (17) by means of the setting and clutch levers (16) and engaged with the setting wheels (13) that turn the hands. Modern clocks and watches frequently have an additional mechanism that indicates the date and the day of the week; large timepieces may also indicate the month. Wristwatches often have antishock devices to protect them from damage.

Self-winding mechanical wristwatches are becoming more common. They have a free-swinging, unbalanced weight in the shape of a sector, which is mounted in the movement at the side of the case. While the watch is worn on the wrist, the weight oscillates and winds the spring through wheel gearing by means of a reversing device; in the course of 10–12 hours the spring is fully wound, which ensures that the watch will run for 20 hours or longer. The user is freed from the necessity of winding the watch, and, what is especially important, the watch is operated with a more constant force from the mainspring and consequently runs more accurately.

Electrical devices were first tried in clocks in the 1830's and 1840's. Initially electric contact pendulum and balance-wheel clocks were wound by an electromagnet, electric motor, or similar device. The work of the Swiss clockmaker M. Hipp and the French clockmaker L. Breguet, who designed clocks with an electric drive, was of great importance to the future development of electric contact clocks. In clocks operated by an electric drive, the power supply to the drive is switched on periodically through contacts controlled by a pendulum or balance wheel so that self-excited oscillations are established in the escapement. The oscillatory system fulfills the function of a motor, its motion being converted by a special mechanism into intermittent rotary motion of the hands.

Until the mid-1900's, electric contact clocks were mainly large pendulum types and, occasionally, balance-wheel types. The advent of miniature contacts and small current sources having a high energy density led to the perfection of small models, particularly wristwatches. In the early 1950's such watches were produced at the LIP factory in France and by the Hamilton Watch Company in the USA. Their electric circuit was completed through mechanical contacts when a pulse was fed to the balance wheel.

The replacement of mechanical contacts by electronic switches in the form of transistors, tunnel diodes, and integrated circuits improved the reliability of electric watches. Such modern balance-wheel wristwatches have an accuracy of ±15 sec per day and consume approximately 10 microamperes of current from a source having a voltage of 1.3–1.5 volts. Such timepieces may be called contactless types to distinguish them from their predecessors. They have a traditional oscillatory system—either a pendulum or a balance wheel and hairspring.

The high-speed response of electronic devices and the feasibility of controlling them at small oscillator amplitudes have motivated the development of tuning fork and quartz-crystal watches and clocks that are extremely accurate.

During the 1970's both wristwatches and table clocks that used tuning forks became popular. They operate on self-contained batteries that require replacement every one or two years, and they are accurate to ±2 sec per day. The first tuning fork regulator with a contact interrupter was devised in 1915 by H. Guye. In 1919, W. Eccles and F. W. Jordan of Great Britain and H. Abraham and E. Bloch of France proposed a vacuum-tube, tuning fork regulator circuit with an electromagnetic drive. Transistorized tuning fork regulators for wristwatches were first manufactured by the Bulova Watch Company of the USA in 1950; in the USSR tuning fork watches were first produced in 1962 at the Second Moscow Watch Factory. Such watches have a ratchet mechanism to convert vibrations from the tuning fork into rotary motion of the hands. One design for an electromagnetic, tuning fork clock is shown in Figure 2. When the tuning fork vibrates, an electromotive force is induced in the release winding that turns on the transistor, thereby causing current to flow from the power supply into the pulse winding. The vibration frequency of the tuning fork is 360 hertz.

In electric contactless clocks and watches that have relatively high-frequency (of the order of 32-kilohertz) quartz-crystal oscillators, the electric pulses of the regulator may control the operation of a stepper or synchronous electric motor, or they may synchronize the operation of a DC motor. The control circuit consists of an electronic frequency divider, a pulse-shaping circuit, and amplifiers. Most quartz-crystal clocks and watches have a stepper motor. The running rate is adjusted by means of a trimming capacitor in the oscillator circuit. W. A. Marrison of Great Britain was the first to propose a circuit for a quartz-crystal clock (1929); in the late 1970's such watches were produced by many firms, including Ebauches S. A. in Switzerland, Omega Watch Corporation and Hamilton Watch Company in the USA, and Seiko Time Corporation in Japan. The excellent temperature stability, high quality, and stable performance of quartz-crystal oscillators with respect to external dynamic influences ensures an accuracy of approximately 2 sec per day for small clocks designed for everyday use and of 0.001 sec per day for large high-precision types.

Quartz-crystal wristwatches are now common as a result of the capabilities of modern, semiconductor production technology and the development of integrated circuits. The watches that have electronic circuitry and digital readout by means of liquid crystals or light-emitting diodes are called electronic watches. In

addition to a quartz-crystal oscillator, the electronic portion of such watches includes a frequency divider (or counter) and decoders (Figure 3). In 1977 the USSR produced models with conventional hands and with digital displays.

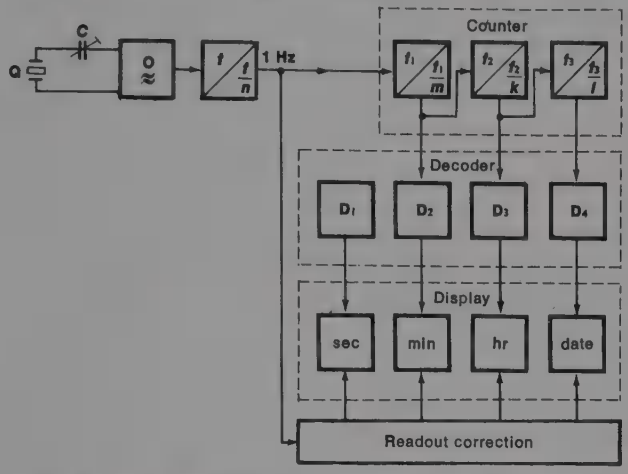

Figure 3. Block diagram of a quartz-crystal wristwatch with liquid-crystal readout: (Q) quartz crystal, (O) oscillator, (*C*) trimmer, (*f*) oscillation frequency, (D) decoder

A common timing system is used to match the readings of a group of clocks. The system consists of high-precision primary clocks and groups of secondary clocks, which are connected through communication channels with the primary clocks. The primary clocks control the operation of the secondary clocks, which may be ordinary electric contact clocks or electric pulse counters. In order to improve the accuracy and reliability of a common timing system, the secondary clocks are often made to operate independently, and their rate is either corrected periodically or synchronized by accurate time signals from the primary clocks.

Modern clocks and watches vary widely in accuracy, depending on the practical requirements of time measurement. For example, atomic clocks, used particularly for cosmic studies, have a relative error of approximately 10^{-13}; high-precision pendulum clocks have an error of the order of 10^{-11}; and quartz-crystal marine chronometers exhibit an error of approximately 10^{-8} (that is, the accuracy of their running is within several thousandths of a second per day). Quartz-crystal wristwatches have an accuracy of ±2 sec per day, and the tuning fork and balance-wheel electric contactless watches are accurate to within 15 sec per day. High-quality mechanical clocks designed for everyday use are accurate within 5 sec per day; those of average quality exhibit an error range between 30 and 60 sec per day. Mechanical alarm clocks exhibit an error ranging from 1 to 1.5 min per day.

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V. I. DENISOV and B. M. CHERNIAGIN [29–96–1]

CLOTHING INDUSTRY, the branch of light industry that produces clothing and other sewn goods for household and industrial purposes from woven and knitted fabrics; artificial and natural leather and fur; and double- and triple-layered materials of new design. It also produces various finishing materials and accessories and components. In the USSR the clothing industry is the largest industrial branch producing consumer goods, with an average annual output valued at more than 20 billion rubles.

In prerevolutionary Russia, the manufacture of clothing was a cottage industry, and there were no garment factories. In large cities craftsmen served the upper classes and the clergy, and commercial firms extensively employed home workers, including those who lived in rural areas. Most of the population wore homespun clothing. Only just before World War I were the first clothing shops established; they had only very simple equipment —hand-driven sewing machines, irons, and needles.

After the October Revolution of 1917, the Department of Ready-made Clothing and Underwear was established at the Central Textile Trust (Tsentrotekstil) in 1918; in April 1920 the Main Committee of the Clothing Industry was formed under the Supreme Council on the National Economy. The primary task of the committee was to industrialize the sector by centralized production planning. The clothing industry began developing rapidly as the result of new construction and the technical reequipping and organization of production-line manufacturing. The creation of domestic machine building for the clothing industry was a decisive step. By 1930, 32,000 general-purpose industrial machines and 6,500 specialized machines manufactured by the Podol'sk Machine Plant had been installed in the industry's enterprises. Between 1921 and 1930 the output of garments increased by a factor of 4.3. In 1930 the Scientific Research Institute of the Clothing Industry was founded in Moscow.

In 1940 the clothing industry had 210 large and medium-size enterprises whose operation was scientifically structured in the areas of technology, organization of labor and production, and planning and management. During World War II, one-third of the country's clothing factories were completely destroyed. The clothing industry regained its prewar level in 1950, and 30 percent of the industrial equipment was modernized.

Qualitative changes took place in the industry's technological equipment in the period 1951–55. The use of specialized and semiautomatic machines increased, and their number rose to 18,700 units; the number of presses in use totaled 3,800. Large-scale enterprises were built in Khabarovsk, Komsomol'sk-na-Amure, Angarsk, Ashkhabad, and Karaganda.

Technological reequipping of the industry has been particularly intensive in the 1960's and 1970's, primarily through extensive introduction of physicochemical methods of processing, high-efficiency semiautomatic equipment, specialized machinery, and presses for moisture and heat treatment of garments. The use of specialized and semiautomatic machines increased by a factor of more than 5 between 1955 and 1975, and the use of presses for moisture and heat treatment more than tripled.

New forms of production-line manufacturing developed in the 1960's: multifashion, sectional production lines, aggregate and group production lines, start-to-finish production lines, production line factories, and integrated mechanized production lines. The widespread introduction of integrated mechanized production lines in the clothing industry (806 such lines had been installed by July 1, 1977) made it possible to achieve a significant increase in the level of mechanization and to reduce the percentage of manual labor required. Labor productivity increased 40–50 percent.

The level of specialization and concentration in the clothing industry is rising. The proportion of specialized enterprises was 29.4 percent in 1966, 46.4 percent in 1968, 68.0 percent in 1970, and 74.0 percent in 1972. Enterprises with 300 or more employees today produce 87.7 percent of the total volume of output; those with less than 300 employees produce 12.3 percent.

High rates of development have been achieved in the clothing industry by implementing organizational and technical measures. Thus, the average annual growth rate of production was 12.2 percent in the period 1966–70 and 3.5 percent in the period 1971–75; the average annual growth rates for labor productivity for the same periods were 8.0 percent and 3.9 percent.

The volume of gross output rose 8 percent between 1960 and 1965; it had risen 90 percent in 1970 and 140 percent in 1975. Between 1965 and 1976, the production growth rates for most important garments have also been high: for coats and cloaks, 125 percent; suits, 127 percent; dresses, 205 percent; shirts, 126 percent; and trousers, 135 percent.

Table 1. Soviet production of garments in the highest quality category

Index	1971	1972	1973	1974	1975
Garments in highest quality category					
million rubles[1]	—	69.3	77.0	275.5	432.3
million items	—	1.8	4.6	11	17.4
Number of models in highest quality category	349	509	1,184	2,121	3,026
Number of enterprises manufacturing garments in highest quality category	87	102	198	335	365

[1] In enterprise wholesale prices for July 1, 1967

Compared with 1960 figures, the number of employees in the clothing industry was 1.2 times higher in 1965, 1.5 times higher in 1970, and 1.6 times higher in 1975.

Efforts are being made in the industry to improve the quality and range of production (see Table 1).

In 1967 certain Moscow and Leningrad garment enterprises became the first to certify their products with the state seal of quality in the highest quality category. In 1976 the production volume of garments so certified had increased by a factor of 9.5 compared with 1972. In the period 1973–76, production totaled 77.4 million garments of improved quality and range (identified by the letter "N"), valued at 1.8 billion rubles.

Among the leading enterprises of the clothing industry are the Klara Zetkin Experimental-Technical Garment Factory of the Central Scientific Research Institute of the Clothing Industry and the 40th Anniversary of the All-Union Komsomol Tiraspol' Garment Factory. Leading production associations include Bol'shevichka, Saliut, Moskva, Smena, and Start in Moscow; Bol'shevichka, Pervomaiskaia zaria, Volodarskii Rassvet, and Vesna in Leningrad; and Rigas Apgerbs in Riga. The Znamia Industrializatsii Garment Factory in Vitebsk and the Chimkent Garment Factory are also major enterprises.

In the other socialist countries, the clothing industry is most highly developed in the German Democratic Republic and Czechoslovakia. Intensive development of the industry in Bulgaria, Hungary, Poland, and Rumania began only in the mid-1960's. The technological level of the clothing industry in these countries makes it possible to maintain high rates of development and steadily improve the quality of products. The largest enterprises are the garment associations in Prostějov and Trenčín (Czechoslovakia), the Fórtschritt (Berlin, German Democratic Republic), Vitosha (Sophia, Bulgaria), and the Red October and 1 May garment factories (Budapest, Hungary), the Cora Garment Factory (Warsaw, Poland), and the garment factory in the city of Focşani, Rumania.

Among the industrially developed capitalist countries, the most highly developed clothing industries are found in the USA, Italy, the Federal Republic of Germany, France, Great Britain, and Japan. A significant decline in the clothing industry can be observed in most of them. The most important garment manufacturers include the following: Levi Strauss and Company and Phillips–Van Heusen Corporation (USA), Lebole and Facis (Italy), B. und A. Becker GmbH and Nikolaus Boll Fabrik Modischer Anzüge GmbH, a factory that makes stylish suits (Federal Republic of Germany), Vestra-Union Manufacture de Vêtements and Vêtements Armand Thiéry Ainé (France), Arsa Trading Company Ltd. and Debretta Ltd. (Great Britain), and Teijin Ltd. and Wako Koeki Company Ltd. (Japan).

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P. P. KOKETKIN [29–938–1]

CODE, a set of arbitrary symbols used by members of the diplomatic service for secret correspondence with their government and by the armed forces for transmission of orders, directives, and messages. Encipherment is achieved by substituting in varying combinations numerals or letters of the alphabet for entire phrases or for words, syllables, or letters in accordance with a predetermined system, which, consequently, is the key for deciphering the text. Texts written in double codes must be deciphered twice and require two keys. Codes do not always guarantee secrecy of correspondence, since the key to even a very complex code can be derived from calculations, from computations involving the recurrence of individual symbols, and by other means. [29–1241–2]

COINING, the production of raised images on the surfaces of medals, coins, and the like (*see* COIN-MAKING AND MEDALLIC ART); it may be accomplished manually—by means of heavy blows—or in a coining press with steel dies bearing the desired images and inscriptions in intaglio.

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COINING PRESS, a short-stroke, vertical knuckle-joint press designed for coining and other closed impression die forging operations. A distinguishing feature is the use of a crank-and-toggle mechanism to drive a slide, in which the upper link of the toggle is connected to the frame of the press and the lower link is connected to the slide block. Such a mechanism develops great force on the slide block at the end of the working stroke for a small torque at the driving crankshaft. Coining presses may develop pressures up to approximately 40 meganewtons (4,000 tons-force). [29–131–3]

COLEOPHORIDAE (casebearer moths), a family of small moths having a wingspread of 7 to 40 mm. The wings are narrow and lusterless, often with light linear patterns along the veins and framed by a long fringe. The caterpillars live in portable cases constructed from silk or small amounts of leaf epidermis. The shape of the case can be used to identify the species of the caterpillar. Some caterpillars live in the stems and fruits without a case or form galls. The caterpillars bore through and feed on the leaves of woody or herbaceous plants.

Casebearer moths are distributed throughout the world but are particularly diverse in the Mediterranean region and in the deserts of the Palaearctic region. The USSR has approximately 1,000 species. Some are agricultural and forest pests, including *C. laricella* and *C. dahurica*, which eat the coniferous needles of larches, and *C. prunifoliae* and *C. hemerobiella*, which gnaw passageways through the buds, young shoots, and leaves of seed and stone-fruit crops. [29–400–2]

COMMISSION FOR NATIONAL EDUCATION (Polish, Komisja Edukacji Narodowej), from 1773 to 1794, the governmental body in charge of education in Poland. Established after the dissolution of the Society of Jesus (the Jesuits), the commission was to use the Jesuits' property as the basis for establishing a new national school system. Such prominent representatives of the Polish Enlightenment as H. Kołłątaj, G. Piramowicz, and I. Potocki took part in its work. The commission reformed and secularized the system of secondary and higher education. It expanded in-

struction in the natural sciences and made Polish the language of instruction. The commission's achievements were of great importance for the development of Polish culture and education.

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[29–1692–4]

COMSTOCK MEALYBUG (*Pseudococcus comstocki*), an insect of the family Pseudococcidae of the suborder Coccoidea, a dangerous pest of many agricultural crops. The females are wingless; their elongate-oval bodies reach 5 mm in length and have a white waxy sheen. The males are often extremely small.

The Comstock mealybug is native mainly to tropical regions of East Asia but has been introduced accidentally to all continents. In the USSR the insect is an object of internal and external quarantine; it is found in Uzbekistan, Kirghizia, Tadzhikistan, southern Kazakhstan, and Transcaucasia. In Middle Asia three generations develop each year. The eggs (as many as 600) winter in fissures, under tree bark, or in the soil. The larvae hatch in April, damaging leaves, shoots, trunks, and—less commonly—roots and tubers. The plants are devitalized or killed. The pest is distributed in planting material and fruits, as well as by wind and water. Control measures include examining and decontaminating produce before its removal from regions where the pest is distributed, treatment of damaged plants with pesticides, and biological control (the use of *Opuntia vulgaris*, a parasite of the insect).

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A. N. ELIZAROVA [29–179–4]

CONE DRYER-SHAKER, a device for drying cones of coniferous trees and removing the seeds. It may be manufactured as a stationary or mobile unit. The most common stationary model, designed by V. G. Kapper, is a two-level device occupying an area of about 30 sq m. Two double-drum drying chambers and an air heater are housed on the first level, and a drying box for preliminary drying of the cones is located on the upper level. A temperature of 25°C is maintained in the drying box, while a temperature of about 55°C is maintained in the drying chambers. The drums of the drying chambers are made of wire mesh and are divided into four sections. During the drying process, the drums are turned every 20–30 min so that the seeds fall out of the dried cones. The drying time is approximately one day, and the output of one cycle is 4.5 kg of seeds. Mobile cone driers are mounted in truck bodies. [29–1250–1]

CONNECTING ROD, a link in a plane mechanism that is connected to other moving links by means of rotating kinematic pairs and that describes a complex two-dimensional motion.

Connecting rods are an important component in widely used crank-slide mechanisms, which convert the reciprocal motion of a slide (the piston) into the rotary motion of a crank (the crankshaft), or vice versa. In piston engines, compressors, and pumps, the connecting rod generally has an H-shaped cross section; the end connected to the piston (the small, or piston end) is not detachable, and the big end, connected to the crankshaft, is demountable to allow assembly of the mechanism.

In forging and press equipment, the connecting rod end is sometimes of a special design that allows acceptance of high loads in a single direction; connecting rods of both constant and variable length are also used to control the position of a slide. The length of the connecting rod may be varied by means of a rod, the threaded end of which is screwed into the body of the connecting rod and the other (spherical) end of which forms a spherical kinematic pair with the slide. N. IA. NIBERG [29–882–2]

CONTINENTAL SHELF, the comparatively level part of the underwater margin of the continent adjacent to the coast and characterized by the same geological structure. The boundaries of the continental shelf are the shores of the sea or ocean and the shelf break (an abrupt increase of the declivity of the sea floor, the transition to the continental slope). The depth at the shelf break is close to 100–200 m, but in some cases reaches 500–1,500 m, for example, at the southern part of the Sea of Okhotsk and the shelf break of the New Zealand Shelf.

The continental shelf as a historical geological category has existed in all geological periods, prograding considerably in some, such as the Jurassic and Cretaceous periods, while retrograding in others, for example, the Permian and Devonian periods. The present geological epoch is characterized by a moderate development of the shelves.

The continental shelf is part of the underwater margin of the continent and has a continental crust. The coast and the shelf have similar geomorphological features. Various relict subaerial forms of relief and deposits are widespread, as are many traces of ancient shorelines, which indicate that the shelf formed primarily as a result of the inundation of the continental margins by the world ocean in postglacial times and as a result of recent tectonic subsidences of the earth's surface. Also widespread are shelves formed as a result of the retreat of shores through the action of abrasion or as a result of the underwater accumulation of thick deposits of sediments near the continental margins.

The total area of continental shelves is about 32 million sq km. The largest shelf areas are found along the northern margin of Eurasia, where it is 1,500 km wide, in the Bering Sea, Hudson Bay, the South China Sea, and along the northern coast of Australia.

The continental shelf has been used for fishing and hunting sea mammals since ancient times; 92 percent of all the fish caught commercially are caught in shelf waters. Prospecting for minerals, especially petroleum and gas, has developed extensively in the shelf area. In 1975 petroleum extracted from the shelf accounted for 20 percent of all the petroleum extracted in the world; placer deposits of minerals, such as cassiterite, titanomagnetite, diamonds, and gold, are also exploited.

The international legal status of the continental shelf is regulated by a special convention adopted in Geneva in 1958. In the Convention on the Continental Shelf, the term "continental shelf" refers to "(a) the seabed and subsoil of the submarine areas adjacent to the coast but outside the area of the territorial sea, to a depth of 200 m or, beyond that limit, to where the depth of superjacent waters admits of the exploitation of the natural resources of the set area; (b) the seabed and subsoil of similar submarine areas adjacent to the coasts of islands." The convention acknowledges the sovereign right of coastal states to explore and exploit the natural resources of the shelf, including mineral and other nonliving resources of the seabed and subsoil and living organisms attached to the seafloor or moving along it, such as corals, sponges, mussels, and crabs. Other states do not have the right to do this without the consent of the coastal state.

As a general principle, the boundary of the continental shelf is determined by agreement between interested states in conformity with the rules established by the convention. Such agreements have been concluded by the Soviet Union with Finland (May 20, 1965, and May 6, 1967) and with Poland (Aug. 28, 1969). In addition, the USSR, Poland, and the Democratic Republic of Germany signed a declaration on the continental shelf of the Baltic Sea on Oct. 23, 1968, which established the general principles for delineating the shelf in this region.

A special aspect of the legal status of the continental shelf is that it does not involve the legal status of the superjacent waters of the high seas and the air space above these waters. According to the convention, a coastal state has the right to build, maintain, and operate necessary structures and installations on the shelf and to create a 600-meter safety zone around such structures and installations, as well as to take any necessary steps to protect them. It is stipulated that these structures, installations, and safety zones must not be on important international sea-lanes.

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Zhudro, A. K., and Iu. Kh. Dzhavad. *Morskoe pravo.* Moscow, 1974. [29–1119–3]

CONTINUOUS COMPRESSION MOLDING OF PLASTICS, a method for the production of long items, such as pipes and rods, which consists in the pressing of a plastic through a heated compression mold with open entry and exit holes. The mold is set on a special horizontal press, the plunger of which performs a slow forward (compression) motion and then rapidly returns to the starting position. The entire batch of material is fed into the mold in one cycle; the heated plastic remaining from the previous load is mixed with a new portion, thus achieving a continuous process. The method is used primarily for working thermosetting plastics with a high volume fraction of filler, such as molding powders. It has been replaced almost entirely by extrusion in the production of items made from thermoplatics.

The processing cycle for thermosetting plastics includes softening of the material, consolidation to produce items with good mechanical properties (achieved by using compression molds in which the area of the plunger is several times greater than the area of the exit hole), and curing. The process is performed at pressures of 250–400 meganewtons per m^2 (2,500–4,000 kg-force per cm^2) and temperatures from 65°–80°C in the loading chamber of the compression mold to 150°–200°C at the exit of the item from the mold channel. Productivity ranges from 2 to 20 m per hour. [29–1488–2]

CONTRACT OF AFFREIGHTMENT, in international commercial navigation, a contract by which maritime cargoes are transported.

The contract of affreightment may include one or both of two documents: a charter party and a bill of lading. It places an entire ship, part of a ship, or a specified place on a ship at the disposal of the shipper. Standardized forms, such as the Jenkon or Soviet-wood charters, are used for different types of cargoes and routes; the signatory parties may introduce qualifications and additions by mutual consent. A charter party must name the parties to the contract and specify the freight charge, the vessel and its cargo, the port of loading, and the port of destination or the ship's route. A widely used charter party is the voyage charter, by which a ship is chartered for one or more voyages.

The charter party governs the relation between the shipper and the carrier and is signed by them or their agents. The charter party is often accompanied by a bill of lading, which must contain a clause stating that it has been issued on the basis of the charter party and that the conditions stated in the charter party hold good for tne bill of lading.

The demise charter is not considered a contract of affreightment but a type of property lease contract (*see* LEASE OF PROPERTY). In a demise charter, by which a ship is hired for a definite period, the shipowner, for a consideration (rent), places the capacity of the ship at the disposal of the charterer (lessee) for the transport of cargoes or passengers or for other purposes, such as towing or fishing. Standardization forms are used for the demise charter, as in contracts of affreightment. [29–66–2]

CONTROL PANEL, a complete operating board used for centralized monitoring and control of production processes in complexes such as industrial enterprises, electric power plants, and water-, gas-, and power-supply systems. Measuring and monitoring instruments, pilot lights, control switches, and graphic panels are arranged on the control panel so that they can be easily read and reached. In addition to panels for the process control of entire enterprises—usually known as master panels, or, in enterprises with supervisory control, as instrument panels—there are control panels for systems, shops, and units. [29–1607–1]

CONVERTER TUBE, a receiving tube that converts the frequency of electrical oscillations by mixing the oscillations with oscillations of another frequency; for example, in a superheterodyne receiver the signals received are mixed with oscillations from a local oscillator (*see also* FREQUENCY CHANGER and MIXER).

Converter tubes are usually multielectrode tubes, most often heptodes; combination tubes (triode-heptodes, triode-hexodes, and triode-pentodes) are also used. A typical feature is the presence of two control grids which permits dual control of the plate current in order to obtain combination oscillations. The mixer and the local oscillator are combined in a single envelope. If the local oscillator is a separate tube, the other tube is only used for mixing frequencies, in which case it is known as a mixer tube.

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S. M. MOSHKOVICH [29–91–1]

ĆOPIĆ, BRANKO. Born Jan. 1, 1915, in Hašani, Bosnia. Serbian writer. Member of the Serbian Academy of Sciences and Arts (1967) and the Academy of Sciences of Bosnia and Hercegovina (1973). Participant in the National Liberation War in Yugoslavia of 1941–45.

Ćopić graduated from the philosophy faculty of the University of Belgrade. He began publishing in 1929. His mastery of the realistic short story was evident even in such early collections *At the Grmeč* (1938). The warm and sincere humor that characterizes this collection was also typical of Ćopić's later work.

Ćopić's poems and short stories from the war years, including the collection *The Fiery Birth of the Homeland* (1944), enjoyed wide popularity. He describes the antifascist struggle of the Yugoslav peoples in the novels *Breakthrough* (1952; Russian translation, 1959), *The Hidden Gunpowder* (1957), and *The Daredevils at Bihać* (1975) and in such short-story collections as *Events from the Life of Nikoletina Bursać* (1956; Russian translation, 1958) and *The Hollyhock Garden* (1970). In the novels *Do Not Grieve, Bronze Guard* (1958) and *The Eighth Attack* (1964), Ćopić deals with important problems of postwar Yugoslav life. He is also the author of many books for children.

In 1972, Ćopić was awarded the Antifascist National-liberation Council of Yugoslavia Prize and the Njegoš Prize.

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A. D. ROMANENKO [29–684–3]

ČOPIĆ, VLADIMIR. Born Mar. 8, 1891, in Senj, Croatia; died 1938. Figure in the Yugoslav communist movement.

The son of a craftsman, Čopić graduated from a *Gymnasium* and studied law at the University of Zagreb until 1914. He was called into the army at the start of World War I and was captured by the Russians in April 1915. After joining the Yugoslav Communist group of the RCP(B) in May 1918 in Moscow, he was assigned in November of the same year to work in Yugoslavia.

Čopić was elected to the Central Committee in 1919 at the First (1919) and Second (1920) Congresses of the Communist Party of Yugoslavia (CPY). In 1920 he was chosen organizational secretary of the Central Committee and a CPY deputy to the Skupština. Čopić was sentenced in 1921 to two years in prison for revolutionary activities.

Čopić was elected a member of the Central Committee in January 1924 at the Third Conference of the CPY and was a CPY delegate to the Fifth Congress of the Comintern in the same year. He emigrated to the USSR in 1925 and served as a representative of the CPY in the Comintern. After commanding the 15th International A. Lincoln Brigade in Spain in 1937 and 1938, Čopić worked in the USSR. [29–685–1]

COPPERS, a group of closely related butterfly genera (*Lycaena, Heodes*, and *Thersamonia*) of the family Lycaenidae. In the past such insects were regarded as belonging to a single genus, *Chrysophanus*. The wings are red-gold or, less commonly, brown or light blue. The caterpillars, which resemble wood lice in

shape, feed on the leaves of herbaceous plants of the families Polygonaceae and Leguminosae. The insects are distributed mainly in Europe and Asia. Of the approximately 20 species occurring in the USSR, many are found only in the high meadows of Middle Asia and Transcaucasia. The two most common species are *Heodes virgaureae* and *Lycaena phlaeas*. The former has a wingspread of 30–35 mm and flies from June to August. The caterpillars feed on sorrel. The species is distributed in meadows in the forest zone of Europe and Asia. *L. phlaeas* has a wingspread of 25–30 mm. There are two generations: the first generation of butterflies flies in May and June, and the second in July and August. The caterpillars develop on sorrel and marjoram. The species is distributed in the northern hemisphere (except the far north). [29–182–9]

ÇORBACI, in the Ottoman Empire:

(1) An officer rank among the janissaries that corresponded to the commander of an *orta* (company).

(2) A member of the village elite, which comprised elders, leaders, and prosperous peasants. The Turkish authorities recruited *çorbacis* to work in judicial and administrative agencies and usually appointed tax collectors from their ranks. In the 19th century the term came to refer mainly to merchants and wealthy Christians. In modern Turkey the term is used colloquially by sailors to mean shipowner. [29–685–3]

CORDED WARE CULTURE, a group of archaeological cultures of the late Aeneolithic period and the Bronze Age in Central and Eastern Europe and of the Neolithic period in Northern Europe. Among the common features shared by the cultures are the pottery, decorated with cord impressions or with hatching resembling cords, as well as polished perforated stone battle axes, (hence the alternate name of the Corded Ware culture—the Battle-ax culture). The cultures also have many differences, and therefore the question of whether they belong to a single ethnic group has yet to be resolved, although it is believed that their bearers were Indo-European tribes, ancestors of the Slavs, Germans, and Balts.

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[29–1329–3]

CORRESPONDING MEMBER, an academic title in the USSR and in a number of foreign countries, including the German Democratic Republic, Poland, and Czechoslovakia. (A similar title—correspondent—is used in France.) In the USSR, corresponding members are elected for outstanding achievements in science or scholarship to the Academy of Sciences of the USSR, the academies of sciences of the Union republics, the Academy of Medical Sciences of the USSR, the V. I. Lenin All-Union Academy of Agricultural Sciences, the Academy of Pedagogical Sciences of the USSR, and the Academy of Arts of the USSR. Candidates are nominated by scientific institutions, public organizations, or individuals. The names of the candidates are published in the press prior to the elections. Corresponding members are elected by secret ballot within the appropriate division of an academy and are approved by the academy's general assembly. [29–671–1]

ÇORUH (Russian, Chorokh), a river in Turkey and the USSR (in the Adzhar ASSR of the Georgian SSR). The Çoruh has a length of 438 km; of this total, 26 km of the lower course are in the USSR. The river drains an area of 22,000 sq km. It flows mainly in a tectonic valley between the Lazistan Ridge and the Çoruh Mountains before emptying into the Black Sea, near Batumi. The mean flow rate is 285 cu m per sec; high water occurs in spring and summer. The Çoruh is used for floating timber and for irrigation. The Turkish city of Bayburt is situated on the river. [29–686–1]

ÇORUM, a city in Turkey, in central Anatolia. Capital of Çorum Vilayet. Population, 65,000 (1975). Çorum is a highway junction and the commercial center of an agricultural region that produces grains, fruits, and livestock. Industry is represented by food processing and the production of cement. [29–686–3]

CORYMB, a type of racemose inflorescence in angiospermous plants. The lower flower stalks (in a simple corymb) or branches (in double and compound corymbs) are longer than the upper ones. The flowers are arranged in a single plane, with the outer ones opening first. The corymb originated as a type of raceme. The corymbose polychasium and the corymbose panicle are often confused with the corymb. [29–1613–1]

ĆOSIĆ, BRANIMIR. Born Nov. 13, 1903, in Štitar; died Jan. 29, 1934, in Belgrade. Serbian writer.

Ćosić studied law, literary history, and art history in Belgrade, Lausanne, and Paris. He was the author of the well known collections *Stories of Bošković* (1924), *The Egyptian Woman and Other Stories* (1927), and *Like the Waters That Flowed* (1933). In his early short stories and in his early novels *Sabbath* (1925) and *The Two Kingdoms* (1928), Ćosić wrote in the tradition of Serbian realism while dealing with moral questions from the viewpoint of idealist ethics. In the early 1930's, under the influence of the progressive literary movement called social literature, he adopted a sharply critical attitude toward bourgeois society. This attitude is evident in Ćosić's novel *The Mowed Field* (1934; Russian translation, 1957), which is one of the best works of Serbian prose written in the period between the two world wars.

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[29–687–1]

COSMIC NOISE, the electrical fluctuations in a receiving antenna that are due to the radio radiation of the sun, the stars, the planets, interstellar media, and other matter.

Regardless of its origin, cosmic noise manifests itself in radio reception in the same manner as thermal noise. Its intensity is defined in terms of the brightness temperature of the sky, which is the equivalent temperature of the hypothetical celestial sphere that envelops the antenna and that has the properties of a black body. The heat-radiation levels of the hypothetical sphere and of the real sources of cosmic noise must be equal in all directions to satisfy the criterion of equivalence. Sky temperature decreases rapidly with the decrease of wavelength λ. Specifically, when detected by an antenna with a broad directivity diagram, mean cosmic noise levels—the noise background of the sky—decrease with λ as $\lambda^{-2.4}$. When $\lambda \approx 5$ cm, for example, cosmic-noise temperature is approximately 15°K. I. M. AINBINDER [29–1547–3]

COTTER PIN, a wire strip semicircular in cross section and bent approximately in half. Cotter pins are used to fasten lightly stressed, coupled parts or to prevent nuts from loosening. After a cotter pin is inserted through a hole, its ends are separated. Half of the pin is longer than the other for convenient separation. Cotter pins are made of carbon steel. [29–1403–1]

COUPLING LOOP, in microwave engineering, a section of transmission line of specified length that is used as the coupling link in loop-type directional couplers. A coupling loop is regarded as a type of four-terminal network with specified parameters. In the designing of loop-type directional couplers, the lengths and the characteristic impedance of coupling loops are calculated, together with certain other parameters that provide the required operating characteristics of such couplers—namely, the required directivity and isolation—in the frequency band used.

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See references under STUB. R. I. PERETS [29–1282–2]

CRANIAL INDEX, the ratio of the maximum breadth of the skull (transverse diameter) to its maximum length (longitudinal diameter) expressed as a percent. The cranial index is used in anthropology to characterize the shape of the skull in the horizontal plane. Low values reflect a relatively long and narrow skull. An index not greater than 74.9 is indicative of dolichocrany, whereas indexes of 75–79.9 and 80 or greater reflect mesocrany and brachycrany, respectively. The cranial index of humans does not reflect intellectual capacity. The index is used as a means of distinguishing anthropological racial types from skeletons. [29–215–2]

CRANIAL NERVES, the 12 pairs of nerves that branch off from the anterior (lower) surface of the brain stem in succession from front to back through special openings in the skull. The cranial nerves innervate the organs and tissues of the head and neck, with the exception of the vagus nerve, which descends into the thoracic and abdominal cavities. Cyclostomes, fish, and amphibians normally have only the first ten pairs of cranial nerves.

The first and second pairs of the cranial nerves are the olfactory and optic nerves, which, unlike the other cranial nerves, originate in the brain and serve as conducting pathways for the olfactory and visual analyzers. The third, fourth, and sixth pairs are the oculomotor, trochlear, and abducens nerves; they develop in association with cephalic myotomes and innervate the muscles of the eye. The fifth pair, the trigeminal nerves, is associated with the region of the mandibular arch; the nerves are the chief sensory nerves of the face and serve as the motor nerves of the muscles of mastication. The seventh pair, the facial nerves, innervates the organs of the lateral line and the musculature of the hyoid arch in fish, the superficial musculature of the neck and the muscle that lowers the lower jaw in terrestrial vertebrates, and the facial muscles in humans and simians. The facial nerves also contain secretory fibers to the lacrimal and salivary glands and sensory fibers to the mucous membrane of the tongue. The eighth pair, the vestibulocochlear nerves, evolved from the facial nerves. These nerves are purely sensory: They are responsible for linking the organs of hearing and equilibrium with the brain. The related ninth, tenth, and 11th pairs—the glossopharyngeal, vagus, and accessory nerves—are unequal in fiber composition and extent of spread. The ninth and tenth pairs have motor, sensory, and autonomic components. In mammals the 11th pair arises from the vagus nerve. The accessory nerve is motor to the sternocleidomastoid and trapezius muscles. The 12th pair, the hypoglossal nerves, is unusual in that it arose in amniotes as a result of fusion of the muscular branches of the spinal nerves.

The cranial nerves, unlike the spinal nerves, are not segmented and are highly specialized. Every muscle or group of functionally combined muscles (for example, the masseter muscle) and every organ is supplied only by a single source. Hence, disturbance of nerve conduction, as in paralysis of the facial nerve, cannot be compensated by adjacent nerves. The cranial nerves are nerves of highly specialized sense organs and are regulators of respiration, blood circulation, and digestion.

V. V. KUPRIIANOV [29–216–1]

CRATER (the Cup), a constellation of the southern hemisphere; its brightest star has a visual stellar magnitude of 3.6. The constellation is most easily viewed in March; it is visible from the central and southern regions of the USSR. (*See* STELLAR SKY.) [29–111–2]

CRNOJEVIĆ, a feudal house in Zeta (now Montenegro). The first mention of the Crnojevići dates from 1331. In the late 14th and early 15th centuries they fought the Balšić brothers for control of Zeta. The Crnojevići came to power in the second third of the 15th century and ruled until 1528.

The most notable rulers from the Crnojević family were Ivan (Ivan the Black; ruled 1465–90) and Djuradj (ruled 1490–96). During the reign of Stefan Crnojević (ruled 1496–98), the state was subordinated to the Ottoman Empire; it was officially incorporated into the empire in 1499. [29–283–1]

CROCUS, a genus of perennial cormous stemless plants of the family Iridaceae. The flowers are solitary or, less commonly, in groups of two or three. Glumaceous scales that seem to arise directly from the bulb surround the variously colored flowers. The numerous radical and linear leaves usually develop during or after the flowering period.

There are about 80 species in Europe and Asia. The USSR has 19 species, found mainly in Transcaucasia, in the Crimea, and in the mountainous meadows of the Tien-Shan and the Dzhungar Alatau. Crocuses are cultivated in many countries, including the USSR. They are used as a coloring and flavoring agent by the food and candy industries. Many species have especially beautiful flowers.

The most common species raised as ornamentals are *C. tomasinianus*, whose light violet flowers bloom in the beginning or middle of April; the common crocus (*C. vernus*), whose lilac, white, or purple-striped flowers bloom in April; *C. chrysanthus*, whose yellow flowers bloom in February and March; and *C. speciosus*, whose lilac flowers bloom in September. Crocuses are propagated by bulbs, corms, or seeds. The soil must be light in texture and fertilized with humus. The corms are planted at a depth of 5–6 cm. Autumn-blooming species are planted in the spring, and spring-blooming species are planted in the fall and covered with leaves and spruce branches. The corms of plants that have blossomed are dug out, dried, and cleaned of earth, roots, and old scales; they are stored at a temperature of 17°C until planting. Plants grown from seed bloom in the second or third season. Garden and wild crocuses are planted in groups on lawns or in rock gardens. Garden forms are often forced during the winter.

Stigmata from the saffron crocus (*C. sativus*) were formerly used medicinally in a compound tincture of aloe and in infusions of opium and saffron. [29–888–4]

CSOKONAI VITÉZ, MIHÁLY. Born Nov. 17, 1773, in Debrecen; died there Jan. 28, 1805. Hungarian poet and dramatist.

Csokonai Vitéz' poems, representative of the Enlightenment, reflect the influence of J.-J. Rousseau and Voltaire; they include "Evening" and "Constantinople." In the satirical play *Tempefői* (published 1844; staged 1938), he denounced the stagnation and ignorance of the nobility. The poem cycle *Songs of Lilla* creates an atmosphere of amorous languor, bitter solitude, and disappointment while protesting against social inequality. Csokonai Vitéz' poems combine traditional mythological elements and a refined style with the form and language of Hungarian folk poetry.

During his lifetime, Csokonai Vitéz published only a small amount of poetry, the collection of translations *Spring* (1802), and the comic epic poem *Dorottya* (1804).

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[29–679–2]

CSONGRÁD, a *megye* (county) in southern Hungary, in the basin of the middle course of the Tisza River. Area, 4,100 sq km. Population, 455,000 (1975). The administrative center is the city of Szeged.

Csongrád is an agricultural and industrial region. The main crops are wheat, corn, sugar beets, hemp, alfalfa, sunflowers, rye, potatoes, and fruits, including grapes. Rice is grown on irrigated land in the Tisza River valley. Red peppers used for paprika are cultivated near Szeged, and onions are grown around Makó. Cattle, swine, and poultry are raised, and fish are bred in ponds. Crude oil and natural gas are extracted near Szeged and Illos. Industrial enterprises manufacture textiles and food products. A plant for the production of agricultural machinery is located in Makó, and ceramics are produced at Hódmezövásárhely. [29–682–6]

CSONGRÁD, a city in Hungary; situated on the Tisza River, in the *megye* (county) of Csongrád. Population, 20,000 (1976). Food products, furniture, and bricks are manufactured in the city. [29–682–7]

ĆUBRILOVIĆ, VASO. Born Jan. 13, 1897, in Bosanska Gradiška. Yugoslav historian. Academician of the Serbian Academy of Sciences and Arts (1961).

Ćubrilović took part in the assassination of Archduke Francis Ferdinand, the heir to the Austro-Hungarian throne, on June 28, 1914. For his participation in the plot, Ćubrilović was sentenced to 16 years in prison, but he was freed in 1918. In 1922 he graduated from the faculty of philosophy of the University of Belgrade, and in 1939 he became a professor there. During World War II he was in a concentration camp in Banica. From 1946 to 1967, Ćubrilović headed the department of modern national history at the University of Belgrade. In 1967 he became the director of the Institute of Balkan Studies of the Serbian Academy of Sciences and Arts.

Ćubrilović is the author of works on the medieval and modern history of Bosnia, Hercegovina, Serbia, and Croatia. He was named a foreign member of the Academy of Sciences of the USSR in 1976.

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Istorija političke misli u Srbiji XIX v. Belgrade, 1958. [29–704–2]

ÇUKUROVA, a lowland plain in southern Turkey, situated between the Central Taurus and the Mediterranean Sea. The Çukurova extends along the coast for 150 km, reaching widths of as much as 70 km. The Ceyhan and Seyhan rivers flow across the plain. Insular mountain massifs rise above the Çukurova, the highest being the Misis Mountains, with a maximum elevation of 789 m.

The Çukurova has a Mediterranean climate and is the hottest region of Turkey. The country's main cotton-producing region, it also produces grain crops and citrus fruits and has plantations for the cultivation of olives and sugarcane. The cities of Adana, Ceyhan, and Mersin are situated on the Çukurova. [29–755–3]

ČULINOVIĆ, FERDO. Born May 17, 1897, in Karlovac; died Sept. 15, 1971, in Zagreb. Yugoslav historian. Academician of the Yugoslav Academy of Sciences and Arts (1962).

Čulinović was a lawyer by education. During the National Liberation War in Yugoslavia of 1941–45, he was a member of the Antifascist National-Liberation Council of Croatia and served as secretary of the council's legislative commission. In 1945 he became a professor of national history in the law faculty of the University of Zagreb. Čulinović was the author of many works on the history of Yugoslavia.

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Krest'ianskie vosstaniia v Khorvatii. Moscow, 1959.
Otkliki Oktiabria v iugoslavianskikh zemliakh. Moscow, 1967.
[29–757–1]

CUTTING, a part of a plant used for vegetative propagation. Cuttings are obtained from high-quality plants. Plants grown from cuttings retain the properties and characteristics of the maternal plant. There are root, stem, and leaf cuttings. Under certain growing conditions, roots form on stem cuttings, buds on root cuttings, and both buds and roots on leaf cuttings. The ability of plants to propagate by cuttings depends on the species and varietal characteristics of the maternal plants as well as on external conditions, for example, temperature, humidity, and aeration. [29–203–1]

CUTTINGS, PROPAGATION BY, a method of plant propagation by which a part of a plant is cut off and planted. Propagation by cuttings is used in fruit raising, ornamental horticulture, forestry, and the cultivation of certain industrial and medicinal plants. Root cuttings and stem cuttings (lignified stems without leaves or green stems with leaves) are most often used. Root cuttings are used to propagate raspberry, dewberry, young apple seedlings, and white poplar. Lignified stem cuttings are used to propagate currant, grape, quince, and fig. Green stem cuttings with two or three leaves are used to propagate currant, plum, cherry, grape, and certain varieties of gooseberry. Leaf cuttings are used to propagate begonia, violet, and some other plants. [29–201–1]

CYNOGLOSSUM (hound's-tongue), a genus of plants of the family Boraginaceae. The plants are biennial, perennial, or—less commonly—annual herbs. The leaves are entire and alternate. The flowers, which are mostly purple, red, dark blue, or violet, are in cymose inflorescences known as bostryxes. The calyx is five-partite to the base; it enlarges when fruits are present. The corolla is funnelform or rotate. The fruit consists of four nutlike lobes with hooked prickles.

There are about 60 species, distributed in temperate and subtropical zones and in tropical mountains, mainly in dry regions. The USSR has nine species. The common hound's-tongue (*C. officinale*) grows on dry slopes, along river bluffs, and in gravelly areas; it also is encountered as a weed along roads and in wastelands and fields. The plant is poisonous, as are other *Cynoglossum* species. Its roots and seeds contain alkaloids (cynoglossin, cynoglosseine) and glycoalkaloids. The roots and leaves are used in folk medicine as analgesics, as an agent to treat coughs and convulsions, and as an emollient in the form of a fomentation to treat furunculosis, burns, and snakebites. The juice and the roots are used to control insects and rodents. The species *C. amabile* is cultivated as an ornamental. [29–290–2]

CZARDAS, a Hungarian folk dance performed by couples to 2/4 time. The czardas, which appeared in the mid-19th century, consists of one slow section and one fast, impetuous section. It has syncopated rhythms, and many steps are improvised. The czardas served as the basis of ballroom dance that became popular in Russia in the early 20th century as the *vengerka.* Musical reworkings of the czardas are found in Liszt's *Hungarian Rhapsodies*, Brahms' *Hungarian Dances*, Delibes's *Coppélia*, and Tchaikovsky's *Swan Lake.* [29–59–2]

CZARTORYSKI, a Lithuanian-Byelorussian, later polonized, princely family, that claimed to trace its origins back to Gedymin. Its most prominent members were Adam Jerzy Czartoryski and Władysław Czartoryski.

Adam Jerzy Czartoryski. Born Jan. 14, 1770, in Warsaw; died July 15, 1861, in Montfermeil, France. Polish and Russian state and political figure.

A. J. Czartoryski was one of Alexander I's closest friends and a member of the Unofficial Committee. He became deputy foreign minister in 1802 and served as foreign minister from 1804 to 1806. He put forth a program by which all the Polish lands would be united under the rule of Alexander I. In 1816 he became a senator of the Kingdom of Poland. During the Polish Uprising of 1830–31, as head of the National Government, he obstructed the implementation of social and political reforms. After the defeat of the uprising he emigrated to Paris, where his residence, the Hôtel Lambert, became a center for conservative monarchist émigrés. In 1834 his adherents proclaimed him de facto king. Czartoryski developed a program for the restoration of Polish independence that relied on the support of the Western powers.

Władysław Czartoryski. Born July 3, 1828, in Warsaw; died June 23, 1894, in Boulogne-sur-Seine, France. Polish political figure. Son of A. J. Czartoryski.

W. Czartoryski succeeded his father as head of the Hôtel Lambert group. On May 15, 1863, during the Polish Uprising of 1863–64, the "white" Rząd Narodowy appointed Czartoryski its chief diplomatic agent. Czartoryski opposed the alliance of the Polish people with the revolutionary forces of other peoples and recommended that the insurgents limit themselves to armed demonstrations that would bring about the military intervention of the Western powers.

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I. S. MILLER [29–71–2]

CZECH, the language of the Czechs, one of the official languages of the Czechoslovak Socialist Republic (the other is Slovak).

Czech is spoken in Czechoslovakia (in Bohemia, Moravia, and part of Silesia) and abroad (in the USA, Austria, Canada, and other countries) by approximately 10 million people (1974, estimate). Czech, which belongs to the West Slavic group of languages, has four groups of dialects: (1) the Bohemian dialects—central (with Prague as the center), southwestern, and northeastern; (2) the Haná (central Moravian) dialects; (3) the Lach dialects (in northeastern Moravia and in Silesia); and (4) the Moravian Slovak dialects (in eastern Moravia to the borders with Slovakia).

The Czech sound system is characterized by the presence of short and long vowels, which, like the diphthong *ou*, are phonemically distinctive, and by the presence of syllabic *r* and *l*. There are only three pairs of hard and soft consonants (*n*/*n'*, *t*/*t'*, and *d*/*d'*). Most consonants are paired as voiced-voiceless. Typical of Czech is the alternation of short and long vowels and consonant alternation. Stress is dynamic and always falls on the first syllable of a word; a secondary stress occurs in polysyllabic words. The morphological system is distinguished by a diversity of declensional and conjugational types. The noun is marked for the categories of gender, number, and case (six cases and a vocative form); masculine nouns are also marked for animateness. All relative, and some qualitative, adjectives are used only in the long form. The verb is marked for the categories of aspect, voice, mood, tense, person, and number; participles and adverbial participles are marked for gender.

The Czech literary language was formed on the basis of the central Bohemian dialect. The earliest written records date from the late 13th century. The written language of the first half of the 19th century was purely a bookish, literary form. The colloquial form of the modern literary language arose in the mid-19th century and existed side by side with everyday speech forms. The writing system is based on the Latin alphabet; diacritical marks are used to indicate sounds specific to the Czech language.

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A. G. SHIROKOVA [29–525–3]

CZECHOSLOVAK ACADEMY OF SCIENCES (Československá Akademie Věd), the highest scientific institution in the Czechoslovak Socialist Republic and the Czech Socialist Republic. Founded in Prague in 1952, the academy includes the Slovak Academy of Sciences. Its predecessors were the Royal Bohemian Society of Sciences (1790) and the Czech Academy of Arts and Sciences (1890). The academy carries on the progressive traditions of Czech and Slovak science.

In 1976 the academy, with more than 150 members, included 19 scientific boards responsible for the development of their respective disciplines and 135 research institutes, of which 60 were institutes of the Slovak Academy of Sciences. Twenty-three of these institutes are conducting research in mathematics, physics, geology, and geography; 15 in the technical sciences; 11 in chemistry; 33 in biology, medicine, and agriculture; and 34 in the social sciences. The academy also serves as an advisory body to the government of Czechoslovakia on scientific matters. The first president of the academy was Z. Nejedlý; since 1970 the post has been held by Academician J. Kožešník, a foreign member of the Academy of Sciences of the USSR since 1971.

The academy plans the development of Czechoslovak science, prepares government plans for basic research, coordinates and directs the execution of such plans, trains scientific workers, and represents Czechoslovak science abroad. As of 1974, more than 13,000 workers were employed by the academy's institutions, including some 5,500 workers with higher education. [29–501–1]

CZECHOSLOVAK CORPS MUTINY OF 1918, an armed counterrevolutionary revolt of Czechoslovak troops in Soviet Russia instigated by agents of the Entente. Czechoslovak units were formed in Russia during World War I from among Austro-Hungarian prisoners of war and Russian subjects of Czech nationality. In June 1917 two rifle divisions were united to form the Czechoslovak Corps, which was deployed in the Ukraine. After the October Revolution of 1917 the commanders of the corps, abetted by agents of the Entente, conducted anti-Soviet propaganda among the soldiers, declared the corps to be part of the French Army, and demanded that the Soviet government send the corps to Western Europe. In the second half of March 1918 most of the corps left the Ukraine; only Czechoslovak internationalists joined the Red Army to fight the Austro-German aggressors.

On Mar. 26, 1918, the Soviet government agreed to evacuate the Czechoslovak troops via Vladivostok on condition that they surrender most of their weapons to local soviets. Nevertheless, the corps commanders, meeting with agents of the Entente and Right Socialist Revolutionaries (SR's) in Cheliabinsk on May 14, decided to stage a revolt. The soldiers were told that the Soviet government had ordered the trains stopped and the soldiers disarmed and confined in prison camps. The corps commanders exhorted the soldiers to make their way to Vladivostok by force of arms. By late May, trains carrying up to 45,000 Czechoslovak soldiers were stretched all along the Siberian Railroad from Rtishchevo station (near Penza) to Vladivostok, a distance of about 7,000 km. The revolt began in Mariinsk on May 25 and in Cheliabinsk a day later; thereafter Czechoslovak troops and SR-White Guard detachments captured Novonikolaevsk on May 26, Penza on May 29, Syzran' on May 30, Tomsk on May 31, Omsk on June 7, Samara on June 8, and Krasnoiarsk on June 18. Passing to the offensive, the Czechoslovak troops and White Guard detachments proceeded to seize Ufa on July 5, Simbirsk on July 22, Ekaterinburg on July 25, and Kazan on August 7, where the gold reserves of the republic fell into their hands.

The mutiny of the Czechoslovak Corps opened a new phase in the Civil War by greatly expanding the theater of operations and strengthening the counterrevolutionary forces. The mutiny was accompanied by mass arrests and executions of soviet and party functionaries and revolutionary workers and peasants. In the captured areas the Czechs abolished the Soviet governing bodies and assisted in the formation of such counterrevolutionary governments as the Committee of Members of the Constituent Assembly (Komuch) in Samara, the Cadet-SR Urals Government in Ekaterinburg, and the Provisional Siberian Government in Omsk.

In July 1918 the Soviet forces in the Volga Region were united to form the Eastern Front. In August 1918 the Soviet forces halted the advance of the Czechoslovak and SR-White Guard troops, and passing to the offensive, they liberated Kazan and Simbirsk in September, Samara and Syzran' in October, and Ufa and Cheliabinsk in November. Military reverses and clandestine work by communists demoralized the Czechoslovak troops. In November and December 1918, after refusing to fight on the side of the White Guards, they were withdrawn from the front and put to guarding the railroad. From the second half of 1919, the Czechoslovak units retreated to the east along with Kolchak's army. Meeting at Kuitun station on Feb. 7, 1920, the command of the Red Army and of the Czechoslovak Corps signed an armistice agreement guaranteeing the corps passage to the Far East and evacuation. In the spring of 1920 the Czechoslovak troops as-

sembled in Vladivostok, from where they were gradually evacuated from Russia.

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S. N. SEMANOV [29–503–5]

CZECHOSLOVAKIA (Československo), Czechoslovak Socialist Republic (CSSR; Československá Socialistická Republika).

GENERAL INFORMATION
CONSTITUTION AND GOVERNMENT
NATURAL FEATURES
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General information

The Czechoslovak Socialist Republic is a socialist state in Central Europe. Situated on the watershed of the Danube, Labe (Elbe), and Oder, the republic is bounded on the north by Poland, on the northwest by the German Democratic Republic, on the west by the Federal Republic of Germany, on the south by Austria and Hungary, and on the east by the USSR. Area, 127,900 sq km. Population, 15 million (1977). The capital is Prague. The Czechoslovak Socialist Republic (CSSR) includes the Czech Socialist Republic (CSR; capital, Prague) and the Slovak Socialist Republic (SSR; capital, Bratislava). Administratively, the country is divided into ten regions (*kraje*), with Prague and Bratislava having the status of regions (see Table 1). The regions are divided into districts (*okresy*), which in turn are subdivided into communes (*obce*).

Constitution and government

Czechoslovakia is a socialist state and a federal republic composed of two equal sovereign socialist republics, the Czech and Slovak socialist republics. The present constitution was adopted in 1960 and amended by the 1968 Constitutional Law on the Czechoslovak Federation. All power in the country belongs to the working people.

The supreme state authority and sole legislative body of the CSSR is the bicameral Federal Assembly, composed of the House of the People, whose 200 deputies are elected by the entire country, and the House of Nations, whose 150 deputies are elected on a parity basis by the CSR and the SSR. The Federal Assembly is empowered to amend the constitution of the CSSR and enact laws. It ratifies the medium-range state plans for the development of the national economy and the state budget of the federation, resolves fundamental questions of foreign and domestic policy, elects the president of the CSSR (five-year term) and the members of the Supreme Court of the CSSR, and establishes federal agencies. Between sessions of the Federal Assembly its functions (except emergency powers) are exercised by the 40-member Presidium of the Federal Assembly, which is elected by both houses from among their members.

The head of state is the president, who is accountable to the Federal Assembly. He represents the CSSR in international relations, concludes and ratifies international treaties, appoints and recalls the members of the federal government (cabinet), and serves as the supreme commander in chief of the armed forces.

The federal government of the CSSR—the supreme executive body of state power—consists of a prime minister, deputy prime ministers, and ministers. A member of the Presidium of the Federal Assembly or of the Constitutional Court may not hold a cabinet post.

The 200-member Czech National Council and the 150-member Slovak National Council are the supreme representative institutions and sole legislative bodies of the constituent republics. Each National Council enacts the constitutional and other laws of the republic, ratifies the medium-range state plans for the development of the republic's economy, and adopts the republic's budget. The National Council elects from among its members the Presidium, which exercises the council's functions (except emergency powers) in the interval between sessions of the council. The Presidium of the National Council appoints and recalls the members of the government (cabinet), the highest executive body of state power in each republic.

The local governing bodies in the regions, districts, cities, and communes—called national committees—direct economic, cultural, and social development in their respective areas. The national committees elect general executive bodies—councils—and establish commissions to initiate and expedite the work of the committees. All representative bodies of state power are elected for five-year terms by universal and equal suffrage and direct and secret ballot. All citizens who have attained the age of 18 years may vote. Deputies to any representative body are required to take an oath.

The judiciary includes the Supreme Court of the CSSR, the Supreme Courts of the CSR and SSR, and regional, district, and military courts. Supervision of the observance of laws rests with the Procurator's Office, headed by the procurator general of the CSSR. Each of the constituent republics also has a procurator general.

Natural features

Czechoslovakia stretches for more than 750 km from west to

Table 1. Administrative divisions of Czechoslovakia
(1976)

Regions and cities with regional status	Area (sq km)	Population	Administrative center
Czech Socialist Republic	78,863	10,158,000	Prague
Prague (Praha)	497	1,176,000	—
Central Bohemia (Středočeský kraj)	11,002	1,139,000	Prague
South Bohemia (Jihočeský kraj)	11,347	676,000	České-Budějovice
West Bohemia (Západočeský kraj)	10,872	880,000	Plzeň
North Bohemia (Severočeský kraj)	7,810	1,149,000	Ústi nad Labem
East Bohemia (Východočeský kraj)	11,240	1,234,000	Hradec Králové
South Moravia (Jihomoravský kraj)	15,029	2,005,000	Brno
North Moravia (Severomoravský kraj)	11,066	1,899,000	Ostrava
Slovak Socialist Republic	49,014	4,815,000	Bratislava
Bratislava	368	350,000	—
West Slovakia (Západoslovenský kraj)	14,491	1,648,000	Bratislava
Central Slovakia (Středoslovenský kraj)	17,976	1,477,000	Banská-Bystrica
East Slovakia (Východoslovenský kraj)	16,179	1,341,000	Košice

east and 150–200 km from north to south. It is a country of uplands and low mountains, its natural landscape dominated by forests and forest-steppes.

Topography. The western part of the country is occupied by the Bohemian Massif, whose interior is a vast basin lying at an elevation of 200–400 m. The interior basin is divided into a series of smaller basins separated by uplands and crystalline and volcanic massifs ranging from 700 m to 900 m in elevation. Along the edges of the basin rise medium-elevation, predominantly flat-crested ranges: the Bohemian Forest and the Šumava in the southwest, the Ore Mountains (Krušné Hory) in the northwest, and the Krkonošě in the northeast. The prevailing elevation of these encircling mountains varies from 800 m to 1,200 m; the highest peak is Mount Sněžka (1,602 m) in the Krkonoše. In the southeastern part of the Bohemian Massif lie the Bohemian-Moravian Uplands. The section of the uplands known as the Moravian Kras has numerous karst landforms, among them the spectacular Macocha Gorge.

The eastern part of the country is dominated by mountains of the Carpathian system. The highest peak in Czechoslovakia and in the Carpathians, Gerlachovský Štít (2,655 m), is in the Tatra Mountains, which have well-defined glacial landforms. After the Tatras, the greatest heights occur in the Vel'ká and Malá Fatra, the Low Tatra, and the Slovak Ore Mountains, all of them deeply dissected, predominantly middle-elevation mountains. The Slovak Kras is noted for its karst formations, such as the famous Domica Cave. In the southern Carpathians rise the volcanic massifs of the Kremnica and Štiavnica mountains. The Central Danubian Plain enters Czechoslovakia from the south in two prongs, forming the Danubian Lowland in the south and southwest and the Tisza Lowland in the southeast. The elevation of the lowlands rises from 100–200 m in the south to 200–400 m near the Carpathians.

Geological structure and minerals. The western part of Czechoslovakia, the Bohemian Massif, is the core of the ancient basement of Variscan folding in Central Europe. The eastern part of the country, coinciding with the Western Carpathians, belongs to the Alpide geosynclinal region. The basement of the Bohemian Massif is composed of Precambrian gneisses, migmatites, schists, and granulites and of Paleozoic slates, quartzites, and sandstones. The sedimentary cover is made up of Cretaceous and Cenozoic, mainly clastic, rocks. The basement of the Carpathians consists of Precambrian and Paleozoic metamorphic rocks intruded by Variscan granitoids. (Such intrusions also occur in the Bohemian Massif.) The folded Mesozoic and early Cenozoic complex of the Carpathians (limestone, sandstone, flysch) serves as the foundation of late Cenozoic molasse basins filled mainly with sand-clay sediments and extrusive rocks.

The country's principal mineral resource is coal—the hard coal of the Ostrava-Karviná Basin and the brown coal of the North Bohemian Basin. Petroleum and gas deposits occur in the northern part of the Viennese and Pannonian basins and in the Ciscarpathian Foredeep. In the Spišská-Hemerska Ore Region of Slovakia iron-ore deposits are worked at Rudňaný and Nižna-Slana and manganese ore deposits at Kišovce-Svabovce. There are numerous hydrothermal lead and zinc deposits in Bohemia (Příbram, Kutná Hora, Stříbro), North Moravia (Zlaté Hory, Horní Benešov, Horní Město), and the Spišská-Hemerska Ore Region (Banská Štiavnica). Hydrothermal copper deposits are found in Moravia (Staré Ransko) and Slovakia (Slovinky, Rudňaný, Rožňava). In the Ore Mountains deposits of tin and tungsten ore (Cinovec, Krupka) are associated with Variscan granitoids. The uranium deposits at Příbram and Mimoň and in the Bohemian-Moravian Uplands are associated with hydrothermal veins. The schists and granitoids of the Carpathians contain veins of antimony ore, mined at Pezinok Pernek, Magurka, Medzibrod, Čučma, and Zlata Idka. The Cenozoic volcanic rocks of the Slovak Ore Mountains contain mercury deposits. Other deposits include fluorite, graphite, baryte, pyrite, kaolin, magnesite, and construction materials.

Czechoslovakia is rich in therapeutic mineral springs, including thermal springs, many of them associated with the Precambrian and Paleozoic rocks of the Bohemian Massif and with tectonic dislocations in the Carpathians. The most famous are the alkaline springs of Karlovy Vary and Mariánské Lázně, the hydrocarbon springs of Teplice, the sodium sulfate springs of Františkovy Lázně, the hydrogen sulfide springs of Trenčianske Teplice, and the radioactive springs of Jáchymov and Teplice.

Climate. The country's temperate climate becomes more continental from west to east and in the intramontane basins. The mean January temperature ranges from −1° to −4°C in the plains, dropping to −7°C in the mountains of the Bohemian Massif and to −10°C in the Carpathians. In winter there are frequent temperature inversions in the intramontane basins. The mean July temperature, 19°–21°C in the plains, can fall to as low as 8°C in the mountains of the Bohemian Massif, and 4°C in the Carpathians. The annual precipitation varies from 450 mm to 700 mm in the plains; in the mountains it increases rapidly with elevation, reaching 1,600 mm in the Bohemian Massif and 2,100 mm in the Carpathians at a height of about 2,000 m. The maximum precipitation falls in the summer, although droughts may occur in the plains at this time of the year owing to the strong evaporation. In the plains the snow cover, often unstable and broken by thaws, lasts 1½ to two months. Its duration increases to 2½ or three months in the mountains and to six months on the crests of the Carpathians.

Rivers and lakes. The country has a dense network of relatively short rivers. Among its largest rivers are the Danube, whose middle course flows through the country, the Váh and the Morava, both tributaries of the Danube, the upper reaches of the Oder and Labe (Elbe), and the Vltava, a tributary of the Elbe. The Tisza River, another tributary of the Danube, flows along the eastern border of Czechoslovakia for a short distance and receives the waters of the Hornád and Ondava. Most of the rivers have spring high water, resulting from the melting of snow in the mountains and foothills; heavy summer rains may cause flooding. The rivers are frozen for one or two months in the winter. The Danube and the Labe and the lower reaches of the Vltava are navigable, and hydroelectric power plants have been built on the Váh and Vltava. The country's lakes, mainly of glacial or tectonic origin, are small. Its numerous ponds, covering a total area of 50,000 ha, chiefly in South Bohemia, are used for fish raising and water supply.

Soils. The most common soils are the brown and mountain-brown forest soils typical of deciduous and mixed forests. Mountain podzolic soils are found in the upper part of the mountain forest belt, and mountain meadow soils occur under alpine meadows. In unforested areas, soddy brown-earth soils have developed under secondary meadows, and soddy calcareous soils (rendzinas) have formed on calcareous rocks. The plains of Central Bohemia and South Moravia are covered with chernozem-like soils, generally leached and podzolized but sometimes calcareous, and the valleys of the Danube, Labe, Morava, and other major rivers have alluvial soils. The soils of the plains and gentle mountain slopes are for the most part plowed up.

Flora. Cultivated steppes with small planted groves of oak and pine predominate to an elevation of 300 m. Forest-steppes, which in earlier times made up most of the vegetative cover of the plains, have survived only on unproductive lands and in preserves. At elevations of up to 600–700 m plowlands alternate with forests of oak or oak and beech. Between 600–700 m and 1,100–1,200 m the landscape is dominated by beech and fir-and-beech forests, above which spruce and fir forests grow to elevations of up to 1,400–1,500 m. About one-third of the country is forested, with conifers covering 71 percent of the area. The most common coniferous species is spruce, accounting for 48 percent of the forested area. Most of the forests are in the Carpathians and in the mountains of the Bohemian Massif. Between 1,400–1,500 m and 1,600–1,700 m the forests give way to *Krummholz* and then to scrub and subalpine and alpine meadows.

Fauna. Among the more common mammals are the brown bear, wolf, lynx, fox, marten, ermine, deer, wild boar, roe deer, hare, squirrel, and hedgehog. Birds include capercaillies, partridges, storks, goatsuckers (*Caprimulgus europaeus*), hoopoes (*Upupa epops*), kingfishers, and eagles. The rivers and ponds abound in trout, carp, salmon, grayling, pickerel, perch, burbot, and lamprey.

Preserves. Some 170,000 hectares (1976), mostly forests, have been set aside as protected areas. In addition to the famous Tatra

People's Park and the Krkonoše and Pěniny national parks, there is a network of sanctuaries and natural landmarks, notably the Karlstein and Bohemian Paradise.

Natural regions. There are four distinct natural regions: the Bohemian Massif, the Western Carpathians, and the Danubian and Tisza lowlands. On the Bohemian Massif rolling plowed-up plains alternate with low and middle-elevation mountains covered with beech, oak, and mixed forests. The Western Carpathians consist of middle-elevation and high mountain ranges whose landscapes change with elevation: mixed and coniferous forests are succeeded by *Krummholz*, which gives way to subalpine and alpine meadows. The Danubian Lowland is an undulating plain, mostly plowed up, with tracts of oak forests. The Tisza Lowland encompasses a rolling plowed-up plain and low mountains clothed with oak and beech forests.

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Population

The basic population of Czechoslovakia consists of two nations, the Czechs and the Slovaks, each having its own republic. In 1977 the population was estimated to include 9,612,000 Czechs, 4,526,000 Slovaks, 598,000 Hungarians, most of them living in southern Slovakia, 76,000 Germans, 78,000 Poles, and 60,000 Ukrainians and Russians. About two-thirds of the believers are Roman Catholics, and the remainder are Protestants (Bohemian Brethren, Evangelicals, or Calvinists), Uniates, or Greek Orthodox. The official calendar is the Gregorian.

The population has been steadily growing; the censuses of 1960 and 1970 showed that the population had increased from 13,698,000 to 14,350,000. The rate of natural increase, per 1,000 population, was 6.7 in 1960, 6.4 in 1965, 4.3 in 1970, and 8.0 in 1975. In view of the diminishing rate of natural increase in the 1960's, the government adopted a vigorous demographic policy aimed at ensuring a higher birthrate. As for social composition, statistics from the end of 1976 indicate that workers made up 61 percent of the total population; office employees, 28 percent; peasants and artisans belonging to cooperatives, 10 percent; and independent peasants and artisans and members of the liberal professions, about 1 percent. In 1976 the labor force totaled 7,476,000 persons, of whom 80.6 percent (83.3 percent in 1960) were engaged in material production and 19.4 percent in the nonproduction sphere. A breakdown of the production sphere showed that industry accounted for 38.6 percent of the work force, construction for 9.6 percent, agriculture and forestry for 15.3 percent, transportation and communications for 6.7 percent, and other sectors for 10.4 percent. The nonproduction sphere included those employed in public health and social insurance (4.4 percent) and in the field of education, culture, or sports (6.3 percent).

The population density averages about 117 persons per sq km for the country as a whole and about 129 persons per sq km in the CSR. The most densely populated regions are the Ostrava-Karviná and Prague-Central Bohemia industrial conurbations, with about 650 and 500 persons per sq km, respectively.

A land with a very old urban culture, Czechoslovakia has many nationally distinctive cities that date from the early Middle Ages. Today, urban dwellers, classified as those living in cities or urban-type communities, account for 66.3 percent of the country's population. Apart from the three major historical urban centers—Prague in Bohemia, Brno in Moravia, and Bratislava in Slovakia—only Ostrava, Plzeň, and Košice have more than 100,000 inhabitants. Most Czechoslovak cities have a population of less than 50,000.

Historical survey

The territory of Czechoslovakia has been inhabited since the Paleolithic. Archaeological excavations have uncovered the remains of Upper Paleolithic permanent dwellings built by mammoth hunters at Dolní Věstonice, Pavlov, and other sites. In the Neolithic farming spread among the tribes of the Linear Pottery culture. During the Bronze Age, best represented by the Únětice culture, the area was a focal point of Central European metalworking. The Iron Age Hallstatt culture flourished here in the first half of the first millennium B.C. Around the fourth century B.C. the area was settled by Celts, who founded numerous urban artisan and trade centers, *oppida*, of which the best known are Hrazani, Stradonice, Závist, and Staré Hradisko. At the beginning of the Common Era, the power of the Celts was broken by the Germanic Marcomanni and Quadi tribes, who advanced as far as the Váh River. In the first and second centuries A.D. the Germanic tribes fought against the Romans, who occupied part of Slovakia. The arrival of Slavic tribes in the middle of the first millennium coincided with the decline of the primitive communal system among the tribes.

Early feudal period (sixth to mid-11th century). In the second half of the first millennium plow farming developed among the Slavs, mainly in connection with expanding land settlement, an irregular three-field system was adopted (tenth century), and handicrafts were gradually becoming separated from agriculture. The most famous of the fortified settlements, or *hrady*, founded by the Slavs was Pražský Hrad, built at the turn of the ninth century. The development of the city as a handicraft and commercial center surrounded by trade and artisan settlements (Staré Město on the Morava River)—accompanied by the social stratification of Slavic society and the rise of an elite—signaled the transition to an early feudal class state. The earliest rudimentary states were tribal principalities encompassing a network of *hrady*. The territory of modern Czechoslovakia formed part of Samo's state in the seventh century and was included in the Great Moravian State in the ninth and early tenth centuries.

The development of early feudalism in Great Moravia was facilitated by the spread of Christianity in the ninth century, introduced by the Slavic educators Cyril and Methodius, who devised the Slavic writing system. Feudal fragmentation (late ninth century) and the loss of its Bohemian (895) and Lusatian (897) lands weakened the Great Moravian State in its struggle against the expansion of the German feudal lords and enabled the nomadic Magyars to conquer some of its territory in the early tenth century. The Magyar conquest interrupted the amalgamation of the Bohemian-Moravian and Slovak tribes into one nationality, a process that had begun in the eighth century.

In Bohemia, the unification of tribal principalities ended in the early tenth century with the formation of a Bohemian state under the Přemyslid princes. Moravia was incorporated into Bohemia in 1029 (1019 according to some sources). In the first quarter of the 11th century Slovakia was absorbed into the Kingdom of Hungary, remaining under Hungarian rule until the formation of a unified Czechoslovak state in 1918. Over the centuries two nationalities would emerge on the territory of modern Czechoslovakia: the Czech people, who included the Moravians, although the latter preserved their ethnic distinctiveness, and the Slovaks.

Mature feudalism (mid-11th to the 15th century). Feudal fragmentation, affecting the Czech lands by the mid-11th century and Slovakia by the 13th century, was an important factor in the consolidation of the feudal seigniory and the establishment of fully developed conditional land tenure. The growth of productive forces from the 11th to the 14th century was accompanied in some regions, from the early 13th century, by the influx of large numbers of Germans into the cities and the countryside, first in the Czech lands and then in Slovakia as well. This period saw the evolution of the basic groups making up the feudal class: ecclesiastical feudal lords, secular feudal lords (*pán*), and lesser nobles (*vladyka*). Foreign trade linked the Czech lands and Slovakia with all of Central Europe and parts of Western and Eastern Europe. In the countryside the expansion of commodity production led to the introduction of monetary feudal rent. In Slovakia, which as part of the Kingdom of Hungary was subjected to the tyranny of Hungarian magnates and magyarization, the rate of economic development was slower than in the Czech lands. In the early 1240's southwestern and southeastern Slovakia and Moravia were invaded by the Mongol Tatars.

Bohemia became a powerful feudal estate monarchy under Emperor Charles IV of the Luxembourg dynasty (Charles I of Bohemia), who ruled from 1346 to 1378. Nevertheless, the political consolidation of the Czech lands was not destined to be completed in the 14th and early 15th centuries, partly owing to German feudal expansion, albeit in such a covert form as the settlement of German colonists, disrupting the ethnic homogeneity of the country. In Slovakia the strengthening of royal authority took place in the 14th century under the Anjou dynasty.

Intensified feudal exploitation of the Bohemian and Moravian peasantry by the ecclesiastical and secular feudal lords, corruption within the Catholic Church, and growing German domination in both the countryside and the cities, where the patriciate was predominantly German, gave rise to an opposition movement in the Czech lands in the late 14th and early 15th centuries. The movement took the form of popular heresies and the teachings of such preachers as Jan Milíč of Kroměříž and Matthew of Janov. The religious reforms advocated by these preachers, and especially the ideas of Jan Hus and his followers, notably Jerome of Prague, paved the way for the development of the Hussite revolutionary movement, a powerful and broadly based social-revolutionary, national liberation, and anti-Catholic movement. From the very outset the Hussites were divided into the moderate Calixtines and the radical Taborites.

The German Emperor Sigismund I and Pope Martin V failed in their attempts to suppress the Hussites by launching crusades against them (1420, twice in 1422, 1427, and 1431). Led by such gifted generals as J. Žižka and Prokop the Great, the Hussites repulsed the invasions of the crusaders. The treachery of the Calixtines and the dissension among the Taborites weakened the revolutionary forces, however, and in 1434 the Taborites were routed at the battle of Lipany. Despite its defeat, the Hussite revolutionary movement, as the wellspring of the revolutionary and national traditions of the Czech people, was a crucial period in the history of the Czech lands. In Slovakia, the dissemination of Hussite ideas fanned the Slovak burghers' struggle against the domination of the German patriciate, a struggle that had begun in the previous century. Taborite troops marched through Slovakia during their campaign against Hungary from 1428 to 1433. The large numbers of Taborites who escaped to Slovakia after the suppression of the Hussite movement formed the backbone of the anti-feudal Brethren movement, which lasted from 1445 to 1471. The Hussite revolutionary movement strengthened the linguistic and cultural ties between the Czechs and the Slovaks.

Late feudalism (16th to 18th centuries). A gradual shift to "second serfdom" took place in the Czech lands and Slovakia from the late 15th century. Seeking to expand their deliveries of agricultural products to markets, the feudal lords increased the peasants' obligations and began to rely more heavily on labor services, especially after 1550. The growing feudal exploitation exacerbated the class struggle and precipitated peasant uprisings. After the suppression of the Dózsa Rebellion in 1514, in which the Slovak peasantry took part, the Hungarian feudal lords legalized the enserfment of the Hungarian and Slovak peasantry. A decade later there were reverberations of the German Peasant War of 1524–26 among the peasants and miners of Bohemia.

Another sign of feudal reaction was the political domination of the magnates, whose influence increased as royal power declined under the Jagiellonian kings Vladislav II and Louis II, who ruled Bohemia from 1471 to 1516 and from 1516 to 1526, respectively. Inasmuch as the king of Bohemia also occupied the Hungarian throne from 1490 to 1526, the Czech lands and Slovakia were temporarily unified under one monarch. The decline of royal authority weakened the Czech lands and Slovakia in their struggle against Ottoman aggression. King Louis perished at the battle of Mohács (1526), in which the Turks inflicted a crushing defeat on the small Hungarian-Czech Army.

In 1526 the Czech feudal lords elected a Hapsburg to the throne; the Austrian archduke Ferdinand, who ruled from 1526 to 1564. The Czech lands were to remain an integral part of the Hapsburg monarchy until 1918. As a result of the Austro-Turkish wars of 1532–33 and 1540–47, most of Slovakia also came under Hapsburg rule in 1547 as part of the Kingdom of Hungary. The Slovaks in the Hapsburg monarchy were thus subjected to double national oppression, by both Hungarian and German-Austrian feudal lords. Southern Slovakia fell under the control of Ottoman feudal lords. In the Czech lands and the part of Slovakia that was under the Hapsburgs, German-Austrian ascendancy in the bureaucracy, urban life, and commerce and increasingly heavy taxation provoked the opposition of some of the nobility and burghers and stimulated the spread of the Reformation. The first open revolt against the Hapsburgs in the Czech lands, the Czech uprising of 1547, was suppressed. The next major anti-Hapsburg insurrection, the Czech uprising of 1618–20, precipitated the Thirty Years' War (1618–48).

After the defeat of the Czech troops by the Hapsburg forces and their allies in the battle of the White Mountain (Bílá Hora, 1620), the Czech lands lost their political autonomy and became hereditary possessions of the Hapsburgs. The privileges of the estate Diets were reduced to a minimum. In the ensuing period of feudal Catholic reaction and religious persecution, the land belonging to the Czech nobility and the cities was confiscated and turned over to foreigners, mainly Germans. Large numbers of Czechs emigrated. Meanwhile, the population of Slovakia, which was fully incorporated into the Hapsburg Empire under a peace treaty concluded at the Karlowitz Congress of 1698–99, also suffered great hardships. In Slovakia, the almost ceaseless warfare between Turkish and Hapsburg troops and the anti-Hapsburg revolts of the Hungarian nobility hindered the development of the area's productive forces and accelerated the decline of urban life, handicrafts, and agriculture.

The second half of the 17th century saw the culmination of "second serfdom" in the Czech lands and Slovakia, a situation made all the more intolerable by the Counter-Reformation. The growing feudal exploitation provoked numerous antifeudal peasant uprisings in the 17th and 18th centuries, of which the largest were the *kurucok* uprisings in Slovakia in 1672 and 1697 and the Czech uprisings of 1680 and 1775. The Austrian government was obliged to regulate the peasants' obligatory services through legislation, promulgating *corvée* patents in 1680, 1717, 1738, and 1775. Centralized manufacture arose in the Czech lands in the middle of the 18th century and somewhat later in Slovakia. Capitalist elements developed in the economy under conditions of absolutist Hapsburg rule and the germanization of the Czechs and the magyarization of the Slovaks.

Decline of feudal serfdom and development of capitalist economy; the national revival (late 18th and first half of the 19th centuries). A rapid growth of productive forces, beginning in the Czech lands in the late 18th century and in Slovakia in the early 19th century, hastened the decline of the feudal system and created conditions more favorable to capitalist enterprise. Another contributing factor was the abolition of the personal dependence of the peasants, which took place in the Czech lands in 1781 and in Slovakia in 1785. The industrial revolution, reaching the Czech lands in the early 19th century and Slovakia in the 1840's, gave impetus to the formation of new classes: an industrial bourgeoisie, predominantly German in the Czech lands and German and Hungarian in Slovakia, and a factory and agricultural proletariat.

The shift from feudalism to capitalism was accompanied by the emergence of the Czech and Slovak nations against the background of national oppression, an upsurge in the national movement, resistance to forcible germanization and magyarization, and efforts to develop the native language, literature, science, and art. In Czechoslovak historiography the period of the late 18th and first half of the 19th centuries is known as the National Renaissance, and the Czech and Slovak intellectuals who played a decisive role in fostering national consciousness and creating a national culture are called the awakeners. The idea of Slavic brotherhood expounded by J. Kollár played an important role in the Czech and Slovak national movement.

In the 1830's and 1840's the national movement began assuming a political character and attracting the popular masses. Learned and educational societies were founded, among them the Matice Česká (1831). The Czech national movement split into the radical democrats, whose spokesman was K. Sabina, and the national liberals, headed by F. L. Rieger and F. Palacký, whose national political program rested on the concept of Austro-Slavism. The ideology of the nascent Slovak bourgeoisie was essentially formulated by L. Štúr and J. Král, who headed the national movement in the 1830's and 1840's. Radical democratic

and revolutionary sentiments became stronger in the Slovak national movement in the 1840's.

Premonopoly capitalism (until the end of the 19th century). The intensity and complexity of the class and national antagonisms in the Czech lands and Slovakia made them an arena of revolutionary events in 1848–49, which were an integral part of the Revolution of 1848–49 in the Austrian Empire. The revolutionary democratic movement in the Czech lands culminated in the Prague uprising of 1848. The leaders of the Czech liberal bourgeoisie, which was frightened by the sweep of the democratic movement, leaned increasingly toward cooperation with the Hapsburgs. Concurrently, the radicals' attempt to incite an anti-Hapsburg uprising in May 1849 failed. In Slovakia, the revolutionary movement was closely tied to the Revolution of 1848–49 in Hungary. On May 10, 1848, the programmatic Demands of the Slovak People were adopted in Liptovský Mikuláš. Rejecting these demands, the noble-dominated government of revolutionary Hungary gave the Hapsburgs an opportunity to use the Slovaks in the struggle against the revolutionary forces in Hungary.

After quelling the revolutionary movement in 1849, the Hapsburgs nullified most of the gains won during the revolution in the Czech lands and Slovakia. They did not, however, rescind the Patent of Sept. 7, 1848, liberating the Czech peasants from feudal dependence and abolishing the *corvée* in return for redemption payments, and by the Patent of Mar. 2, 1853, they confirmed the abolition of personal dependence and the *corvée* (for part of the peasantry) in Slovakia. These measures opened the way for a freer development of capitalist relations. By the end of the 1860's the industrial revolution had transformed most of the industries in the Czech lands, now the most highly industrialized part of the Hapsburg monarchy. Small-scale production continued to prevail in Slovakia, which owing to historical circumstances lagged far behind the Czech lands economically.

The development of capitalist industry in the Czech lands and Slovakia was at this time almost exclusively financed by German-Austrian and Hungarian capital. Czech and Slovak capital investments were confined to industries processing agricultural raw materials and, in the Czech lands, also to enterprises manufacturing food-processing or farm machinery. The Czech Živnostenská Bank, founded in 1869, played a major role in the consolidation of Czech national capital. The trend toward concentration of production and the centralization of capital intensified in the Czech lands shortly after the economic crisis of 1873; in Slovakia this process did not begin until the 1890's. The formation of the basic classes of capitalist society—a national bourgeoisie and a proletariat—was completed in the latter half of the 19th century.

The Czech bourgeois National Party, founded around 1860, called for the reorganization of the Hapsburg monarchy along federal lines and broad autonomy for the Czech lands. The Slovak national movement also gained momentum in the early 1860's. The Martin Declaration, drawn up at a national congress convened in Turčianský Sv. Martin in 1861, demanded autonomy for Slovakia, and the Matica Slovenská, a cultural and educational society, was founded in 1863.

When the Hapsburg Empire was transformed into the dual monarchy of Austria-Hungary by the Austro-Hungarian agreement of 1867, the Czech lands became part of Cisleithania, ruled by Austria, and Slovakia was included in Transleithania, governed by Hungary. The establishment of the dual monarchy wrecked the political plans of the Czech bourgeoisie, which had hoped to see the Austrian Empire transformed into a federal state. Dual rule meant that the dominant position of the Hungarian and German-Austrian nationalities would be strengthened at the expense of the Slavic peoples.

In the late 1860's and early 1870's the Czech national movement, headed by the Czech bourgeoisie, began attracting the masses and assumed a general democratic character. People's rallies (*tábory*) were held demanding political independence, national equality, and universal franchise. In 1874 the Czech National Party split into the conservative Old Czechs and the left-wing Young Czechs. A division into conservatives and liberals also took place in the national movement of Slovakia, where magyarization was stepped up after 1868.

Socialist ideas spread through the Czech lands from the late 1860's, largely through the efforts of J. B. Pecka, L. Zápotocký, and J. Hybeš. The development of class consciousness among the Czech and Slovak workers was influenced by the strike movement, notably the Sárov Strike of 1870 and the strikes of the early 1870's in Banská Štiavnica. The Czechoslovak Social Democratic Labor Party was founded in 1878 as a member of the Social Democratic Party of Austria, becoming a separate party in 1893. The workers of the Czech lands and Slovakia participated in the May Day celebrations of 1890, and in 1893 they joined the working class of the other peoples of Austria-Hungary in agitating for universal franchise. Trade union organizations were founded in the Czech lands and Slovakia in the 1890's.

Several Czech political parties emerged in the late 19th century to promote the interests of various groups of the national bourgeoisie; the most influential of them was the Czech Progressive Party, whose founder and ideologist was T. G. Masaryk. In the early 20th century the Slovak national movement also separated into several currents: conservative, liberal (V. Šrobár), clerical (A. Hlinka), and agrarian (M. Hodža). From the late 1880's the leaders of the Czech and Slovak national movements showed an increasing desire to join forces in the struggle for the democratization of the Austro-Hungarian monarchy and for the solution of the national problem. In advocating the national liberation of their people, Slovak liberals urged close Czech-Slovak cooperation.

Monopoly capitalism (until 1918). The economic crisis of 1900–03 intensified the concentration and centralization of industrial production and capital in the Czech lands and Slovakia, a trend that had begun in the late 19th century: by 1913 the Czech lands accounted for 60 percent of the industrial output of the empire. The importance of Czech national investment capital increased: from 1900 to 1913 the proportion of the empire's capital that was controlled by Czech banks rose from 7.9 percent to 13.3 percent. Czech capital was exported to the Balkans and to Russia. In both the Czech lands and Slovakia there were large farms organized on a capitalist basis. The exploitation of the working people, national oppression, and the denial of political rights caused a powerful upsurge in the labor and general democratic movement. Under the impact of the Revolution of 1905–07 in Russia a mass campaign for universal suffrage unfolded in the Czech lands and Slovakia. The government was obliged to carry out an electoral reform, instituted in the Czech lands in 1907 and in Slovakia in 1912. The Czech and Slovak labor movement was adversely affected by Austro-Marxism and lacked unity.

During World War I intensified exploitation and national oppression, political terror, and a rapidly deteriorating economic situation caused a spontaneous upwelling of indignation among the working people in the Czech lands and Slovakia. Antigovernment demonstrations assumed a mass character, and Czech and Slovak soldiers and officers deserted or surrendered in droves. (In late 1916 there were more than 250,000 Czech and Slovak prisoners in Russia alone.) The Austrian government had the support of most of the Czech political parties, which in the fall of 1916 united to form the Czech Federation, a coalition of Reichsrat deputies from nine Czech parties, including the Czechoslovak Social Democratic Labor Party. At the same time, the pro-Austrian National Committee was formed in Prague by representatives of seven political parties. The policy of the Hungarian government received the wholehearted support of the Slovak bourgeois parties, especially the clericalists.

Nevertheless, pro-Entente sentiments became stronger among Czech and Slovak political circles during the war, with some pro-Entente groups, notably the Young Czechs and National Socialists, leaning toward tsarist Russia and others, mainly the political groupings of the Czech liberal bourgeoisie and intelligentsia, gravitating toward Great Britain and France. Some political activists among the Slovak bourgeoisie, notably Šrobár and Hodža, also shared the views of the pro-Entente politicians. Meanwhile, the émigré leaders of the Czech (Masaryk, E. Beneš) and Slovak (M. Štefánik) bourgeoisie founded a political center in Paris called the Czechoslovak National Council, opened negotiations with the Entente powers aimed at winning recognition for an independent Czechoslovak state after the war, and began organizing Czechoslovak military units in Russia, France, and Italy to fight on the side of the Entente. The revolutionary, antiwar, and

national liberation movement in the Czech lands and Slovakia escalated under the impact of the February Bourgeois Democratic Revolution of 1917 in Russia. The liberation movement in the Czech lands and Slovakia assumed mass proportions in the summer and fall of 1917.

Formation of the bourgeois Czechoslovak republic (1918). The Great October Socialist Revolution gave a powerful stimulus to the liberation struggle of the Czech and Slovak peoples. In late 1917 and early 1918 all of Austria-Hungary was engulfed by a wave of rallies, demonstrations, and strikes expressing solidarity with the proletarian revolution in Russia. In January 1918 a general strike broke out in the Hapsburg Empire, including the Czech lands and Slovakia. The working people called for peace on the basis of the Soviet proposals, national self-determination, the democratization of public life, and improved food supplies. In February sailors stationed on the Gulf of Kotor rebelled. Mass desertions at the front and numerous spontaneous soldiers' revolts in the rear throughout the spring and summer of 1918 attested to the rapid disintegration of the Austro-Hungarian army.

In the face of a mounting revolutionary crisis, the National Committee in Prague was reorganized in July 1918. Headed by K. Kramář, the leader of the National Democrats, the committee now included representatives of all the Czech political parties, who announced their intention of working for the establishment of a sovereign Czechoslovak state. The escalation of the liberation movement in the country and the failure of the Entente powers to negotiate a separate peace with the Hapsburgs impelled these powers and the USA to recognize the Czechoslovak National Council in Paris as the basis of a future government. The diplomatic position of the bourgeois émigrés was strengthened by the outbreak, on May 25, 1918, of an anti-Soviet mutiny in the Czechoslovak army corps that had been formed in Russia during the war.

In September 1918 the Socialist Council was set up in Prague to coordinate the actions of the Czechoslovak Social Democratic Labor Party and the Czech Socialist Party. On the council's initiative a general strike was held on October 14; in a number of cities demonstrators called for the creation of an independent Czechoslovak republic. Confronted with the military defeat and imminent collapse of Austria-Hungary, the National Committee proclaimed the establishment of an independent Czechoslovak state on Oct. 28, 1918. Two days later the Slovak National Council, meeting in Turčiansky Sv. Martin, adopted a declaration demanding the creation of a unified state of Czechs and Slovaks.

From November 1918 to March 1939. On Nov. 14, 1918, the Provisional National Assembly confirmed the Hapsburg dynasty's loss of all rights to the Czech lands and proclaimed Czechoslovakia a republic. Masaryk was elected president, and Kramář headed the first coalition government. The borders of Czechoslovakia were established by the Versailles (1919), St. Germain (1919), and Trianon (1920) treaties between the victorious powers and Germany, Austria, and Hungary. The Transcarpathian Ukraine was included in Czechoslovakia despite the resolution on unification with the Soviet Ukraine that was adopted by the People's Congress in Khust in January 1919. The Těšín district, claimed by both Czechoslovakia and Poland, was divided between them by a decision of the Conference of Ambassadors of the great powers in the summer of 1920.

Czechoslovakia emerged as a multinational state, with Germans, Hungarians, Ukrainians, Poles, and other nationalities constituting about one-third of its population. It encompassed 22 percent of the territory, 26 percent of the population, and more than 70 percent of the industry of former Austria-Hungary. Its heavy reliance on foreign markets and raw materials was to make its economy unstable.

The first postwar years saw the rapid growth and strengthening of Czech finance capital. The large Czech banks that profited from the war—the Živnostenská, Prague Credit, and Agrarian banks—became the nuclei of powerful concerns that controlled dozens of joint-stock companies in industry, agriculture, trade, and money circulation. Relying on their representatives in the state apparatus and on the support of the Entente powers, the Czech monopolies gradually squeezed out Austrian, German, and Hungarian capital and strengthened their position in the economy of Slovakia and the Transcarpathian Ukraine, turning them into an agricultural raw-material appendage of the industrially developed Czech lands and a source of cheap labor. At the same time, large amounts of foreign capital, mainly French, British, and American, began flowing into the Czechoslovak economy. By the late 1920's foreign capital accounted for 20 percent of all the capital invested in the Czechoslovak national economy.

As many as 50 different parties and associations functioned in Czechoslovakia in the interwar years. The interests of big Czech industrial and banking capital were most openly championed by the Czechoslovak National Democratic Party. The largest bourgeois party in the country was the Agrarian Party, founded in 1899 and renamed the Republican Party of the Farming and Small Peasant Population in 1922. Initially representing the Czech rural bourgeoisie, which was able to influence a considerable part of the peasantry, the Agrarian Party became the chief party of Czechoslovak finance capital. The Czechoslovak Socialist Party, founded in 1897 as the Czech National Socialist Party, drew its support from the urban petite bourgeoisie, part of the intelligentsia, and some nationalistic workers. After merging with most of the Slovak Social Democrats in December 1918, the Czechoslovak Social Democratic Labor Party became the country's most broadly based political party.

The constitution adopted by the Provisional National Assembly in February 1920 gave legal form to the country's bourgeois-democratic republican system. Behind the rapid succession of coalition governments (20 cabinets were formed prior to March 1939), the affairs of state were directed by a group of leaders of the bourgeois and reformist parties, called the "five" until 1925 and the "eight" thereafter. From 1922 most of the Czechoslovak governments were headed by Agrarians.

In the first years of the bourgeois republic the ruling circles were obliged to carry out several social and political reforms. The nobility lost its political privileges, legislation was enacted providing for an eight-hour workday, state unemployment compensation was introduced, and medical insurance was made available to more people. In April 1919 a law was passed establishing the principles of agrarian reform, and in the first half of 1920 laws were enacted that determined the procedure for the expropriation, with compensation, and redistribution of landed property, belonging for the most part to German and Hungarian nobles. These limited reforms could not satisfy the working people. From early 1919 the country was gripped by a spreading mass movement protesting against high prices and speculation and demanding the nationalization of industry and a thorough democratic agrarian reform.

In April 1919 Czechoslovak troops took part in the Entente-organized armed intervention against the Hungarian Soviet Republic, established earlier that year. The Hungarian Red Army stopped the interventionists, passed to the offensive, and, supported by local working people, entered eastern Slovakia. On June 16, 1919, the Slovak Soviet Republic was proclaimed in Prešov. The republic lasted only until early July, when troops of the Czechoslovak bourgeois government occupied Slovakia.

The municipal elections of June 1919 and the parliamentary elections of April 1920 clearly demonstrated the radicalization of the working people and the general discontent with the policy of the ruling circles. The Social Democrats and Socialists received almost half of all the votes cast, and the right-wing Social Democrat V. Tusar was chosen to head the new coalition government. A left opposition crystallized within the Czechoslovak Social Democratic Labor Party (CSDLP) in the second half of 1919; it insisted that the party eschew coalitions with the bourgeoisie and pursue an independent policy serving the working class. In December 1919 the revolutionary wing of the CSDLP organized itself as the Marxist Left, headed by B. Šmeral, J. Hybeš, and A. Zápotocký. Elections of delegates to the next regular party congress, held in the summer of 1920, gave an absolute majority to the Marxist Left. The Thirteenth Party Congress, duly convened in September, endorsed the formation of the CSDLP (Left). The party's right-wing leaders refused to accept the decisions of the congress. On December 9 the police seized the building occupied by the Executive Committee of the Marxist Left and sealed off the printing plant of the newspaper *Rudé právo*, thereby sparking a political strike (*see* DECEMBER POLITICAL STRIKE OF 1920). The December events hastened the formation of a

Communist Party. A congress of the CSDLP (Left) held in Prague on May 14–16, 1921, voted to assume the name "Communist" and to join the Comintern. The Unification Congress (Oct. 30–Nov. 4, 1921) completed the formation of the united Communist Party of Czechoslovakia.

In their foreign policy in the 1920's the Czechoslovak ruling circles aimed at consolidating the country's position within the Versailles system and looked to France as the chief guarantor of this system. The Little Entente, a military and political alliance between Czechoslovakia, Rumania, and Yugoslavia, was formed under the aegis of France in 1920–21. A Franco-Czechoslovak military and political treaty was concluded in 1924. After the collapse of the anti-Soviet armed intervention in 1918–20 and the failure of the capitalist countries to impose their will on Soviet Russia at the Genoa Conference of 1922, Czechoslovakia signed the Provisional Treaty with the RSFSR (Prague, June 5, 1922) and another treaty with the Ukrainian SSR (June 6). These treaties provided for mutual de facto recognition and for the establishment of trade and economic relations. Continuing, however, to support the anti-Soviet policy of the Western powers, Czechoslovakia participated in the Locarno Conference in 1925 and signed the Locarno Treaties, which greatly complicated its foreign policy without guaranteeing the security of its borders.

With the exception of a few brief recessions, such as the industrial slowdown of 1926, industrial and agricultural production increased steadily between 1924 and 1929, when the general indexes exceeded prewar levels. With the partial stabilization of capitalism, opportunist elements became more aggressive in the labor movement. In February 1929 the Fifth Congress of the Communist Party removed from the leadership the right-opportunist group that had formed around V. Bolen and B. Jilek and elected a new Central Committee headed by K. Gottwald.

The first symptoms of a world economic crisis were felt in Czechoslovakia as early as 1929. By the time the crisis reached its height in the spring of 1933, industrial output had dropped by more than one-third from the 1929 level. According to official statistics, unemployment reached 920,000 in late February 1933. The Communist Party headed the working people's struggle against the attempts of the bourgeoisie to resolve the crisis at their expense. The Communists led strikes and mass protests of the unemployed. The 1932 Most Strike in the North Bohemian Coal Basin, a political event of European significance, forced the employers and the government to satisfy some of the miners' demands. The economic depression intensified the conflicts among and within the various groups of Czechoslovak finance capital and between the bourgeoisie of the country's different nationalities.

The fascist victory in Germany complicated Czechoslovakia's international and domestic political situation. Czech fascist organizations that had arisen in the mid-1920's stepped up their activity. Fascist separatist elements gained the upper hand in the Slovak People's Party, which had been founded in 1918. The Sudeten German Party, founded in October 1933 by K. Henlein, became Hitler's tool. The threat of aggression by fascist Germany, the growing international prestige of the USSR, and the pressure of the popular masses obliged the Czechoslovak government to extend de jure recognition to the USSR in June 1934, and after the signing of the Franco-Soviet mutual assistance treaty, to conclude a similar treaty with the USSR in May 1935. Guided by the decisions of the Seventh Congress of the Comintern, the Communist Party proposed the formation of a united popular front to combat the mounting reaction and threat to national independence. The profascist forces were defeated in the parliamentary elections of May 1935, although Henlein's followers managed to poll two-thirds of the German votes. Neither did the extreme reactionaries succeed in electing their candidate in the presidential elections of December 1935, won by E. Beneš.

Nevertheless, the sabotage of the reformists and Agrarians prevented the formation of a united antifascist front. The ruling circles of Czechoslovakia followed the French and British policy of appeasing the aggressor. At a congress held in Karlovy Vary in April 1938, Henlein's supporters demanded autonomy for the Sudetenland. The next month German and Polish troops began massing along Czechoslovakia's borders. The Czechoslovak government announced a partial mobilization, but under the pressure from Lord Runciman's "unofficial" British mission, which arrived in Prague in July, it yielded to almost all the Karlovy Vary demands. Despite the concessions, Henlein's followers, acting on direct orders from Berlin, demanded the immediate unification of the Sudetenland with Germany. On September 12 they staged an armed putsch.

On September 21 the government of the Agrarian Hodža accepted, with the consent of President Beneš, the Anglo-French ultimatum to cede the border regions of Czechoslovakia to Germany. The next day the Communist Party initiated a general political strike. When the Hodža government resigned in favor of a new cabinet formed by General J. Syrový, Beneš assured Great Britain and France that the change of government did not mean a refusal to accept their demands. The ruling circles of Czechoslovakia rejected the military assistance that the Soviet government was ready to give under the Soviet-Czechoslovak treaty of 1935 even if France should refuse to aid Czechoslovakia. On September 29 the governments of Great Britain and France concluded the Munich Pact with Germany and Italy on the dismemberment of Czechoslovakia (*see* MUNICH PACT OF 1938). In early October 1938 fascist Germany occupied the Sudentenland. On October 2 bourgeois-landlord Poland seized the Těšín district, and on November 2, in accordance with the Vienna Arbitration, Horthy's Hungary appropriated the southern regions of Slovakia and of the Transcarpathian Ukraine. As a result, Czechoslovakia lost one-third of its territory and population, more than 40 percent of its industry, and a considerable part of its raw-material resources.

Czechoslovakia found itself completely dependent on fascist Germany, both politically and economically. The Communist Party was outlawed, first in Slovakia, where an autonomous government was formed by J. Tiso, the leader of the separatists, and later in the Czech lands. On March 14, 1939, the Slovak separatists, acting in concert with Berlin, proclaimed the formation of an "independent Slovak state." The next day German troops occupied the Czech lands, which on Hitler's orders were transformed into the Protectorate of Bohemia and Moravia. The Transcarpathian Ukraine was seized by Horthy's Hungary. The Soviet government alone refused to recognize the destruction of Czechoslovakia, branding Germany's actions as a lawless act of aggression.

Fascist German rule; the struggle of the peoples of Czechoslovakia against Nazi oppression (from March 1939 to May 1945). A brutal occupation regime was established in the Protectorate. The economy was subordinated to German monopolies and placed at the service of the Nazis' militarist plans. After signing treaties with Germany in 1939–40 establishing a military and political alliance and pledging economic cooperation, the Slovak puppet government drew Slovakia into the war on the side of the fascist axis. The reactionary circles among the Czech bourgeoisie embarked on open collaboration with the occupation forces. Some of the bourgeois political leaders, headed by Beneš, emigrated to the West. In 1939 they formed in Paris the Czechoslovak National Committee, which became the basis of a provisional government formed in London the following year. The Communist Party headed the resistance to the aggressors and their confederates. The activity of the underground Communist organizations (the Communist Party of Slovakia was constituted as a separate entity in the spring of 1939) was directed by the Moscow-based united party center, headed by Gottwald. At first the resistance to the occupation forces generally took the form of strikes, demonstrations, and acts of sabotage.

After the USSR entered the war with fascist Germany, it was the first power in the anti-Hitler coalition to recognize the Czechoslovak government in London. On July 18, 1941, the USSR and the provisional government signed an agreement on military cooperation that provided for the restoration of Czechoslovakia within the pre-Munich borders. Meanwhile, in the USSR a Czechoslovak military unit was being formed under the command of L. Svoboda that would subsequently grow into the First Czechoslovak Army Corps. The first partisan detachments were organized in Czechoslovakia in the summer of 1942. A Soviet-Czechoslovak treaty on friendship, mutual assistance, and postwar cooperation was signed in Moscow on Dec. 12, 1943.

The Moscow treaty and the Soviet Army's advance toward the borders of Czechoslovakia gave impetus to the national libera-

tion movement. A national uprising broke out in Slovakia on Aug. 29, 1944 (*see* SLOVAK NATIONAL UPRISING OF 1944). In the liberated areas power passed to the Slovak National Council, which had been founded in 1943 on the initiative of the Communists and which included three members of the Central Committee of the Slovak Communist Party—K. Schmidke, G. Husák, and L. Novomeský. To aid the rebels, the Soviet command changed its original plans and launched an offensive near the passes across the Carpathians, capturing Dukla Pass on October 6 after heavy fighting. Nevertheless, the center of the uprising, the town of Banská Bystrica, fell on October 27 under the onslaught of superior Nazi forces. The rebels retreated into the mountains, where they continued the struggle.

The Slovak uprising marked the beginning of the national democratic revolution in Czechoslovakia. Meeting in Moscow in March 1945, representatives of the London exiles, the Slovak National Council, and the leadership of the Czechoslovak Communist Party agreed to form the National Front of Czechs and Slovaks and worked out its program. In early April a National Front government was formed in Košice and its program was announced to the country (*see* KOŠICE PROGRAM). Supported by partisans, armed insurrections against the occupation forces broke out in several Czech cities in May. Prague rebelled on May 5 (*see* PEOPLE'S UPRISING OF 1945). Soviet troops came to the aid of the insurgents, and, entering Prague on May 9, completed the liberation of Czechoslovakia.

Establishment of ■ people's democratic system; the national democratic revolution develops into ■ socialist revolution (from May 1945 to February 1948). After the liberation of Czechoslovakia from the fascist German aggressors, the independent state of Czechs and Slovaks was resurrected on a new, democratic basis. The national democratic revolution that unfolded in the country led to the establishment of a people's democratic system, based on the National Front, which derived its strength from the alliance of workers and peasants. The Communist Party of Czechoslovakia and the Communist Party of Slovakia held leading positions in the National Front. Although all the parties that joined the National Front pledged to fulfill the joint government program and to build a people's democratic republic, the National Socialists, the Czechoslovak People's Party, and the Slovak Democratic Party tried from the very beginning to slow down the revolutionary process and gradually to restore the regime that had existed in the pre-Munich bourgeois republic. The Communists alone consistently struggled for revolutionary changes in political and economic life.

Relying on the working class and the working peasantry and overcoming the resistance of the bourgeoisie, the Communist Party of Czechoslovakia launched a campaign to turn the national democratic revolution into a socialist revolution. The national committees (local governing bodies), working jointly with factory councils, began taking over the management of enterprises belonging to the occupation forces or to persons who had cooperated with them and set about purging the state machinery of traitors and collaborators. The presidential decree of June 21, 1945, opened the first phase in the implementation of the agrarian reform. The land and other property belonging to German and some Hungarian landlords or to traitors was confiscated.

On Oct. 24, 1945, decrees were issued nationalizing key industries and all banks and private insurance companies. By the end of 1946 the state had taken over about 3,000 major industrial enterprises, including all mines, almost all the metallurgical works and power plants, and three-fourths of the chemical and metalworking enterprises. The nationalization of key industries and the banks heralded the formation of a socialist sector in the national economy. The Eighth Congress of the CPC (March 1946) summed up the social changes and set forth the tasks of further strengthening the people's democratic system. The congress demonstrated that the Communist Party had become the strongest political party in the country.

In the May 1946 elections to the Constituent National Assembly and to the national committees, the Communist Party polled more votes than any other political party. For the first time in Czechoslovak history the government was headed by a Communist, the party chairman K. Gottwald. The program adopted by the new government provided for further democratic changes, the drafting of a new constitution, and the drawing up of a plan for the restoration and development of the national economy in 1947–48. In accordance with the program, the government initiated the second phase of the agrarian reform: arable land in excess of 150 hectares (ha) or total landed property exceeding 250 ha was expropriated. By the middle of 1947, some 2,946,000 ha of agricultural land and forests had been confiscated, most of it in the border regions. A large part of the agricultural land was given to farmhands, small peasants, and peasants with large families.

At the end of 1947 economic difficulties, aggravated by a drought, and the bourgeoisie's resistance to revolutionary changes exacerbated the class struggle in the country. The bourgeois parties opposed the measures proposed by the Communist Party for improving the food situation in the country, measures that included raising the wholesale prices of farm products and levying an emergency tax on millionaires.

In February 1948 the reactionary bourgeoisie, which was losing one position after another, tried, with the support of Western imperialist circles, to stage ■ counterrevolutionary coup and to restore the capitalist system in the country. The ministers representing the bourgeois parties resigned in the hope of provoking a government crisis and forming a new government without Communists. The Communist Party appealed to the popular masses to defend the people's democratic system and its revolutionary gains (*see* FEBRUARY EVENTS OF 1948). On Feb. 24, 1948, a one-hour general strike was held to protest the machinations of the reactionary forces. By this time power in the country was in fact already wielded by the working class. The antipopular plot of the Czechoslovak bourgeoisie and international imperialism was foiled. The next day, President E. Beneš was obliged to accept the resignation of the reactionary ministers and to replace them with people proposed by Gottwald. The crisis was resolved by peaceful means. The February victory of the working class concentrated all power in the hands of the working class. The national democratic revolution had indeed developed into a socialist revolution. With the victory of the socialist revolution, the people's democratic system assumed the functions of a dictatorship of the proletariat.

Building socialism. The establishment of a dictatorship of the proletariat and the activity of the new Gottwald government made it possible to continue implementing revolutionary reforms and to begin building socialism. In March 1948 the National Assembly enacted a new land reform law that limited private landholdings to 50 ha of farmland. More than 4 million ha of farmland and forests had been redistributed since 1945; of this area more than 2 million ha of farmland were transferred to small peasants, and about 800,000 ha of land went to state farms, laying the basis for a socialist sector in agriculture.

The second stage of the nationalization of industry was completed in April 1948, when the state took over all enterprises employing more than 50 workers and, in some industries, all the enterprises. Large commercial firms and stores were also nationalized, and a state monopoly on foreign trade was established. These reforms produced radical changes in the socioeconomic structure of society and eliminated the main exploiting classes—the big industrial, banking, trade, and rural bourgeoisie. The alliance of the working class and the peasantry was strengthened.

The new constitution adopted on May 9, 1948, proclaimed Czechoslovakia a people's democratic republic of Czechs and Slovaks and made socialism the goal of the country's development. In the May 30, 1948, elections to the National Assembly the National Front candidates polled 89.3 percent of the votes.

After the resignation of Beneš in June 1948, Gottwald was elected president of the republic, and A. Zápotocký was chosen to head the new government (cabinet). The non-Communist National Front parties—the Czechoslovak Socialist Party, the Czechoslovak People's Party, the Slovak Reconstruction Party, and the Slovak Freedom Party—purged their ranks of reactionary elements and accepted the Communist Party's policy of building socialism. The guiding role of the Communist Party was considerably bolstered. In June 1948 the Social Democratic Party merged with the Communist Party on a Marxist-Leninist basis. At the party's Ninth Congress, held in May 1949, the building of

socialism was adopted as the party's general line. The primary objective of the first five-year plan (1949–53) was to lay the foundation for a socialist economy. The plan emphasized the development of heavy industry, especially machine building, called for the gradual formation of agricultural cooperatives, and aimed at raising the living standard of the working people. Special attention was given to overcoming the economic backwardness of Slovakia through industrialization. The country's cities and villages embarked on a massive program of building socialism.

After Gottwald's death in March 1953, Zápotocký was elected president. A. Novotný, first secretary of the Central Committee of the Communist Party from September 1953, succeeded to the presidency after Zápotocký's death in November 1957. The office was held by L. Svoboda from March 1968 to May 1975.

The Tenth Congress of the Communist Party (1954) affirmed that the first five-year plan had laid a firm foundation for a socialist society. The socialist sector, which included the unified agricultural cooperatives, now dominated the country's economy, accounting for 92 percent of the national product. The gross industrial output increased by 93 percent during the five-year plan, reaching a level more than double the 1937 output. Machine building became the leading industry, its output increasing by a factor of 3.3 over the five years. Industrial growth was especially rapid in Slovakia. At the same time, there were disproportions in the development of individual branches of the national economy, and agriculture lagged behind the growing demands of industry and the population.

The second five-year economic development plan (1956–60), adopted in 1956, aimed to complete the building of the material production base of socialism, promote a more even development of the national economy, revive the lagging fuel, energy, and mining industries, and ensure the preponderance of the socialist sector in agriculture. The party's Eleventh Congress (June 1958), noting the successes in building the foundation of socialism, set the concrete tasks of the second five-year plan: the more rapid development of production, the improvement of socialist democracy, and the strengthening of the moral and political unity of the people on the basis of Marxist-Leninist principles.

During the second five-year plan the industrial output increased by 66 percent, rising to four times the prewar level (1937). The national income increased by a factor of 2.5 between 1948 and 1960. The socialist sector now owned 87.4 percent of the farmland, and the organization of farmers into cooperatives was virtually completed. Nevertheless, in terms of the growth of production, agriculture lagged behind industry. The successes of socialist construction quickly raised the living standard of the people. A national conference of the Communist Party, held on July 5–7, 1960, confirmed the victory of socialist production relations in the country. Several days later, on July 11, the National Assembly adopted a new constitution under which the country was renamed the Czechoslovak Socialist Republic (CSSR). The constitution proclaimed the CSSR a socialist state based on a firm alliance, headed by the working class, of the peasantry, the working class, and the intelligentsia.

Economic development slowed during the third five-year plan (1961–65), chiefly owing to an exhaustion of the means of production expansion, but also because of shortcomings in the management of the national economy and a weakening of centralized control. The Twelfth Congress of the Communist Party (December 1962) stated that the objectives of further economic development were to improve planning, correct the imbalance between the development levels of industry and agriculture, and establish an equilibrium between output and consumption.

In the years of socialist construction the working people of Czechoslovakia, led by the Communist Party, achieved notable successes in economic, scientific, and cultural development and in raising the living standard of the population. Nevertheless, the road to socialism was strewn with obstacles and difficulties, and some mistakes were made. The level of development of society and the degree of its moral and political unity were overestimated; Marxist-Leninist principles were inconsistently applied in the life of the party and society; and a subjectivist approach was taken to the solution of several important problems. Not enough attention was given to the ideological work of the party. The struggle against bourgeois ideology and petit bourgeois views was relaxed, permitting the spread of revisionist trends in the party. At the same time, the pressure of bourgeois propaganda intensified, and foreign imperialist forces stepped up their subversive activity. The party's Thirteenth Congress (May–June 1966) proposed ways to overcome the difficulties. However, neither party nor government leaders took the necessary steps to implement the decisions of the congress and to eliminate shortcomings and errors, a lapse that led to a crisis in the party and in society.

The January 1968 Plenum of the party's Central Committee set three basic tasks: eliminating from the activity of the party or its leadership anything that hindered the further development of the socialist society, strengthening the alliance between Czechs and Slovaks through a consistent implementation of the Marxist-Leninist nationality policy, and solving pressing economic problems. But right-wing opportunists gained the upper hand in the party leadership elected at the plenum; A. Dubček was elected first secretary of the Central Committee. The new leadership was incapable of carrying out the tasks set by the Thirteenth Congress and the January Plenum, and its actions contributed to a large-scale offensive by right-opportunist and antisocialist forces against the party's policy and the socialist system. Under cover of demagogic slogans calling for the "democratization" of society and the creation of a "new model" of socialism, the right-opportunist and antisocialist forces launched virulent attacks on socialism, seeking to abolish the leading role of the working class and its vanguard, the Communist Party, to dismantle the agencies of socialist power, and to break Czechoslovakia's alliance with the USSR and the other socialist countries. Supported by Western imperialist circles, the newly formed political coalition of right-opportunist and antisocialist forces began making extensive preparations for a counterrevolutionary coup aimed at restoring the bourgeois system.

By August 1968 a critical counterrevolutionary situation had developed in Czechoslovakia, and the country was on the brink of civil war. Under these circumstances, thousands of Communists and nonparty citizens, many members of the Central Committees of the Czechoslovak and Slovak Communist Parties, members of the cabinet, and deputies to the National Assembly, realizing that the imminent counterrevolution could no longer be averted with internal forces, asked the governments of the socialist countries and the leading bodies of the fraternal parties to extend international aid to the Czechoslovak people in the defense of socialism. Such assistance was rendered in August 1968 by the allied socialist countries: the USSR, the People's Republic of Bulgaria, the Hungarian People's Republic, the German Democratic Republic, and the Polish People's Republic. With international support, the Marxist-Leninist forces within the Communist Party of Czechoslovakia assailed the antisocialist elements, opportunists, and revisionists and mobilized the working class and all the working people for the defense of the socialist achievements.

A turnaround in both the party and the country occurred after the April 1969 Plenum of the party's Central Committee, which elected a new party leadership headed by G. Husák. The May 1969 Plenum of the Central Committee adopted a program of consolidation designed to deal with the consequences of the crisis. Work began on rallying the party around the principles of Marxism-Leninism and on purging it of opportunists and careerists through an exchange of party membership cards, completed in 1970. Measures were taken to strengthen government and administrative bodies, to reinforce state planning and economic management, to stabilize the economy, and to regain the trust of and reestablish fraternal ties with the CPSU and the communist parties of the other socialist countries. It was thus possible to normalize the situation in the country and strengthen the party's authority, enabling the working people of Czechoslovakia to continue their constructive labor.

On May 6, 1970, the CSSR and the Soviet Union signed a new treaty of friendship, cooperation, and mutual aid that still further expanded and deepened the fraternal relations between the two countries. The December 1970 Plenum of the party's Central Committee adopted the document Lessons Drawn From the Crisis Development in the Party and Society After the Thirteenth Congress of the Communist Party of Czechoslovakia, giving an

in-depth Marxist-Leninist analysis of the recent events and showing how the threat of a counterrevolutionary coup had arisen and how it had been eliminated. In particular, the document noted that the international aid of the fraternal socialist countries had been timely, necessary, and the only correct solution.

In assessing this complex period in the history of the party and the country, the Fourteenth Congress (May 1971) affirmed that the task of restoring the Communist Party of Czechoslovakia as a Marxist-Leninist party had been carried out and that the party was now able to resume its historical role as the leading force in society. The congress also stated that the socialist principles of economic, scientific, and cultural development had been reestablished. The Fourteenth Congress has been called the congress of victory over the enemies of socialism in Czechoslovakia and the congress of the triumph of socialism and proletarian internationalism. But the congress also pointed out that opportunism and revisionism continued to present the main danger and called for an uncomprising struggle against them. The congress ratified the directives for the fifth five-year economic plan (1971–75), which gave priority to raising the efficiency of the national economy through a maximum utilization of intensive growth factors and to meeting the growing needs of the people. The decisions of the congress opened the way for the further comprehensive building of a socialist society in Czechoslovakia.

In the national and local elections held in November 1971 the voter turnout was 99.45 percent. National Front candidates to the House of the People polled 99.81 percent, and those to the House of Nations received 99.77 percent of the votes cast. Husák, general secretary of the Central Committee of the Communist Party and chairman of the Central Committee of the National Front, was elected president of the CSSR in May 1975. The Fifteenth Congress of the Communist Party (April 1976) was an important event in the life of Czechoslovakia. Summing up the results of socialist construction, the congress noted that from the standpoint of economic and social development the preceding five years had been one of the most successful periods in the history of socialist construction in Czechoslovakia. The congress set a task of programmatic significance—the building of a fully developed socialist society in Czechoslovakia—and established the main economic and social objectives for the next five years. It emphasized the need to develop the state and improve the political system, to invigorate party work, and to strengthen the leading role of the party. The congress demonstrated the fidelity of the Czechoslovak Communists and working people to the ideas of proletarian internationalism.

Czechoslovakia has concluded treaties of friendship and mutual assistance with most of the socialist countries, including Poland (1947, 1967), Bulgaria (1948, 1968), Rumania (1948, 1968), Hungary (1949, 1968), the Mongolian People's Republic (1957, 1973), the People's Republic of China (1957), and the German Democratic Republic (1967, 1977). It has been a member of the Warsaw Treaty Organization since 1955. A founding member of COMECON (Council for Mutual Economic Assistance), Czechoslovakia is carrying out the organization's joint program of socialist economic integration. The Soviet Union, Czechoslovakia's principal trading partner, is also rendering technical assistance in the construction of several industrial enterprises, nuclear power plants, and the Prague subway. Czechoslovakia in turn is helping to build many industrial enterprises in the USSR. The coordination of national economic plans is an important factor in the economic cooperation between the two countries, which are also rapidly expanding their scientific and technical cooperation and cultural ties.

Czechoslovakia's strength as a socialist state has enhanced its prestige in the international arena. A founding member of the UN, Czechoslovakia has cosponsored many proposals of the socialist countries aimed at relaxing international tension and strengthening peace. Having contributed to the preparation and successful conclusion of the Conference on Security and Cooperation in Europe (1975), Czechoslovakia is working with the other socialist countries to implement the conference's decisions.

Czechoslovakia's relations with the capitalist countries rest on the principles of peaceful coexistence and mutually advantageous cooperation. In 1973 it concluded a treaty establishing diplomatic relations with the Federal Republic of Germany. The treaty reaffirmed the inviolability of the border between the two countries, which pledged to respect each other's territorial integrity and to refrain from making territorial claims on each other. The parties declared the Munich Pact of 1938 to be null and void. The signing of the treaty contributed to an improvement of the political climate in Europe.

The CSSR maintains political, trade, and cultural relations with many Asian, African, and Latin American countries and renders them economic, scientific, and technical aid. A number of enterprises in India, Syria, Iraq, and other countries have been completed or are being built with its technical assistance. As of December 1979, Czechoslovakia maintained diplomatic relations with 124 countries and traded with almost as many nations. It is a member of more than 54 major international organizations.

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Political parties, the National Front, trade unions, and other social organizations

Political parties. The Communist Party of Czechoslovakia (CPC; Komunistická Strana Československa), founded in 1921, had 1,525,000 members and candidate members as of Jan. 1, 1980. The Communist Party of Slovakia (CPS; Komunistická Strana Slovenska) is the regional organization of the CPC in Slovakia. The Czechoslovak Socialist Party (CSP; Československá Strana Socialistická) was founded in 1948 by some members of the Czech National Socialist Party, which had existed since 1897 and which had been called the Czechoslovak Socialist Party from 1918 to 1926. The CSP draws its main support from several strata of the population that formerly belonged to the urban middle and petite bourgeoisie and the intelligentsia, but it also attracts a small segment of the workers and peasants. It operates only in the Czech lands. The Czechoslovak People's Party (CPP: Československá Strana Lidová) was founded in February 1948 after the reorganization of a bourgeois party of the same name that had existed since 1918. It brings together part of the peasantry, several former petit bourgeois strata, some artisans and members of the intelligentsia, and a negligible number of workers. Most of the members of the CPP, which operates only in the Czech lands, are practicing Christians.

The Slovak Reconstruction Party (Strana Slovenskej Obrody) was founded in February 1948 by the more progressive elements in the Democratic Party, which broke up during the February events of 1948. It unites a small part of the urban and rural working people of Slovakia. The Slovak Freedom Party (Slovenská Strana Slobody), founded in 1946 by secessionists from the Democratic Party, is supported by an insignificant part of the former Slovak petite bourgeoisie and by a small number of office employees and members of the intelligentsia, chiefly Roman Catholics.

All the non-Communist parties recognize the CPC's leading role in society and support the program of building socialism.

National Front. Founded in 1945 on the initiative of the CPC, the National Front (Národní Fronta) is the political expression of the CPC-led class alliance of the urban and rural working people. It embraces all the country's political parties and the main social organizations.

Trade unions and other social organizations. The country's occupational and social organizations function in accordance with the country's federal structure, that is, Czech and Slovak organizations are administered on a federal basis. The Revolutionary Trade Union Movement, founded in April 1946, had about 7 million members in 1980. It is a member of the World Federation of Trade Unions.

The Socialist Union of Youth, founded in 1970 and with 2.3 million members in 1980, carries on the revolutionary traditions of the Czechoslovak Komsomol, founded in 1921, and the Czechoslovak Union of Youth, established in 1949. The Czechoslovak-Soviet Friendship Alliance, founded in 1948, had about 2.5 million members in 1980. The Czechoslovak Women's Union, formed in 1974 from women's organizations founded in 1967, had a membership of 800,000 in 1980. S. I. Kolesnikov

Economic geography

General characteristics. The CSSR is an advanced industrial country with an intensive agriculture and a high living standard and culture. It accounts for more than 1.5 percent of the world's industrial output and for about 5 percent of the industrial output of the COMECON countries. In terms of volume of industrial output the CSSR holds 11th or 12th place in the world. In 1976 industry provided 68 percent of the national income, construction 12.9 percent, agriculture and forestry 7.2 percent, transportation and communications 2.7 percent, and commerce, food services, and other sectors 9.2 percent. About one-third of the national income is derived from foreign trade. In 1976 the socialist sector accounted for 99.6 percent of the national income, for 99 percent of the production fixed assets, for 100 percent of the gross industrial output, and for 96.8 percent of the gross agricultural output.

The Czechoslovak economy has passed through several stages of socialist construction and radical social and economic change (*see above*: Historical survey). These stages are reflected in a series of economic development plans, the two-year plan of 1947–48 and the five-year plans of 1949–53, 1956–60, 1961–65, 1966–70, and 1971–75. In accordance with the decisions of the Communist Party congresses, economic policy was aimed at modernizing industry and creating a large-scale socialist agriculture. Precedence was given to the development of heavy industry. The industrial output of Czechoslovakia, a highly industrialized country even before the war, grew almost tenfold between 1949 and 1976, with the output of machinery increasing 23 times and of chemical products 27 times. These quantitative changes were accompanied by qualitative changes in the structure of industry. By 1976 capital goods accounted for two-thirds and con-

sumer goods for one-third of the total value of the industrial output. The number of workers employed in machine building and metalworking doubled between 1937 and 1975. Meanwhile, agriculture shifted from small-scale production to large-scale modern production carried out by cooperatives. Productivity increased by more than 50 percent per unit of farmland, and farm labor productivity rose by a factor of 4.4. The economy as a whole developed rapidly: between 1949 and 1976 the gross social product increased sixfold and the national income more than fivefold.

In the years of people's rule the regional inequalities in living standard inherited from capitalism have been eliminated, and full employment has been achieved. The differences between working conditions in industry and agriculture are being erased gradually. Economically backward regions no longer exist; the formerly agricultural regions have been industrialized; and the historical disparity between the western and eastern parts of the country has been essentially eliminated. Formerly an agricultural area, Slovakia has become an industrial and agricultural land, its share in the country's industrial output rising to 26 percent, compared to 7 percent in 1937. The five-year national economic plan for 1971–75 prescribed measures aimed at integrating the development of the country as a whole with the proportional development of the economies of the republics.

Czechoslovakia's economy has entered the period of building a fully developed socialist society. The sixth five-year plan (1976–80) calls for raising production efficiency and accelerating scientific and technological progress as the basis for the dynamic development of the whole national economy. An important factor in the overall rise in economic efficiency is Czechoslovakia's participation in the international socialist division of labor. In line with the Comprehensive Economic Integration Program of the COMECON countries, specialization and cooperation in both production and scientific and technical research are developing rapidly. Within COMECON the CSSR specializes in various branches of machine building, including the manufacture of machine tools, equipment for nuclear power plants, and textile machinery.

Industry. Postwar industrial development has been marked by a rapid growth rate (averaging 6.7 percent a year between 1966 and 1976) and changes in the branch and regional structure of industry (see Table 2). The tempo of growth has been greatest in the chemical and machine-building industries. Other expanding industries have included electronics, electrical and vacuum engineering, precision mechanics, and computer technology. Radical changes have taken place in light industry and in the food industry, which in the past were dispersed and fragmented, with only 3 percent of the enterprises employing more than 20 people. Like the newer branches of industry, they are now highly concentrated and specialized. About 50 percent of the country's industrial labor force is employed in enterprises with more than 1,000 workers, compared to 18 percent before World War II. Large economic associations, called economic production units, were established in the 1970's; there are about 100 of them in industry and construction. (See Table 3 for the output of the principal industrial goods.)

Industrial production, notably machine building, is now relatively evenly distributed throughout the country, largely owing to the construction of large industrial facilities in eastern Czechoslovakia, as well as in some parts of Bohemia and Moravia. Of the roughly 2,000 industrial enterprises and separate installations that were built in the CSSR between 1945 and 1970, 181 employ more than 1,000 workers. The CSSR holds a leading place among the COMECON countries and a prominent place in the world in the per capita output of such important industrial products as pig iron (635 kg; figures for 1976 unless otherwise indicated), steel (985 kg), rolled metal (697 kg), metalcutting machine tools (21.3 units per 10,000 population), passenger cars and trucks (145.1 units per 10,000 population), paper (all types, 55.7 kg), cotton fabrics (35.2 m), wool fabrics (5.7 m), footwear (7.9 pairs), and sugar (56.9 kg in 1975).

MINING AND POWER ENGINEERING. The CSSR has limited fuel, energy, and mineral resources. Its substantial coal reserves account for more than 90 percent of its fuel and energy resources and are the main source of electric power. Imported oil and natural gas play a major role in the production of energy; in 1976 imports, chiefly from the USSR, amounted to 17.1 million tons of crude oil, 4.5 billion cu m of gas, and 4.6 billion kilowatt-hours of electric power. In 1975 the structure of the fuel and energy balance was as follows: solid fuel, 66 percent; oil, 24.7 percent; fuel gas, 5.5 percent; nuclear energy, 8.0 percent; and water and other types of energy, 3.8 percent.

More than 85 percent of the hard coal is mined in the Ostrava-Karviná Basin and about 8 percent in the Kladno region near Prague. Most of the hard coal is used for coking; of the 11 million tons of coke produced in 1976, 2.1 million tons were exported. There has been a rapid growth in the output of brown coal, mined chiefly in the western part of the country—in the North Bohemian Brown Coal Basin (72 percent) and in the Sokolov Basin (23 percent). Almost 90 percent of the coal is mined by open-cut methods. Of high quality, brown coal is used mainly to fuel thermal electric power plants and to produce gas (8 billion cu m in 1976). The production of oil and natural gas is insignificant: 131,000 tons and 982 million cu m in 1976.

Most of the country's electric power is produced by thermal electric power plants using chiefly brown coal but also hard coal. The installed capacity of the electric power plants was 14.6 gigawatts in 1976, of which 1.8 gigawatts were generated by hydroelectric power plants. About 40 percent of the electricity is produced in the North Bohemian Brown Coal Basin and about 15 percent in the Ostrava-Karviná Hard Coal Basin. The largest power plants, whose capacity ranges from 800 to 1,300 megawatts, are located at Tušimice, Počerady, Prunéřov, Mělník, Detmarovice, and Vojany. The first unit, with a capacity of 500 megawatts, is being installed at the Mělník-3 Thermal Electric Power Plant. Hydroelectric power plants have been built on the Vltava and Váh rivers. The largest, the Orlík Hydroelectric Power Plant on the Vltava, has a capacity of 420 megawatts. The

Table 2. Branch structure of industry

	Percentage of industrial labor force			*Percentage of gross industrial output*
	1930	*1960*	*1976*	*1976*
Fuel and energy	10.1	9.9	8	9.1
Metallurgy	21	7.4	7.5	10.9
Machine building		33.4	36.5	33.3
Chemicals (including rubber and asbestos)	3.2	3.9	4.9	8.5
Construction materials	10.6	4.7	3.9	3.5
Woodworking	7.5	5.2	5.1	3.3
Pulp and paper	2.7	1.8	1.7	1.7
Glass and porcelain-faïence	3.7	2.8	3.3	1.4
Textiles	22.6	10.6	9.4	5
Clothing	6.1	8.9	4.5	1.7
Leather and footwear				2.4
Printing	2.3	1.2	1.2	0.7
Food and condiments	10.2	8.5	7.9	13.9
Others	—	1.4	1.6	4.6

Table 3. Output of leading industrial products

	1937	1948	1960	1970	1976
Electricity (billion kW-hr)	4.1	7.5	24.5	45.2	62.7
Hard coal (net, million tons)	16.7	17.7	26.4	28.2	28.3
Brown coal (million tons)	18	23.6	57.9	81.3	89.5
Pig iron (million tons)	1.7	1.6	4.7	7.5	9.5
Steel (million tons)	2.3	2.6	6.8	11.5	14.7
Rolled metal, excluding pipes (million tons)	1.6	1.8	4.5	7.9	10.4
Trucks (thousand units)	2	7.2	16.3	24.5	36.7
Passenger cars (thousand units)	12.6	18	56.2	142.9	179.1
Motorcycles and motor scooters (thousand units)	14.1	68	191	108	127.8
Tractors (thousand units)	0.2	9.1	32.5	18.5	31.5
Refrigerators (thousand units)	—	7.6	132.4	300.4	385.2
Television sets (thousand units)	—	—	262.9	383.2	455.8
Cement (million tons)	1.3	1.7	5.1	7.4	9.6
Sulfuric acid, 100 percent (thousand tons)	165	215	553	1,110	1,240.4
Nitrogen fertilizers (thousand tons)	25	29.4	139.9	324	520.3
Phosphate fertilizers (thousand tons)	61	54.3	147	322.4	411.5
Chemical fibers (thousand tons)	4	22.5	62.3	100.6	147.3
Paper (thousand tons)	246	260	438	600	831.6
Cotton fabrics (million sq m)	377	236.6	453	518	525
Rayon and part rayon fabrics (million sq m)	31	26	71	95	101
Wool fabrics (million sq m)	33	40	74	81	85.5
Footwear of all types (million pairs)	55	64.4	96.2	117.4	126.9
Refined sugar (thousand tons)	669	517	881	875	629
Beer (million hectoliters)	8.3	8.2	14.1	21.2	22.6

water resources of the Danube are also being harnessed. The country's first nuclear power plant, with a capacity of 150 megawatts, has been put into operation at Jaslovské Bohunice; a second nuclear power plant is being built nearby. The Dukovaní Nuclear Power Plant is under construction in Moravia (1978). The country's unified power grid is connected with the Mir System.

The CSSR produces nuclear raw materials, magnesite, antimony, kaolin, iron ore (1.9 million tons in 1976), and small quantities of copper and lead and zinc ores.

MANUFACTURING. The well-developed ferrous metallurgy industry uses local coal and chiefly imported iron ore (85 percent), most of it supplied by the USSR. In the years of people's rule old plants in Ostrava, Třinec, and Kladno have been modernized, and two large metallurgical works have been built, the K. Gottwald Combine in Ostrava and the Eastern Slovakia Combine in Košice. Most of the ferrous metallurgy works are concentrated in the Ostrava-Karviná region, which produces more than 60 percent of the pig iron and about 60 percent of the steel. A large proportion of the high-grade steel comes from plants in Kladno and Plzeň, as well as from Central Slovakia. Ferroalloys are produced in North Slovakia. Part of the ferrous metallurgy output is exported; in 1976 exports included 2.7 million tons of rolled metal and 500,000 tons of pipe.

The nonferrous metallurgy industry lacks sufficient local raw-material resources. In 1975 the CSSR produced 18,400 tons of copper, 22,000 tons of lead, and 43,300 tons of aluminum. The aluminum plant built at Žiar and Hronom in the early 1950's uses mainly Hungarian bauxite. A cobalt and nickel plant has been built in Sered'. Much of the need for nonferrous metals is met by imports.

Machine building and metalworking, the leading branch of industry, are oriented toward small-lot and medium-lot production with a wide assortment of goods. The years of people's rule have seen substantial changes in the branch structure of machine building. The output of equipment for the power, rolled-metal, chemical, and textile industries, of vehicles, and of metalcutting machine tools has increased considerably, and many modern branches have emerged, such as the manufacture of equipment for nuclear power plants and for the electronics industry. The manufacture of vehicles holds an important place in the structure of machine building, accounting for about one-third of the value of the industry's output. Plants manufacturing diesel and electric locomotives, railroad cars, streetcars, motor vehicles, and motorcycles are concentrated at Prague, Plzeň, Martin, and Mladá Boleslav. A shipbuilding industry has been established in Komárno and a tractor industry in Brno. Machinery for the power industry accounts for about one-fifth of the output of machine building. Equipment for thermal electric and hydroelectric power plants and electrical goods are produced in Prague, Brno, Plzeň, Bratislava, and Pardubice. Machine-tool enterprises are found in Prague, Plzeň, Brno, Kuřim, and Gottwaldov; the CSSR is the second-largest producer of metalcutting machine tools among the COMECON countries, after the USSR.

About half of the machine-building output comes from the Prague, Brno, and Plzeň industrial conurbations. The country's main center of machine building is Prague, noted for the production of transport, heavy, and electrical machinery. The city's largest machine-building enterprise, the ČKD-Prague, produces heavy and transport machinery. The automotive industry is well established. The country's three main plants—the Tatra Plant in Kopřivnice, the Škoda Plant in Mladá Boleslav, and the plant in Prague (now the Gottwald Plant)—began producing passenger cars and trucks as early as the turn of the century. Another major engineering center, Brno, is the site of several large plants specializing in the manufacture of heavy power engineering equipment, metalcutting machine tools, and tractors. One of the country's largest machine-building enterprises, the V. I. Lenin Works (formerly Škoda) in Plzeň, has several production divisions turning out electrical, power engineering, metallurgical, and transport equipment.

The rapidly expanding chemical industry is becoming one of the country's main branches of industry. Old plants producing sulfuric acid, soda ash, and other inorganic chemical products are being modernized, and industrial organic synthesis is developing rapidly on the basis of Soviet oil and natural gas. The organic-synthesis industry produces plastics and synthetic resins (581,000 tons in 1976), chemical fibers, and synthetic rubber. Large amounts of nitrogen and phosphate fertilizer are also produced. Chemical enterprises along the Middle and Lower Labe account for about half of the industry's output. Záluží near Most is the site of one of the country's largest chemical combines, the Czechoslovak-Soviet Friendship Combine, which uses oil as the starting material. The country's largest oil refinery, Slovnaft in Bratislava, has an annual capacity of about 9 million tons and produces dozens of different chemical products. Cooperation with the German Democratic Republic (GDR) is developing under the "olefin program"; an ethylene pipeline links Záluží with Böhlen in the GDR.

The output of construction materials is increasing. To supplement the output of the old cement enterprises in Central Bohemia and North Moravia, new plants have been built in Central and South Moravia, East Bohemia, and Central and East Slovakia. Part of the rapidly expanding output of magnesite refractory materials and ceramic products is earmarked for export.

Table 4. Sown area and yield of chief crops

	Sown (hectares)			Harvest (tons)		
	1934–38[1]	1961–65[1]	1976	1934–38[1]	1961–65[1]	1976
Wheat	882,000	739,000	1,278,000	1,513,000	1,779,000	4,807,000
Rye	983,000	429,000	186,000	1,577,000	897,000	561,000
Barley	653,000	687,000	857,000	1,109,000	1,556,000	2,901,000
Oats	748,000	418,000	198,000	1,212,000	792,000	379,000
Corn	105,000	200,000	204,000	225,000	474,000	514,000
Sugar beets	166,000	235,000	214,000	4,664,000	6,277,000	5,248,000
Potatoes	715,000	492,000	240,000	9,635,000	5,635,000	4,214,000

[1]Annual average

The glass industry, one of the oldest traditional branches, uses local raw materials. Bohemian glass, crystal, and glass jewelry continue to be highly esteemed, and the output of industrial glass is growing. Most of the glass factories are located in North and West Bohemia, where the main centers are Jablonec and Karlovy Vary. Another popular product is ceramic ware, notably porcelain, made from high-quality local kaolin. Most of the porcelain and other ceramic products are manufactured in West Bohemia, chiefly at Karlovy Vary and Horní Bříza, where kaolin is extracted and processed.

The wood-products industry uses mainly domestic raw materials. Enterprises of the lumber and pulp and paper industry are generally found in the forested mountain regions of North and South Bohemia and Central and East Slovakia. The furniture industry is highly developed, and paper, furniture, pencils, and other products are exported to many countries.

The highly diversified textile industry, the leading branch of light industry, has been completely modernized in the years of socialist construction, when large enterprises equipped with up-to-date machinery were built. Although the number of workers employed in the textile industry has declined considerably, the volume of output is steadily increasing. The cotton industry is dispersed throughout North Bohemia, and the woollen industry tends to be confined to large cities, such as Brno and Liberec. The output of rayon fabrics, made chiefly from domestic chemical fibers, is growing. The linen industry, situated in northeastern Bohemia and using both domestic and imported flax, is noted for the high quality of its products. The flourishing clothing industry exports part of its output. The leather and footwear industry also produces both for the national market and for export. Its shoes and leather accessories are well known abroad. Czechoslovakia ranks first in the world in the per capita output of footwear. More than half of the footwear is produced by the Svit Factory (formerly Batá) in Gottwaldov.

Table 5. Livestock and poultry[1]

	1960	1970	1976[2]
Cattle	4,387,000	4,288,000	4,654,000
cows	2,047,000	1,881,000	1,898,000
Hogs	5,962,000	5,530,000	6,820,000
Sheep	646,000	981,000	797,000
Horses	330,000	131,000	57,000
Poultry	28,200,000	39,200,000	44,100,000

[1]End of year [2]67 head of cattle, 98 hogs, and 11.4 sheep per 100 hectares of farmland

The food and condiment industry uses mainly local raw materials and essentially satisfies the country's needs. Sugar refining and brewing have long been important branches. Czechoslovakia is one of the world's major producers of beet sugar, exporting from 25 to 30 percent of its output. Most of the sugar refineries are located in the farming areas along the Labe River, in the Moravian valleys, and on the Danubian Plain. The world famous Bohemian beer is brewed at Plzeň, Prague, and České Budějovice.

Agriculture. In 1975 the socialist sector controlled more than 94 percent of the farmland. In 1976 the country's 213 state farms averaged 4,600 hectares (ha) of plowland, and its more than 2,000 agricultural production cooperatives of all types averaged 1,600 ha of plowland. State agricultural enterprises manage 2.1 million ha of farmland and agricultural production cooperatives, 4.3 million ha. Various types of agricultural-industrial complexes have been set up with a view to mechanizing agriculture. Although the agricultural labor force has declined considerably, socialist changes, capital investments (a tenfold increase in the supply of means of production), and a rise in labor productivity have resulted in a substantial growth in the gross agricultural output, which in 1976 exceeded the prewar level by 36 percent. Most of the growth has taken place in animal husbandry, whose output increased by 66 percent, while the crop farming output rose by 9 percent. In 1976 the gross agricultural output was 4.3 times greater per worker and 1.5 times greater per ha of farmland than the prewar output.

Czechoslovak agriculture is highly intensive. The country ranks fifth or sixth in Europe in the per capita value of agricultural output, and it holds seventh or eighth place in the value of output per ha of agricultural land. Czechoslovakia also ranks high in the number of tractors per unit of farmland (one tractor [converted to 15 horsepower] per 10 ha of cultivated land) and in the application of fertilizers (242 kg in net weight per ha of plowland in 1976). The country produces almost enough bread grain and animal products to satisfy domestic consumption, and measures are being taken to make the country more self-sufficient in other types of foodstuffs. In general, the country's agriculture satisfies about 85 percent of the domestic demand for foodstuffs. Czechoslovakia imports feed grain, vegetables, fruit, and some agricultural raw materials, chiefly cotton and wool, and it exports sugar, hops, malt, and beer.

The postwar years have seen structural changes in agriculture; the share of animal husbandry and crop farming in the gross agricultural output has shifted from 45.9 percent and 54.1 percent, respectively, in 1936 to 57.1 percent and 42.9 percent in 1976. Of the 7 million ha of farmland in 1976, plowlands occupied 4.9 million ha, perennial plantings 360,000 ha (including vineyards 43,000 ha), and natural meadows and pastures 1.7 million ha. Forests covered 35 percent of the country, or 4.5 million ha.

CROP FARMING. The structure of the sown area has changed in favor of expanded plantings of fodder and industrial crops. In 1976 grain and pulses covered 57.6 percent of the sown area (compared to 63.2 percent, the annual average for the 1934–38 period); industrial crops, 6.9 percent (4.2 percent); potatoes and vegetables, 6.1 percent (13.6 percent); and fodder crops, 29.1 percent (19 percent). A growth in grain yield (the current yield of almost 40 quintals per ha far exceeds the European average) has raised harvests considerably above the prewar level. Table 4 shows the sown area and harvest of the principal crops.

Wheat is grown mainly along the Labe, in the Danubian Plain, in the valleys of Moravia, and in the Tisza Lowland. Barley is also grown in these regions, especially industrial strains used for making malt. Corn is grown mainly in southern Slovakia. The most important industrial crop is sugar beets, grown for centuries along the Labe and in the valleys of Moravia and now raised in increasingly large quantities on the Danubian Plain. Large areas are planted to oil-bearing crops, chiefly rape, and to fiber crops, predominantly flax. Potatoes are grown in the hilly regions, principally in the Bohemian-Moravian Uplands. The grape harvest amounted to 209,000 tons in 1976. An important perennial crop is hops, for which the country is famous. Orchards are found throughout the country.

ANIMAL HUSBANDRY. Livestock breeding, primarily hog and poultry raising, is being mechanized. The main branches of animal husbandry—meat and dairy cattle raising, hog raising, and industrial poultry raising—are marked by a high density of livestock per unit of farmland (see Table 5) and by high productivity (see Table 6).

FORESTRY. Forests are one of the country's major natural resources. The timber output averages 15 million cu m a year, with the western regions supplying mainly soft wood and the eastern regions hard wood. Other economic activities include hunting (wild boars, pheasants) and pond fish breeding.

Transportation. The operating length of the country's railroads, the chief means of transportation, is 13,200 km, or 10.3 km per 100 sq km of territory. About one-fifth of the track is electrified. In 1976 railroads transported 276 million tons of freight and 462 million passengers. The electrified trunk line linking Prague, Česká Třebová, Olomouc, Žilina, Košice, and Cierna connects the CSSR with the USSR. As a member of COMECON Czechoslovakia participates in the international economic organization known as the Common Pool of Freight Cars. The country has 73,500 km of hard-surfaced roads, or 60 km per 100 sq km of territory. Road transport is important for passenger traffic; in 1961 motor vehicles transported 1,976,000,000 passengers and 317 million tons of freight. Bus routes connect virtually all the inhabited areas. The Prague-Brno-Bratislava Highway is under construction (1978).

Table 6. Output of principal livestock and poultry products
(thousand tons)

	1960	1970	1976
Meat and fat (dressed weight)	802	1,098	1,322
beef	240	362	415
pork	483	586	728
poultry	45.8	103	141
Milk[1]	4,093	4,978	5,485
Wool (unwashed)	2.5	4.1	3.6
Eggs (million units)	2.267	3.733	4.492

[1]Averaging 2,892 kg per cow in 1976

River transport plays a significant role in foreign trade, with the Danube being used mainly for imports and the Labe for exports. In 1976 some 5.9 million tons of freight were hauled on the country's 458 km of inland waterways. The main ports are Bratislava and Komárno on the Danube and Děčín on the Labe. The country's small merchant marine, based at the Polish port of Szczecin, carried 1.4 million tons of cargo in 1976. There are about 1,500 km of trunk pipelines, including the Druzhba (Friendship) oil pipeline, which extends from the Soviet border to Bratislava and then goes on to Most, the Bratstvo (Brotherhood) gas pipeline, and an international transit gas pipeline from the Soviet frontier to the Prague area, where it branches out toward the German Democratic Republic and the Federal Republic of Germany. Czechoslovak Airlines (CSA) provides air services to all the country's major cities, carrying 1,799,000 passengers in 1976, and makes flights to many countries of Europe, Asia, Africa, and North and South America. There are international airports in Prague (Ruzyné) and Bratislava.

Foreign trade. In per capita foreign trade turnover Czechoslovakia is surpassed only by the German Democratic Republic among the socialist countries. It exports about one-fifth of its industrial output, including about one-third of its machinery output, two-fifths of its output of glass and ceramic ware, one-third of the leather goods and footwear produced, and about one-fourth of its textile output. Table 7 shows the commodity structure of exports and imports.

The foreign trade turnover increased by a factor of 10.5 between 1948 and 1976. More than 80 percent of the imported raw materials and fuel come from the socialist countries, mainly the USSR. The share of the socialist countries in Czechoslovakia's foreign trade turnover rose from 54 percent in 1950 to 72 percent in 1976. The COMECON countries accounted for 67.8 percent and the USSR alone for about one-third of the foreign trade turnover in 1976. The CSSR also maintains extensive trade relations with the advanced capitalist countries and with the developing countries.

The monetary unit is the koruna. By the exchange rate of the State Bank of the USSR, 100 korunas equaled 12 rubles 50 kopeks in January 1978.

Economic regions. When territorial planning was instituted in the mid-1950's, the country was scientifically divided into economic regions. The administrative reorganization of the early 1960's, by which the country was divided into ten administrative regions, was coordinated with economic regionalization. Under the present system of economic regionalization, the CSSR forms a single national economic complex that includes two republic economic complexes, those of the Czech and Slovak socialist republics, which are divided into ten administrative regions and two cities with the status of economic regions (see Table 8).

Standard of living. The comprehensive and rapid development of the national economy in the years of people's rule has ensured a rise in the living standard through increased personal income and social consumption and through a broader satisfaction of cultural needs. The national income doubled between 1960 and 1975, when 70.7 percent of the national income was allocated for the consumption fund. As the general consumption fund increased, so did the share of personal consumption. From 1961 to 1976 wages and other earned income increased by a factor of 2.1, and the earned income of the urban and rural population—of working people in industry and agriculture—was equalized. The average monthly wage of workers and office employees in the state and cooperative sectors of the national economy was 2,304 korunas in 1975, compared to 1,365 korunas in 1960 and 1,937 korunas in 1970. Broken down by branch of the economy, the average monthly wage in industry was 2,340 korunas in 1975 (up from 1,442 in 1960 and 1,967 in 1970); in construction, 2,589 korunas (1,521 and, 2,195); in agriculture, 2,238 korunas (1,113 and 1,806); in transportation and communications, 2,632 korunas (1,461 and 2,239); and in science and scientific services, 2,604 korunas (1,545 and 2,246).

Payments to working people from the social consumption fund—that is, society's expenditures on the social needs of citizens and on free services—increased by a factor of 2.9 from 1961 to 1976. In this period the share of such payments in the income of the population rose from 35 percent to 47.5 percent. State appropriations for public health, education, culture, old-age and health insurance, and family allowances are outstripping the growth in earned income. A program of assistance to large families and maternity support was instituted in the early 1970's. A system of free medical care has been established. Large-scale

Table 7. Commodity structure of exports and imports
(in percent)

	Exports			Imports		
	1960	1970	1976	1960	1970	1976
Machinery, equipment, and means of transportation	45.7	50.4	50	21.7	33.4	35.9
Fuel, mineral raw materials, and metals	19.1	18.6	18.6	27.9	23.5	28.9
Nonedible agricultural raw materials and processed goods, food raw materials, and food products	10.4	7.3	6.8	37.1	24.1	17.7
Manufactured consumer goods	20.4	16.6	17.6	3.4	8.5	7.1
Chemical products, fertilizers, rubber, construction materials, and other products	4.4	7.1	7	9.9	10.5	10.4

housing projects have been built, and measures are being taken to improve the environment. The social security system, which covers the overwhelming majority of the working people (workers, office employees, and members of fishing and agricultural cooperatives), is financed by contributions from organizations and state subsidies. The social security system is administered by the trade unions, whose representatives work with the agencies that allocate pensions.

Table 8. Share of the republics and regions in the area, population, and production output of the CSSR
(in percent)

	Area	Population	Industrial output	Agricultural output[1]
CSSR	100	100	100	100
CSR	61.7	68	74.2	69.2
Prague	0.4	7.9	8.7	—
Central Bohemia	8.6	7.7	8.4	13.5
South Bohemia	8.9	4.5	3.3	8
West Bohemia	8.5	5.9	4.6	5.7
North Bohemia	6.1	7.7	10.8	4.9
East Bohemia	8.8	8.2	8.7	10.9
South Moravia	11.8	13.4	11.4	16.9
North Moravia	8.6	12.7	18.3	9.3
SSR	38.3	32	25.8	30.8
Bratislava	0.3	2.3	5.3	—
West Slovakia	11.3	11	5.5	17.5
Central Slovakia	14	9.8	9	6.3
East Slovakia	12.7	8.9	6	7

[1]In 1974

The amount of sickness allowance depends on the length of employment and varies from 60 to 90 percent of the average wage. Women are granted paid leaves of 26 weeks during pregnancy and after childbirth; the leave is extended to 35 weeks for single mothers or in case of the birth of twins. Allowances for the birth of a child and family allowances for children are also paid out of social security funds.

Pension legislation divides all jobs and all workers into three categories, depending on the hazards and difficulty of the work. The social security system provides old-age and disability pensions, pensions for the loss of a breadwinner, meritorious service pensions, and special pensions. The retirement age is 60 years for men (55 years for workers in the first category and 58 for those in the second category), and from 53 to 57 years for women, depending on the number of children the woman has brought up. The size of the pension depends on earnings and term of service. Pensions for disability resulting from general illness are allocated to those who have worked a certain period of time.

A five-day 42.5-hour workweek is standard; for people engaged in hazardous work and for those under 16 years of age the workweek is reduced to 36 hours. Under the law, all workers receive an annual paid vacation. Persons engaged in subsurface, difficult, or hazardous work are granted an additional leave.

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Armed forces

The Czechoslovak People's Army, consisting of ground, air, and air defense forces, is headed by the president, who is the commander in chief, and is directly administered by the Ministry of National Defense. It originated in the joint struggle of the peoples of the USSR and Czechoslovakia against a common enemy, German fascism. The first military unit of the People's Army, the Independent Battalion, was formed by Lieutenant Colonel L. Svoboda at Buzuluk (RSFSR) in accordance with the Soviet-Czechoslovak treaty of July 18, 1941. The battalion, which in March 1943 fought at Sokolovo, near Kharkov, was subsequently expanded, first into a brigade and then into a corps. On Oct. 6, 1944, Soviet troops of the Thirty-eighth Army of the First Ukrainian Front, operating jointly with the Czechoslovak Army Corps, captured Dukla Pass and entered Czechoslovakia. The anniversary of this event is celebrated as People's Army Day.

The victory of the socialist revolution in 1948 opened a new phase in the development of the armed forces. A new type of army—well trained, disciplined, organized along modern lines, and equipped with advanced weapons and combat matériel—was created under the leadership of the Communist Party. The armed forces acquire their personnel by conscription, and all men between the ages of 18 and 60 are subject to military service. Officers are trained at the A. Zápotocký and K. Gottwald military academies, at higher military schools run by the different branches of the armed forces, and at military schools in the USSR. The overwhelming majority of the generals and other officers are of worker or peasant background, and more than 80 percent of the officers are members of the Communist Party. Political party work in the army is directed by the Central Committee of the Communist Party through the Main Political Directorate of the People's Army. Military districts and divisions have political agencies, and regiments, battalions, and companies are assigned deputy commanders for political affairs. Since the founding of the Warsaw Treaty Organization in 1955, the People's Army has taken part in joint measures aimed at strengthening the Joint Armed Forces in order to ensure peace and security in Europe.

Health and social welfare

Medicine and public health. In 1976 the country had a birthrate of 19.2 and a mortality rate of 11.4 per 1,000 population; infant mortality was 20.8 per 1,000 live births. The corresponding figures for 1946 were 22.7, 14.1, and 108.8. The average life expectancy is 70.3 years: 66.9 years for men and 73.7 years for women. Cardiovascular diseases, malignant neoplasms, and diseases of the respiratory system are the leading cause of illness and death. Among the more common infectious diseases are scarlet fever, measles, and epidemic hepatitis. The incidence of tuberculosis has declined sharply, poliomyelitis has been completely eradicated, and the incidence of diphtheria has been reduced to isolated cases.

Under the existing state system of public health the entire population receives free medical care and free medicine. The general protection of health is regulated by the public health law of 1966. The Public Health Council sets the country's public health policy, which is then administered by the Ministry of Health of each republic. In 1974 there were 229 general hospitals (almost all of them attached to polyclinics), 22 tuberculosis hospitals, three institutes of rehabilitation therapy, 36 sanatoriums, 131 spa sanatoriums, 21 research institutes, 14 first-aid stations, and 136 hygiene and epidemiological stations. Other medical facilities included

370 regional and 60 factory polyclinics, 2,700 district dispensaries, and 78 women's and 2,500 children's consultation clinics. In 1976 the various medical institutions had a total of 183,000 hospital beds, or 12.3 per 1,000 population, compared to 110,100 beds, or 9.9 per 1,000 population, in 1948.

In 1976 there were 42,300 doctors, or one per 354 inhabitants (9,000 doctors, or one per 1,300 inhabitants, in 1946), 1,100 dentists, and 6,100 pharmacists. Intermediate medical personnel numbered 105,600 persons in 1973. Training is given at ten medical and two pharmacy faculties, four institutes for the advanced training of doctors, pharmacists, and intermediate medical personnel, and 78 medical schools graduating intermediate medical personnel. Public health appropriations have increased from 4 billion korunas in 1950 to 20 billion korunas in 1976, or 7 percent of the state budget and of the budget of the national committees.

The country's 60 spas had 32,500 beds in 1976, compared to 17,300 beds in 1948. The most famous spas are the balneological resorts of Karlovy Vary, Mariánské Lázně, Teplice, Poděbrady, Janské Lázně, Jachymov, and Luhačovice, the balneological and pelotherapy resorts of Františkovy Lázně and Piešťany, and the climatic resorts of Štrbské Pleso, Tatranská Lomnica, and Tatranská Polianka.

IA. D. POGORELOV

Veterinary services. A number of animal diseases have been eradicated in the postwar period: sheep pox in 1950, glanders in 1954, dourine in 1953, equine infectious anemia in 1965, contagious agalactia in 1946, brucellosis in 1965, and bovine tuberculosis in 1968. In 1976 there were four outbreaks of Newcastle disease, 433 outbreaks of rabies, two outbreaks of hog cholera, and three outbreaks of anthrax. Other diseases recorded that year included swine erysipelas, fowl cholera, myxomatosis, swine influenza, Marek's disease, fowl tuberculosis, infectious porcine encephalomyelitis, blackleg, bovine rhinotracheitis, coccidiosis, infectious atrophic rhinitis of swine, fowlpox, fowl leukemia, pullorosis, fascioliasis, echinococcosis, cysticercosis, and mastitis.

Since 1969 veterinary services have been directed by the veterinary administrations under the ministries of agriculture and food of the constituent republics. Based in Prague and Bratislava, the veterinary administrations are responsible for organizing the veterinary care of livestock. The office of chief veterinarian under the Federal Agriculture and Food Committee, which is advised by a federal veterinary council, coordinates antiepizootic measures, protects the country from the importation of infectious animal diseases, supervises the movement of animals within the country, and maintains contacts with foreign veterinary services and with international veterinary organizations. There were 2,500 veterinarians in Czechoslovakia in 1976. Antiepizootic services are provided without charge, and standard fees for veterinary treatment are set by the government.

Veterinarians are trained by the veterinary faculties of the agricultural universities in Brno and Košice, which also enroll students from Africa, Asia, and Latin America. In addition, there are three institutes for the advanced training of veterinarians. Veterinary research is conducted at the Central State Veterinary Institute, based in Prague and Bratislava, the Scientific Research Institute in Brno (Medlanki), the Central State Diagnostic Institute in Prague, the State Institute for the Control of Biological and Veterinary Preparations in Brno, the State Veterinary Institute of Wild Animals in Jihlava, the Virology Institute of the Czechoslovak Academy of Sciences in Bratislava, and regional research laboratories. Veterinary biologicals are produced at the Biovet enterprises in Terezin, Ivanovice na Hane, and Nitra.

S. I. KARTUSHIN

Education

Written sources attest to the existence of monastery schools in Bohemia and Moravia in the tenth century and in Slovakia in the early 12th century. The first urban schools were established in the 12th and 13th centuries. Charles University, founded in Prague in 1348, greatly influenced the development of Czech national culture and education. In the 15th and 16th centuries Latin was the language of instruction; only the brotherhood schools, founded in the 16th century by the Bohemian Brethren, gave precedence to the native tongue. The writings of J. A. Komenský (Comenius) were associated with the educational work of the Brethren in the 17th century.

Under Hapsburg rule, when the school system in the Czech lands was organized and developed as an integral part of the Austrian system, German was forcibly imposed on the populace. Compulsory education for children from six to 12 years of age was introduced under the school reform of 1774, which established several types of schools: "trivial" schools, offering one or two years of primary instruction; three-year "main" schools, which prepared the pupils for further studies; and two- to four-year "normal" schools, whose curriculum augmented the program of the main school. In the late 18th and first half of the 19th centuries the school network expanded considerably throughout Austria-Hungary. The development of industry obliged the ruling classes to broaden the scope of education. A law enacted in 1869 provided for compulsory eight-year schooling for children six to 14 years of age. The church gradually lost its hold over education.

The establishment of the bourgeois Czechoslovak republic in 1918 brought few changes to the school system, which retained its class character. In the 1930–31 school year only 11 percent of the secondary-school students were of working-class background, although workers constituted at that time almost 60 percent of the population. During the fascist German occupation the number of secondary schools declined sharply, and all higher educational institutions were closed on Nov. 17, 1939. Progressive instructors and students were subjected to repression. After the liberation of Czechoslovakia in 1945 and the beginning of socialist construction, a unified state school system was set up, and the goals and tasks of instruction changed fundamentally. A law enacted in 1948 nationalized all educational institutions and separated the school from the church.

The present education system provides for nurseries for children up to the age of three and kindergartens for children three to five years of age. In the 1976–77 school year the country's 9,554 kindergartens were attended by 522,000 children. Instruction is compulsory for children between six and 16 years of age. The eight-year basic school, enrolling children from six to 14 years of age, consists of a primary level (grades 1 to 4) and an incomplete secondary level (grades 5 to 8). In the 1976–77 school year there were 8,550 basic schools with an enrollment of more than 1,882,000. Upon completing the basic school, the student may enroll in (1) a four-year complete secondary school, called a *Gymnasium*, (2) a two- to four-year vocational school training skilled workers for various branches of the national economy, or (3) a secondary vocational school offering three or four years of instruction. In the 1976–77 school year there were 339 *Gymnasiums* with 137,100 students, and about 400,000 students attended secondary vocational schools of all types.

The system of higher education includes universities, institutes, and higher schools with a course of instruction lasting four to six years. In the 1976–77 academic year there were 36 higher educational institutions with 168,300 students. The largest of these institutions are the universities of Prague (founded 1348), Bratislava (1919), Brno (1919), Olomouc (1576), and Košice (1959); the technical universities in Prague (1707), Bratislava (1938), and Brno (1899); the higher schools of chemical technology in Prague (1952) and Pardubice (1950); the schools of economics in Prague (1953) and Bratislava (1940); the agricultural colleges in Prague (1906), Brno (1919), and Nitra (1946); the Academy of Arts and the Academy of Fine Arts in Prague; the Polytechnical Institute and the L. Janáček Academy of Music and Dramatic Art in Brno; and the Higher School of Fine Arts in Bratislava.

Many of the country's largest libraries are in Prague: the State Library of the Czech Socialist Republic (founded 1958; 4.6 million volumes in 1976), the Main Library of the Czechoslovak Academy of Sciences (1952; more than 700,000 volumes), the National Museum Library (1818; 2.4 million volumes), the Public Library (1891; 2,048,000 volumes), the State Technical Library (1707; 724,000 volumes), and the State Pedagogical Library (1919; 363,000 volumes). Outside the capital, major libraries include the University Library in Bratislava (1919; 1,563,700 volumes), the Matice Slovenská in Martin (1863; 1,850,000 volumes), the University Library in Brno (1815; 1,689,000 volumes), the State Technical Library (1899; 1.1 million volumes) in Brno, and the State Scientific Library in Košice (1657; 846,500 volumes).

The most important Prague museums are the National Museum, the National Gallery, the Museum of the Capital City of Prague, the V. I. Lenin Museum, the Klement Gottwald Museum, the State Jewish Museum, the ethnographic, agricultural, and anthropological museums, the J. A. Komenský Pedagogical Museum, and the B. Smetana and A. Dvořák museums. Among other fine museums are the Slovak National Museum, the Slovak National Gallery, and the Municipal Museum in Bratislava, and the Moravian Museum, the Moravian Gallery, and the Municipal Museum in Brno. There are also several regional museums of local lore.

G. A. KASVIN

Science and scientific institutions

Natural and technical sciences. TO THE LATE 18TH CENTURY. In the Middle Ages urban handicrafts, chiefly cloth-making and metalworking, construction, metallurgy, and mining flourished in the area now known as Czechoslovakia. In the 13th and 14th centuries important mineral deposits were discovered, notably silver ore at Kutná Hora and Banská Štiavnica and copper ore at Banská Bystrica. From the 14th century the focal point of scientific development in the Czech lands was Charles University, whose instructors included the mathematician and medical man Křišťan of Prachatice, and the astronomer and botanist Jan Šindel. The German astronomer and mathematician Regiomontanus worked for a time at the first Slovak university, which was founded in Bratislava in 1467 and existed until 1591. The first Czech printing press was founded in Plzeň around 1468, and another printing press was established in Prague in 1480. One of the first books to be printed in the Czech lands was the medical work *Vetularius* by Albík of Uničov. The Byelorussian printer F. Skorina worked in Prague from 1517 to 1519.

Several major works devoted to practical achievements appeared in the 16th and 17th centuries. G. Agricola, who lived in Jachymov, wrote *On Mining and Metallurgy*, which for two centuries served as a textbook and reference work. The works of Matthesius and L. Ercker contained information on geology, mineralogy, and assay analysis. V. Křička, the builder of the "singing fountain" on Hradčany Hill in Prague, wrote a Czech-language handbook on foundry work (first published in 1947). The eminent physician J. Kamenický wrote on liver diseases, and Jordan of Klausenburk studied therapeutic mineral springs, including those at Karlovy Vary.

Renaissance ideas influenced the work of Tadeáš Hájek, a physician, botanist, and astronomer who expounded the heliocentric system; A. Zalužanský, the author of the first Czech work on botany (1592); and J. Jessenius, a naturalist and the physician of Rudolph II. A scientific center of European renown, attracting such famous scientists as Tycho Brahe and J. Kepler, emerged at Rudolph's court in Prague in the late 16th and early 17th centuries. The *Czech Cosmography*, published in 1554, contained geographical information about many countries. A university was founded in Olomouc in 1576.

The loss of political independence and the stifling of the national culture had a detrimental effect on the further development of science in the Czech lands. Charles University was reorganized and merged with a Jesuit college in 1654. The reopened educational institutions at Trnava (1635) and Košice (1657) regarded as their primary goal the restoration of Catholicism. The best known of the few scientists who worked alone were Marci von Kronland, whose studies in optics included an explanation of the rainbow, and J. Dobřenský, who initiated the clinical teaching of medicine in Bohemia. In the 1620's and 1630's blasting with gunpowder came into use in mining.

An engineering school was established by the estates in Prague in 1707, and in 1751 an astronomical and meteorological observatory was built in the city through the efforts of J. Stepling. The world's first higher mining school was founded in Banská Štiavnica, Slovakia, in 1763–64 and reorganized as a mining academy in 1770. Its faculty included J. K. Hell, who had invented a hydraulic engine in the 1730's and 1740's. Other prominent 18th-century men of science were the physician and naturalist J. K. Boháč, who investigated the possibility of using electricity in therapy, the inventor P. Divisch, who built the first grounded lightning rod in Europe (1754), and J. Tesánek, the author of several works on number theory.

LATE 18TH AND FIRST HALF OF THE 19TH CENTURIES. The last decades of the 18th century and the first half of the 19th century, the period known as the National Renaissance, saw the founding of several new learned and higher educational institutions. The Bohemian Society of Sciences was founded in Prague in 1784; it was renamed the Royal Bohemian Society of Sciences in 1790. A royal-estate technical school was founded in Prague in 1806, later becoming a polytechnical institute, and a higher school of forestry was established in Zvolen in 1807. The Museum of the Kingdom of Bohemia (founded in 1818, now the National Museum) and the Matice Česká played an important role in strengthening Bohemia's scientific forces and in organizing research. The Slovak Learned Society was founded in Trnava in 1793.

The late 18th and the first half of the 19th centuries were marked by a number of outstanding scientific achievements. F. A. Reuss embarked on one of the first mineralogical and balneological studies of the mountain regions of Bohemia. His work was continued by his son A. E. Reuss. J. Krejčí, who studied the Ore Mountains, is regarded as the founder of Czech geology. K. Šternberk made a major contribution to the classification of fossil plants, and F. M. Opiz laid the foundation for the study of the flora of Bohemia. A prominent place in the development of modern Czech science belongs to J. S. Presl, who with his brother K. B. Presl published the *Flora of Bohemia* (1819), the first such work, and a fundamental work on mineralogy (1837). Systematically developing Czech scientific terminology, Presl was one of the founders of Czech scientific writing. In 1821, Presl and J. Jungmann undertook the publication of the first Czech encyclopedia. G. Reuss produced the first botanical description of Slovakia, and L. Šmarda published the three-volume compendium *Geographic Distribution of Animals* (1853).

Several Czech physiologists and physicians came to prominence in the late 18th and early 19th centuries. G. Procháska was one of the founders of the reflex theory, which subsequently became the basis of neurophysiology. The internationally acclaimed work of J. E. Purkinje (Purkyně) had a great impact on the development of cytology, anatomy, and embryology and led to the formulation of the cell theory. B. Bolzano introduced several important concepts of mathematical analysis.

There were also advances in technology and in the technical sciences. In the late 18th century I. Born proposed a method of recovering gold and silver by amalgamation. F. J. Gerstner, who offered original solutions to several practical problems of mechanics, improved mine hoisting machines. J. Ressel designed and successfully tested (1826) a screw propeller for ships. In the 1820's a horse-drawn railroad was built from České Budějovice to Linz. The first railroad, connecting Prague with Olomouc, went into opertion in 1845.

FROM THE MID-19TH CENTURY TO 1918. In the years between the Revolution of 1848 and the emergence of the Czechoslovak state the political climate was not conducive to scientific endeavor. Among the scientists who emigrated abroad were the biologists and physicians K. von Rokitansky, J. Škoda, F. von Hebra, and F. Chvostek and the mechanical engineer A. Stodola. The disparity between scientific development in the Czech lands and in Slovakia became increasingly apparent. Few educational or learned institutions were established in Slovakia: an agricultural school was opened in Liptovský Hrádok in 1871, an industrial school was organized in Krukotin in 1875, and a society of physicians and naturalists was founded in Bratislava in 1856. The Matice Slovenská, founded in 1863, was closed in 1875. Despite the difficulties, D. Štúr continued his research in zoology and paleontology, and A. Kmeť and J. Holuby pursued their work in botany.

In the Czech lands learned societies were formed in several branches of science: medicine (1862), mathematics (1862), chemistry (1871), geology (1884), and geography (1894). A committee for the study of the natural resources of the Czech lands was established at the National Museum in 1864. When the Prague Polytechnical Institute was divided into a Czech and a German institute in 1863, the Czech institute became the first higher educational institution to use Czech as the language of instruction. In 1882 the University of Prague was likewise divided into two universities. The newly formed Czech educational institutions engendered several schools of 20th-century Czechoslovak

scientific thought. By the turn of the 20th century Czech-language scientific works existed in virtually all fields. The Czech Academy of Sciences and Arts was founded in 1890.

Important work in geology was done by J. Barrande (corresponding member of the St. Petersburg Academy of Sciences from 1877), who settled in Bohemia in 1831. Barrande's 24-volume monograph is considered a classic of 19th-century paleontology. F. B. Pošepný did pioneering work on the theory of ore deposits. C. Purkyně and J. V. Daneš laid the foundation for Czech geomorphology, and K. Kořistka compiled geographical maps of most of Bohemia. Prominent biologists included the botanist L. Čelakovský, an exponent of Darwinism, and the zoologists A. Frič and F. Vejdovský, who wrote on animal anatomy. G. Mendel, the founder of genetics, conducted his experiments in a monastery in Brno, publishing in 1866 in the proceedings of the local natural science society the *Experiments in Plant Hybridization*, a classic work that won world recognition in the 20th century. Advances in chemistry included B. Brauner's studies on rare-earth elements, V. Šafařík's research in inorganic chemistry, and J. Stoklasa's work on the biochemistry of plants and agricultural chemistry. Important work in medicine was done by the microbiologist J. Hlava, the surgeon K. Maydl, and the gynecologist and urologist K. Pavlik. J. Jansky won international acclaim for his description of blood groups in 1907.

The leading mathematicians of this period were Eduard Weyr, who wrote on the projective theory of curves, his brother Emil Weyr, and F. J. Studnička, who worked on the theory of determinants. M. Lerch was noted for his works on number theory and the theory of special functions.

The metallurgy industry benefited from F. Wald's work in physical chemistry. Various problems of extracting minerals were solved by the engineers E. Horovský and J. Hrabák, the latter recognized as the founder of Czechoslovak mining mechanics. F. Křižík built the first electric power plant in Bohemia in 1888 and an electrified railroad in 1903. A Czech school of construction engineering emerged under J. Šolín, and the well-known Czech school of sugar refining was established by K. Preis and K. Andrlík. Other technical achievements included J. Husnik's development of phototype in 1868 and F. Hruska's invention of a honey extractor in 1865.

FROM 1918 TO 1945. After independence, the Czechoslovak government established research institutes in Prague in geology (1919, under C. Purkyně), hydrology (1919), and meteorology (1920). Several research institutes and laboratories were set up at Charles University. The university that was founded in Brno in 1919 acquired a natural science faculty the following year. The Czechoslovak Scientific Research Council, founded in 1919, was essentially a representative body. In Slovakia, the J. A. Komenský University was founded in 1919 in Bratislava (a natural science faculty was added in 1938), and the Matice Slovenská was revived. The P. J. Šafařík Learned Society was founded in 1926 to promote scientific work. State appropriations for research, generally small, were reduced to a bare minimum during the economic crisis of 1929–33.

The interwar period saw major achievements in chemistry. J. Heyrovský (elected to the Academy of Sciences of the USSR in 1966) developed the polarographic method in 1922. E. Votoček's investigations in analytical chemistry and the chemistry of sugar and J. Dubský's work on complex compounds were widely acclaimed. The mathematician E. Čech did pioneering work in projective differential geometry. F. J. Studnička, the mathematician, was a tireless popularizer of science. F. Záviška's works dealt with problems of crystallography and hydrodynamics, and V. Dolejšek did research on X rays.

The contributions of Czechoslovak biologists were also significant. B. Němec was one of the founders of experimental cytology. In the tradition of the national school of physiology, E. Babák studied the adaptation of organisms under extreme conditions. V. Ružička won recognition for his work in genetics. The surgeon J. Diviš and the cardiologist V. Libenský did outstanding work in medicine. V. Dedina directed the publication of a multivolume regional geography of Czechoslovakia (1929–31). F. Ulrich and R. Nováček conducted research in mineralogy and geochemistry.

The occupation of the country by fascist troops severely undermined Czechoslovak science. Scientific institutions and universities were closed. The clerical-fascist regime in Slovakia established, for demagogic purposes, the Slovak Academy of Sciences and Arts in 1943. Záviška, Dolejšek, Ulrich, Nováček, and many other scientists perished during the occupation.

SINCE 1945. After the liberation of Czechoslovakia by the Soviet Army, and especially after the victory of the working people in 1948, science was confronted with fundamentally new tasks related to the development of the material and technical basis for socialism and the socialist transformation of society. The higher educational institutions that had been closed were reopened, and new ones were founded; a network of research institutions was established to serve various branches of the national economy. The founding of the Czechoslovak Academy of Sciences in 1952 was followed by the creation of the Slovak Academy of Sciences the next year. The network of scientific institutions steadily expanded, and the coordination of scientific work became more precise. Research, planning, and design organizations were founded not only in Prague and Bratislava but also in many other cities, including the industrial centers of Brno, Ostrava, Gottwaldov, and Košice. The higher educational institutions increased their commitment to research.

Outstanding achievements in mathematics have included E. Čech's and V. Jarník's work on the theory of functions and V. Kořínek's research on group theory. Czechoslovak mathematicians have turned to branches that hitherto received little attention: differential equations, functional analysis, probability theory and mathematical statistics, mathematical logic, and some fields of cybernetics. They are also working on problems of applied mathematics.

A conference of Czechoslovak physicists held in 1951 defined for the first time the basic directions of physics research in the country. The study of X rays continues. Significant work is being done on the physics of semiconductors and ferrites, the magnetic properties of metals, crystallography, low-temperature physics, and superconductivity. Research on the physics of elementary particles and the atomic nucleus has begun with the help of Soviet specialists. In 1957 the first Czechoslovak nuclear reactor was put into operation at Řež. Research on plasma physics, using a Tokamak unit, has been initiated in cooperation with the Academy of Sciences of the USSR. Several kinds of electronic microscopes and other unique instruments have been developed, including instruments for the study of the structure and energy states of surfaces. Astronomical research, much of it conducted at the Ondřejov Astronomical Institute, has focused on interplanetary matter (V. Guth) and on the physics of the sun, stars, and stellar systems.

In chemistry, J. Heyrovský received the Nobel Prize in 1959 for his work on the theory and technology of polarography. Two of Heyrovský's students have also won recognition: R. Brdička for his work on chemical kinetics and D. Ilkovič for his work on thermodynamics. R. Lukeš and his associates have made a major contribution to the chemistry of natural and heterocyclic compounds. Geologists are studying minerals and ores (F. Slavík). Problems of tectonics (V. Zoubek, elected to the Academy of Sciences of the USSR in 1976) and engineering geology are being resolved in conjunction with large building projects. A geological map of the CSSR (1:200,000 scale) has been published, and geomorphological maps have been compiled. A national atlas has been published. F. Vitásek has written one of the most comprehensive textbooks of physical geography (4th ed., 1956–65). Research is under way on landscape science (J. Demek) and on the protection of the environment.

Czechoslovak biologists have done significant work in plant physiology, geobotany, paleobotany, microbiology (D. Blaškovič, elected to the Academy of Sciences of the USSR in 1966), virology, molecular biology (F. Herčík), and biophysics (J. Šterzl). In the medical sciences promising research is being done in histology (F. Studnička), medical biochemistry, endocrinology, human physiology and pathophysiology (V. Laufberger), and medical microbiology. Progress in neurology has been achieved by J. Hrbek (elected to the Academy of Medical Sciences of the USSR in 1969), and several branches of surgery have been advanced by K. Šiška (elected to the Academy of Sciences of the USSR in 1971 and to the Academy of Medical Sciences of the

USSR in 1969) and by F. Burian. Expanding research in pharmacology has led to the discovery of a number of cytostatic and psychopharmacological drugs. Other medical research fields include oncology (V. Thurzo) and pediatrics (J. Houštěk). In the agricultural sciences research has focused on the physiology and genetics of farm animals, general and special zootechny, agronomy, soil science, forestry, land reclamation, and the mechanization of agricultural production.

The technical sciences are flourishing, particularly fields that apply to machine building: applied mechanics (J. Kožešník, elected to the Academy of Sciences of the USSR in 1971), the theory of elasticity and plasticity and the theory of welding (J. Čabelka), and the theory of hydraulic machines (J. Hýbl). O. Maštovský's research and designs have improved the parameters of power-engineering machinery. P. Ryš is doing important work in materials technology and S. Bechyně in construction mechanics. Problems of water management are being studied by T. Eždik. As a result of special engineering studies of rocks and the methods of breaking them, new mineral deposits are being worked and the output of minerals has increased. There has been notable progress in power engineering (J. Řeznicek), electronics and radio engineering (J. Stránský), the technology of strong currents (B. Heller), and the technology of semiconductor materials (Z. Trousil). A computer industry is being established. The products of several industries are noted for their high technical level, namely motor vehicles, including the heavy Tatra trucks, the electric locomotives of the ČKD Plant, river boats, means of communication, and equipment for the leather footwear and textile industries.

Czechoslovak scientists and engineers are working with specialists from the USSR and other socialist countries at the Joint Institute for Nuclear Research and on projects of the Interkosmos Program. V. Remek, the first Czechoslovak astronaut, took part in the flight of the Soviet orbital research complex Salyut 6–Soyuz in March 1978. During the flight the international crew conducted several joint studies and experiments prepared by specialists in the USSR and the CSSR. The scientific and technical cooperation within COMECON encompasses several branches of machine building, metallurgy, power engineering, medicine, and public health. Czechoslovak scientists have taken part in many international programs, among them the international Years of the Quiet Sun, the International Hydrological Decade, the International Biological Program, and the International Project on the Upper Mantle of the Earth. Cooperation with many international scientific organizations is expanding.

Social sciences. PHILOSOPHY. Medieval Czech philosophy was dominated by Thomist scholasticism, whose influence began to wane in the early 15th century with the rise of the antifeudal revolutionary Hussite movement. The forerunners of Hussitism were Matthew of Janov, Vojtěch Raňkův, and Thomas of Štítný. Jan Hus, the ideologist of the Czech Reformation, preached a humane interpretation of "god's law" as the norm of social relations and social justice. The revolutionary wing of the Hussite movement, the Taborites, who repudiated feudalism, held the authority of reason to be the highest principle. The Taborites' views contained elements of pantheism. P. Chelčický, one of the ideologists of the Taborites, rejected the feudal division of society into estates and proposed a utopian program of social reform, to be achieved by passive resistance.

The next phase in Czech philosophy was marked by a blending of Reformation ideas with humanism, which was beginning to speculate about the development of the natural world and society. The humanist tradition in Czech philosophy culminated in the work of J. A. Komenský (Comenius), who held that education and upbringing must be based on enlightened reason and be imbued with the spirit of universal harmony.

In Slovakia, 15th-century philosophy developed under the influence of Renaissance and Reformation doctrines. Founded in the latter half of the 17th century by J. Bayer and I. Caban, the Prešov school was influenced by F. Bacon's ideas and P. Gassendi's atomism. From the mid-18th century Slovak philosophical thought flourished at the University of Trnava and in learned societies. Such Slovak thinkers as J. Laurentzy, J. Feješ, and M. Steigel attacked religious prejudice, affirmed the independence of thought, and propagated deism, empiricism, and Kantianism.

With the development of capitalist relations in the late 18th and first half of the 19th centuries, Czech Enlightenment learning, based on the rational-critical method, found ardent champions in J. Dobrovský and G. Prochaska. The ideologists of the Czech and Slovak National Renaissance—J. Jungmann, F. Palacký, and J. Kollár—espoused the dialectical concepts of J. G. Herder, F. Schelling, and G. Hegel. The Czech mathematician and philosopher B. Bolzano proposed a methodological analysis of the logical foundations of science. Under the influence of Hegelianism the bourgeois-democratic thinkers L. Štúr, J. M. Hurban, F. Klácel, and A. Smetana developed a philosophy of nationalism, history, and art and expounded ideas of freedom and social utopia. The radical democrats E. Arnold, K. Sabina, and J. V. Frič called for progressive social and political changes.

In the latter half of the 19th century the ideas of the German philosopher J. F. Herbart attracted many adherents to the Czech lands and Slovakia. Another major trend, positivism, had a considerable influence on T. G. Masaryk, an ideologist of bourgeois reformism and an opponent of Marxism.

Marxist ideas, filtering into the Czech labor movement in the 1870's and spreading to Slovakia in the 1880's, were disseminated by the "pioneers" of socialism J. B. Pecka and L. Zápotocký. The activity of B. Šmeral was of great importance for the growth of the labor movement and the spread of Marxist-Leninist ideology. In the period of the bourgeois republic Czech and Slovak Marxists, led by K. Gottwald, worked on problems of Marxist-Leninist philosophy. The foundation for a Marxist tradition in philosophy and sociology was laid by Z. Nejedlý and L. Štoll in the Czech lands and by L. Szántó and A. Sirácky in Slovakia.

Contemporary Marxist-Leninist philosophers and sociologists, notably I. Hrušovský, R. Richta, V. Ruml, L. Svoboda, V. Filkorn, and V. Cirbes, are studying the development of a socialist society, the scientific and technological revolution, and philosophical and logical problems of modern science. They are combating bourgeois ideology and revisionism, openly manifested in 1968–69 in the attacks of some philosophers and sociologists on the basic principles of the Marxist-Leninist world view.

Czechoslovak philosophers and sociologists are working closely with scholars in the USSR and other socialist countries, participating in joint conferences, research, and publications. Philosophical and sociological research is conducted by the philosophy departments of the Czechoslovak and Slovak academies of sciences, at the Higher School of Political Studies attached to the Central Committee of the Communist Party of Czechoslovakia, at institutes of Marxism-Leninism, and by the philosophy faculties of the universities in Prague, Bratislava, and Brno. The leading philosophical and sociological journals are *Filosofický časopis* (since 1953), *Sociologický časopis* (since 1965), *Nová mysl* (since 1947), *Slovenský filozofický časopis* (founded 1946; since 1966, *Filozofia*), and *Sociológice* (since 1969), the last two journals being published in Slovakia.

HISTORY. In the Czech and Slovak lands early feudal historical literature originated in the late ninth and early tenth centuries, when hagiographies, in Old Church Slavonic and Latin, were written about the Slavic educators Cyril and Methodius, the Přemyslid rulers Ludmila and Václav (Wenceslas), and the Prague bishops Vojtěch (Adalbert) and Procopius. The finest example of Czech annal writing of the early Middle Ages is the Czech Chronicle, written in Latin in the early 12th century by Cosmas of Prague, dean of the St. Vitus Cathedral. The Bratislava Annals of the late 12th century are also written in Latin. The first historical work to be written in Czech was the rhymed Dalimil Chronicle of the early 14th century. The Chronicle of Abbot Petr Žitavský, written in Latin and covering events down to 1338, dates from the same period.

The highly polemical historical writing of the Hussite period (first half of the 15th century) incorporated such new professional techniques and forms as document citations, diary entries, and dialogues and reflected the more diverse social background of the authors. The chronicles of Vavřinec z Březové, Petr z Mladoňovic, and Mikuláš z Pelhřimova, as well as other historical works, mirrored the bitter social, political, and ideological conflict of that time. After the defeat of the Hussite movement, Reformation and humanist ideas were expounded by such 16th-century writers as Sixt z Ottersdorfa and Jan Blahoslav, whose principal

adversary was Václav Hájek z Libočan, the spokesman of the Czech Catholic nobility. The most important 16th-century Slovak historian was M. Rakovský, who wrote mainly in verse. After the onset of Catholic reaction in the 1620's, the traditions of progressive historiography were carried on by P. Stránský, P. Skála, and B. Balbín. The 18th century writers M. Bel and F. A. Kollár paved the way for the Slovak historiography of the National Renaissance.

The development of capitalist relations in the late 18th and first half of the 19th centuries promoted a rapid expansion of historical studies. The historians of the early period of the National Renaissance, notably G. Dobner, J. Dobrovský, and F. M. Pelcl, initiated the scholarly critique of sources and produced the first historical works aimed at instilling national consciousness. J. Papánek and J. Fándly expressed Enlightenment views in their works on Slovak history. P. J. Šafařík's *Slavic Antiquities* (1837) and *Ethnography of the Slavs* (1843) were the first scholarly investigations of the early history of the Slavic peoples. The greatest historian of the first half of the 19th century was F. Palacký. Representing the bourgeois national-liberal wing of the "romantic" trend in Czech historiography, Palacký and his numerous followers were especially interested in the Hussite movement, which they considered a heroic chapter of their national history. Their works, however, did not reveal the social preconditions of the Czech people's struggle against national and religious oppression. Unlike them, K. Sabina, E. Arnold, and other radical democrats perceived the social roots of the Hussite movement and understood the revolutionary nature of the peasant war led by J. Žižka. The historical-philosophical and political writings of L. Štúr had a profound effect on 19th-century Slovak historiography.

The defeat of the Revolution of 1848–49 reinforced the conservative and pro-Hapsburg tendencies in Czech bourgeois historiography, whose leading exponent was V. Tomek. By the 1860's, however, liberal positivism had become the dominant school in historiography. Led by A. Gindely, J. Kolouŝek, K. J. Erben, and J. Emler, the historians of this school wrote basic works on national history and collected and published a large number of official documents and legal records. In Slovakia, the foremost representative of romantic historiography, which held sway down to the end of the 19th century, was F. V. Sasinek.

The "pure positivist" school of Czech historiography, founded by J. Goll, expanded the subject matter of research to include international relations and social and economic history, broadened the chronological scope to encompass the pre- and post-Hussite periods, enriched the study of sources, and began applying the comparative historical method. The primary weakness of the positivist historians, notably V. Novotný, J. Šusta, G. Friedrich, Z. Winter, K. Krofta, B. Mendl, and V. Chaloupecký, was their tendency to concentrate on individual problems of history. The Goll school, which in the late 19th and early 20th centuries dominated first Czech and then Czechoslovak historiography, underwent considerable evolutionary changes. Some of Goll's students increasingly confined themselves to simply describing historical events and ascertaining facts, reducing comparative history to the "theory of influences." The tumultuous events of the first decades of the 20th century caused a deep ideological and political rift between Goll's students and followers. While J. Pekař took an ultraconservative approach to the major periods of medieval and modern Czech history, Z. Nejedlý, another of Goll's students, criticized the positivists for restricting the tasks of historical research, for refusing to make philosophical generalizations, and for attempting to make history a "pure science."

Other major scholarly contributions at the turn of the century included the early works of the archaeologist and historian L. Niederle, the first works on the modern political history of the Czech lands (A. Srb), the first studies devoted to political, social, national, and cultural problems of Austro-Hungarian history (Z. Tobolka), and the first works on the history of the Czech labor movement (L. Zápotocký, C. Horáček, and B. Šmeral).

After the establishment of the bourgeois Czechoslovak republic, although Czech and Slovak medieval history continued to engross bourgeois scholars, they showed a much greater interest in modern and contemporary national history, particularly in the restoration of the national state. Important work in post-medieval history was done by Tobolka, K. Kazbunda, J. Opočenský, K. A. Medvecký, and J. Botto. There appeared numerous works on "legion" history, dealing with the Czechoslovak political organizations and military units in the Entente countries during World War I. The most influential scholars working on this subject—F. Šteidler, J. Papoušek, J. Kudela, and J. Werstadt—upheld the concept of "national liberation" expounded in the works of Masaryk and other political leaders of the governing bourgeois Hrada group. The social-reformist historians, notably F. Soukoup and I. Dérer, also did not transcend Masaryk's concept, although they devoted much attention to the history of the labor movement. A right-wing, conservative alternative to the official concept of national liberation was propounded by K. Kramář and his followers F. Zuman and A. Kalina. The sole exponent of left-wing legion literature was J. Kratochvíl.

Nejedlý's scholarly and publicistic work promoted the development of progressive views on national history and acquainted the Czechoslovak public with the scientific and cultural achievements of the Soviet Union. The Marxist trend in Czechoslovak historiography was represented mainly by the writings of Communist Party leaders, notably Šmeral, K. Kreibich, J. Šverma, and K. Konrad. In the second half of the 1930's young historians sympathetic to Marxism, among them V. Husa, O. Říha, and V. Čejchan, rallied around the journal *History and Modern Times*.

In the first years after the liberation of Czechoslovakia from the fascist occupation, although bourgeois historians remained influential in education and scholarship, they were already opposed by a group of Marxist historians who were advocating radical changes in the methodology, subject matter, and methods of historical research. Nejedlý formulated the basic principles of a Marxist view of Czechoslovak history.

The prerequisites for intensive Marxist research were created in Czechoslovakia after 1948, when historians began working on problems and periods of national history that had been either totally ignored or distorted in bourgeois historiography, and new sources were made available to scholars. Central problems relating to the ethnogenesis of the Slavs and to the history of the primitive communal system in the Czech lands and Slovakia have been studied by Nejedlý, J. Bem, J. Filip, J. Eisner, J. Poulík, and B. Chropovský. The origins of feudalism and capitalism and the modern national liberation and labor movements have been investigated by Husa, Gosiorovský, Říha, D. Rapant, F. Roubík, B. Varsik, Z. Fiala, J. Janáček, R. Urbánek, J. Purš, J. Křížek, J. Kočí, and P. Ratkoš. Many diverse problems pertaining to contemporary Czechoslovak and world history, to international relations, and to the history of the Communist Party of Czechoslovakia have been studied by J. Veselý, Gosiorovský, L. Holotík, Z. Snitil, V. Plevza, J. Hrozienčík, V. Král, I. Krempa, M. Kropilák, and Č. Amort. Monographic research has permitted the publication of such collaborative syntheses as the *Atlas of Czechoslovak History*, the *Survey of Czechoslovak History*, and the *History of Slovakia*, as well as surveys of the history of the Communist Party and the foreign policy of Czechoslovakia and surveys of the history of Czech-Russian and Czechoslovak-Soviet relations.

Some of the historical works and "historical journalism" produced in 1968–69 betrayed right-opportunist and antisocialist tendencies that essentially represented attempts at a bourgeois-nationalist revision of the Marxist-Leninist theory of the objective laws of historical development and at a reevaluation of the key periods in the history of Czechoslovakia and the workers' and communist movement. The overcoming of these harmful tendencies in the early 1970's was the crucial prerequisite for the further development of Czechoslovak historiography.

Czechoslovak historians are working with international scholarly organizations and with historians in the USSR and other socialist states. Such cooperation includes the formation of bilateral historical commissions, the joint publication of multivolume collections of documents, and collaboration on basic historical research.

The main centers of historical research, which also train scholars and teachers, are the universities in Prague, Bratislava, Brno, Olomouc, and Košice-Prešov, the Institute of Czechoslovak and World History of the Czechoslovak Academy of Sciences

(CSAS) in Prague, the History Institute of the Slovak Academy of Sciences (SAS) in Bratislava, the Czechoslovak-Soviet Institute of the CSAS in Prague, the Institute of European Socialist Countries of the SAS in Bratislava, and the Silesian Institute of the CSAS in Opava. Other major centers of historical research are the Institute of Ethnography and Folklore of the CSAS in Prague, the Ethnography Institute of the SAS in Bratislava, the Archaeology Institute of the CSAS in Prague, the Archaeology Institute of the CSAS in Brno, the Archaeology Institute of the SAS in Nitra, the Oriental Institute of the CSAS in Prague, the Institute of Military History in Prague, the Institute of Marxism-Leninism under the Central Committee of the Communist Party of Czechoslovakia in Prague, and the Institute of Marxism-Leninism under the Central Committee of the Communist Party of Slovakia in Bratislava.

The main history periodicals are *Sborník historický* (since 1953), *Slovanské historické studie* (since 1955), *Slovanské štúdie* (since 1957), *Slovenský národopis* (since 1953), *Numismatický sborník* (since 1953), *Historica* (since 1959), *Archaeologické rozhledy* (since 1949), *Archiv orientalní* (since 1929), *Byzantinoslavica* (since 1929), *Československý časopis historický* (since 1953), *Český lid* (since 1892), *Památky archaeologické* (since 1909), *Slezksý sborník* (since 1936), *Slovanský přehled* (since 1899), *Historické studie* (since 1955), *Časopis Národného muzea* (since 1827), *Časopis Matice moravské* (since 1869), *Historický časopis* (since 1953), *Historie a vojenství* (since 1952), and *Studia historia slovaca* (since 1963). A. Kh. Klevanskii

ECONOMICS. In the Czech lands and Slovakia the study of economics developed later than in the West European countries. An urgent need for economic study arose only in the 19th century, when the disintegration of feudal relations and the development of capitalism, more rapid in the Czech lands than in Slovakia, were accompanied by a national revival. The foundations of Czech bourgeois economic theory were laid by F. L. Rieger, who in the mid-19th century wrote the first significant works on political economy in Czech, translated several works by French economists, and undertook to work out a Czech economics terminology. Bourgeois political economy developed rapidly in the Czech lands in the second half of the 19th century. Its main objectives were to justify theoretically the necessity of developing capitalism and eradicating feudal vestiges and to find ways of vanquishing both the German bourgeoisie, Czech capital's main competitor on the domestic and foreign markets, and the growing labor movement. This social function was fulfilled by F. A. Brauner, J. Kaizl, A. Bráf, and J. Gruber. The German historical school and the Austrian school of vulgar political economy had a great influence on the development of bourgeois political economy in the Czech lands.

Marxist economic theory was somewhat slow to gain a following in the Czech lands and Slovakia. The first Marxist works in Czech and an incomplete Czech translation of Marx' *Das Kapital* were published only shortly before World War I. It was not until 1937 that a popular exposition of Marxist political economy was published, A. Kamenický's *Fundamentals of Marxist Economics*. This circumstance facilitated the dissemination of reformist and opportunist ideas in the Czechoslovak labor movement. Revisionist interpretations of Marxism, such as that of F. Modráček, gained currency.

After 1918 bourgeois political economy was supported by the ruling circles, who required an economic theory that would defend the interests of the national bourgeoisie. Such a defense was provided by V. Mildschuh, A. Rašín, C. Čechrák, A. Basch, C. Horáček, and J. Loevenstein in the Czech lands and by I. Karvaš and R. Briška in Slovakia. K. Engliš, a prominent bourgeois political economist of the interwar period, proposed a teleological method of economic analysis based on the psychology of the economic "subject," seeking thereby to prove the viability of the capitalist economic system. Most bourgeois Czechoslovak economists were indebted to this theory down to World War II. J. Macek, who was strongly influenced by Keynesianism, had a considerable impact on the formation of the reformist views of the right-wing Czechoslovak Social Democrats.

The events of 1948 opened up broad opportunities for basic and applied economic research. In the 1950's Czechoslovak economists focused on the socialist nationalization of industry, the formation of agricultural cooperatives, the industrialization of backward areas, the achievement of a high growth rate of socialist reproduction, and the creation of a system of planning. Right-wing revisionist views proliferated in Czechoslovak economics in the 1960's and were even put into practice by the end of the decade. The revisionists, whose leading exponent was O. Šik, tried to justify the need for "market socialism" in Czechoslovakia. In the early 1970's this point of view was subjected to a comprehensive in-depth Marxist critique.

Czechoslovak economists are studying the political economy of capitalism, the political economy of socialism, the history of economic theories, and problems relating to national economic planning, the management of the socialist economy, and the efficiency of the national economy. Other research fields include the economics of agriculture, distribution, pricing policy, finance, the application of mathematical methods to economics, the international division of labor, the economics of foreign trade, and socialist economic integration. Significant work in these fields has been done by F. Oliva, V. Kvěš, L. Rendoš, J. Bouška, L. Ler, J. Nikl, J. Kabrhel, J. Řezníček, and J. Brčák. Cooperation in economic research is steadily expanding among the economists of the COMECON countries.

The main economics centers are the School of Economics in Prague, the School of Economics in Bratislava, the Institute of Economics of the Czechoslovak Academy of Sciences, the Institute of Economics of the Slovak Academy of Sciences, the Scientific Research Institute for the Planning and Management of the National Economy, the Czechoslovak Scientific Research Institute of Labor, and the Scientific Research Institute of the Standard of Living.

The principal economics journals are *Politická ekonomie* (since 1953), *Ekonomický časopis* (since 1953), *Plánované hospodářství* (since 1948), *Statistika* (since 1962), *Finance a úver* (since 1951), *Moderní řízení* (since 1966), and *Zahranični obchod* (since 1946). The weekly *Hospodářské noviny* has been published since 1958.

J. Brčak and E. D. Matvievskaia

JURISPRUDENCE. Urban, ecclesiastical, and other types of law, as well as jurisprudence, were highly developed by the turn of the 14th century, especially in the Czech lands. This period saw the appearance of the first official and private codifications of customary law, the former exemplified by Václav II's mining code and the *Maiestas Carolina* and the latter by the Rožmberk Book (13th–14th centuries), written in Czech, the law book of Ondřej of Dubá (1400), also in Czech, and the law book of the scribe Jan of Brno (14th century), written in Latin. In the late 14th and early 15th centuries lively discussions of current political and legal problems were held within and outside the law faculty of the University of Prague, which had become a center for the training of experts in canon law. The best-known work on legal matters was written by Cornelius Viktorin z Všehrd at the turn of the 16th century. The law book written by Pavel Kristián of Koldín in 1579 became the basis for standardizing urban law throughout the Czech lands in the next century. Slovakia, ruled by Hungarian feudal lords, also produced some important legal works, generally written in German, Latin, or Czech. Especially noteworthy are the first and second Bratislava law books (15th and 16th centuries), the *Articuli communitatis* of Košice (1604), and the law book of Žilina (15th century).

Despite the Hapsburgs' policy of germanizing political life and forcibly imposing German law, the traditional Czech law and legal system hung on throughout the 17th and 18th centuries. Eighteenth-century works calling for a national revival championed Enlightenment ideas and natural law (J. V. Monse). Earlier, J. A. Komenský (Comenius) had expounded progressive ideas concerning the state and law.

In the late 18th and early 19th centuries Czech legal scholars, notably M. A. Voigt and J. Veith, devoted much attention to the history of the Czech state and law. The heightened interest in Czech legal history that was kindled by the Revolution of 1848 led to the publication of major works by K. Sladkovský, A. Štrobach, and F. L. Rieger and to the creation of a Czech legal terminology. Nevertheless, an official jurisprudence developed only in the 1860's in connection with the emergence of Czech bourgeois legal science. The foremost legal scholars of the latter half of the century were A. Randa, E. Ott (civil law),

J. Pražák (public law), A. Zucker, F. Storch (criminalistics), B. Rieger, and J. Čelakovský (history of the state and law). A Slovak legal terminology was formulated in the late 19th century by M. Mudroň, and a Slovak bourgeois legal science emerged in the early 20th century under the guidance of E. Stodola and A. Rath.

Positivism and normativism were the dominant schools in official jurisprudence in the early 20th century. Fascist theories gained a certain influence in the 1930's.

The establishment of people's rule in Czechoslovakia was followed by the creation of a Marxist-Leninist legal science, but not without a struggle against bourgeois, right-opportunist, and antisocialist views of the state and law, which became especially influential in 1968–69. Czechoslovak jurists have done outstanding work on the theory of the state and law, the constitutional development of the country, socialist popular representative institutions, international law, socialist comparative law, the methodology of legal science, and the criticism of bourgeois ideology. Important works have been published on legal history by V. Vaněček and L. Hubenák, on constitutional law by K. Laco, S. Zdobinský, and S. Matoušek, on administrative law by V. Delong, Z. Lukeš, and Z. Červený, on civil law and procedure by S. Luby, K. Čapek, and Z. Češka, on labor law by J. Bičovský, M. Kalenská, J. Kovařik, and J. Filo, on criminal law by L. Šubert, J. Pješčak, and V. Solnař, and on agricultural cooperative law by J. Suchánek, V. Fábry, and J. Vysokaj.

Legal research is conducted by the Institute of State and Law of the Czechoslovak Academy of Sciences, the Law Institute of the Slovak Academy of Sciences, the Institute of State Administration under the Presidium of the Federal Government, and the Criminology Institute under the Procurator General's Office of the CSSR. There are law faculties at the universities in Prague, Bratislava, Brno, and Košice.

The leading law journals are *Právník* (since 1861), *Právny obzor* (since 1917), *Socialistické soudnictví* (since 1961), *Správní právo* (since 1968), *Socialistická zákonnost* (since 1953), *Národný výbory* (since 1952), *Mezinárodní vztahy* (since 1966), and *Biulleten' chekho-slovatskogo prava* (since 1951). Also published are the yearbooks *Právněhistorické studie* (since 1955) and *Právnické studie* (since 1953). S. S. Novikova

LINGUISTICS. The first Czech grammars, written in Latin, appeared in the 16th century; the best known were those of B. Optát, P. Hzel, V. Filomat (1533), J. Blahoslav (1571), and M. Benešovský (1577). In the following two centuries Czech grammars were produced by B. Nudožerský, J. Drachovský (1600), V. J. Rosa (1672), P. Doležal (1746), and V. Pol (1756). The scientific study of Czech, as well as of other Slavic languages and non-Slavic languages, began in the late 18th and early 19th centuries, when J. Dobrovský produced the first scholarly grammar of Czech, and J. Jungmann published a five-volume Czech-German dictionary. Slovak was studied by A. Bernolák and L. Štúr, who is credited with founding the Slovak literary language. In the late 19th century the neogrammarian J. Gebauer wrote the *Historical Grammar of the Czech Language* (1894–1929) and the *Dictionary of Old Czech* (unfinished). Gebauer's ideas were further developed by V. Ertl and E. Smetánka. The linguist J. Zubatý studied the Indo-European languages, including the Baltic languages. After the establishment of the Czechoslovak republic in 1918, great strides were made in Slavic, Germanic, and Oriental philology. Using structural and functional research methods, the members of the Prague Linguistic Circle studied phonology, language culture, and the theory of literary languages and functional styles.

Highly favorable conditions for the development of linguistics have been created in the CSSR. Research in lexicology and lexicography has led to the publication of the *Dictionary of the Czech Language* (vols. 1–8, 1935–57), the *Dictionary of Literary Czech* (vols. 1–4, 1958–71), the *Dictionary of the Slovak Language* (vols. 1–6, 1959–68), the *Great Russian-Czech Dictionary* (1952–64), and the *Great Russian-Slovak Dictionary* (1960–70). Important work has been done on word formation (*Word Formation in the Czech Language*, vols. 1–2, 1962–67), morphology (*The Morphology of the Slovak Language*, 1966), and syntax. Transformational and generative grammar received much attention in the 1960's. Russian philology is flourishing; a notable achievement is the *Reference Grammar of the Rusian Language* (vols. 1–2, 1960–61). Other research fields include the theory of literary languages and their functional ramifications (B. Havránek, A. Jedlička, V. Barnet, J. Ružička, E. Paulíny), stylistics (K. Hausenblas, J. Mistrík), dialectology (B. Havránek), phonology (J. Vachek, E. Paulíny, A. Lamprecht), the history of language (M. Komárek, J. Stanislav, R. Krajčovič, K. Horálek, A. Novák), and general and comparative linguistics (K. Horálek). The English language has been studied on a high theoretical level by V. Mathesius, I. Poldauf, and J. Firbas. B. Hrozný made a vital contribution to Oriental philology.

The main linguistics centers are the Czech Language Institute (Prague), the L. Štúr Linguistics Institute (Bratislava), the special centers and institutes run by the Czechoslovak Academy of Sciences, and the philosophy and pedagogy faculties of universities. The principal linguistics journals are *Slovo a slovesnost* (since 1935), *Naše řeč* (since 1917), *Jazykovedný časopis* (since 1946), *Československá rusistika* (since 1956), *Philologica Pragensia* (since 1946), *Slavica Slovaca* (since 1966), *Archív orientální* (since 1969), and *Časopis pro moderní filologii* (since 1911). A. G. Shirokova

Scientific institutions. A coordinated state science program has been instituted in accordance with a 1949 law providing for the organization of research. Scientific, experimental, and design work is conducted by the Czechoslovak Academy of Sciences and the Slovak Academy of Sciences, by scientific and scientific-technological organizations subordinate to ministries and other central bodies, by scientific-technological institutions run by economic production organizations, by research and experimental sectors of enterprises, and by research divisions of higher educational institutions.

The central agencies responsible for administering, planning, and coordinating research are the State Committee for Science and Technology (the coordinating agency of the federal government), the federal Ministry of Technological and Investment Development, and the republic ministries of construction and technology. General policy is set by state programs for the development of science and technology. Research is conducted in cooperation with the COMECON countries.

In 1976 the country's research, design, and planning institutions employed 165,350 people, of whom 47,700 held advanced degrees. Some 24,000 people, including 10,400 with advanced degrees, were engaged in basic research (1974); 105,670 people, in industrial research (1976); 11,000 people, in agriculture and forestry research; 8,320 people, in public health research; 6,900 people, in construction research; and 2,520 people, in transportation and communications research. Expenditures on science amounted to more than 14.1 billion korunas in 1976.

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Press, radio, and television

In 1978 there were 30 daily newspapers and 1,062 magazines with a total circulation of 21 million. The oldest and most influential dailies are the Czech-language *Rudé právo* (since 1920, circulation 900,000), the main organ of the Central Committee of the Communist Party of Czechoslovakia, and the Slovak-language *Pravda* (since 1920, circulation 330,000), published in Bratislava as the organ of the Central Committee of the Communist Party of Slovakia. The leading trade union press organs are *Práce* (since 1945, circulation 310,000), a Czech-language daily published in Prague by the Central Council of Trade Unions, and *Práca* (since 1946, circulation 190,000), a Slovak-language daily published in Bratislava by the Slovak Council of Trade Unions.

Two important newspapers are issued by ministries: *Obrana Lidu* (since 1942, circulation 200,000), a Czech-language weekly published in Prague by the Ministry of National Defense, and *Zemědělské noviny* (since 1945, circulation about 350,000), a Czech-language daily published in Prague by the Ministry of Agriculture and Food. The Czech-language daily *Mladá fronta* (since 1945, circulation 238,000), also published in Prague, is the main press organ of the Socialist Union of Youth.

The press organs of the noncommunist political parties are *Lidová demokracie* (since 1945, circulation, 217,000), a Czech-language daily published in Prague by the Czechoslovak People's Party; *Svobodné slovo* (since 1945, circulation 220,000), a daily Czech-language daily published in Prague by the Czechoslovak Socialist Party; and *Sloboda* (since 1946, circulation 6,000), a Slovak-language weekly published in Bratislava by the Slovak Freedom Party.

Among the leading magazines are the monthly *Nová mysl* (since 1947, circulation 40,000), the theoretical and political organ of the Central Committee of the Communist Party of Czechoslovakia; *Vlasta* (since 1947, circulation 800,000), a Czech-language weekly published in Prague by the Czech Women's Union; and *Slovenka* (since 1948, circulation 205,000), a Slovak-language weekly pictorial published in Bratislava by the Slovak Women's Union.

The Czechoslovak News Agency, founded in 1918, is located in Prague. Radio broadcasting, begun in 1923, is conducted in Czech and Slovak. Foreign broadcasts are made in Arabic, English, Hungarian, Spanish, Italian, German, Polish, Portuguese, Russian, Ukrainian, and French. Founded in 1953, the national television network consists of two systems, Program I and Program II, broadcasting from 34 television studios. Radio and television broadcasting are under the jurisdiction of Czechoslovak Radio and Czechoslovak Television, both government organizations.

I. N. LOBASHEVA

Literature

In view of the ethnic, linguistic, and historical affinity of the Czechs and Slovaks and their joint age-old struggle against foreign oppression, it was inevitable that their national literatures would develop through close contact and interaction, which were to become still stronger after the establishment of the Czechoslovak republic in 1918. (For the development of Czechoslovak literature prior to 1918, see CZECH SOCIALIST REPUBLIC and SLOVAKIA: Literature.) The upswing in the country's labor movement that took place under the impact of the Great October Socialist Revolution of 1917 in Russia inaugurated a new phase in Czech and Slovak literature marked by a flowering of revolutionary poetry, the exposé novel, the socialist realist novel, and antifascist literature.

Against the background of intensified class struggle, a revolutionary trend emerged in Czech and Slovak literature in the 1920's and 1930's, fostered by the Marxist writers and critics S. K. Neumann (1875–1947), J. Wolker (1900–24), J. Hora (1891–1945), Z. Nejedlý (1878–1962), B. Václavek (1897–1943), J. Fučík (1903–43), E. Urx (1903–42), V. Clementis (1902–52), and D. Okáli (born 1903). The press organs of the revolutionary trend were the magazines *Červen* (1918–21), *Kmen* (1917–22), and *Proletkult* (1922–24), all published by Neumann, and *Var* (1921–30), published by Nejedlý, as well as the culture section of the newspaper *Rudé právo*, founded in 1920. Proletarian literature was championed by Devětsil, an association of young Czech writers and artists founded in 1920, and Dav, an association of Slovak writers and critics formed in 1924.

Proletarian poetry reached a high level in the 1920's in the collections *Hour of Birth* (1922) by Wolker, *Red Songs* (1923) by Neumann, *A City in Tears* (1921) by J. Sejfert (born 1901), and *Sunday* (1927) by L. Novomeský (1904–76); the narrative poem *The Amazing Magician* (1922) by V. Nezval (1900–58); and the lyric poems of Hora, K. Biebl (1898–1951), and J. Poničan (1902–78). Revolutionary prose was best represented by the novels *The Good Soldier Švejk* (1921–23) by J. Hašek (1883–1923), *Anna the Proletarian* (1928) by I. Olbracht (1882–1952), *The Best of Worlds* (1923) by M. Majerová (1882–1967), and *The Baker Jan Marhoul* (1924) by V. Vančura (1891–1942). Also important were the works of P. Jilemnický (1901–49).

Critical realism flourished in the social novels of the Czech writers A. M. Tilschová (1873–1957), B. Klička (1897–1943), and K. Nový (born 1890). In the highly original novels and plays of K. Čapek (1890–1938) a scathing critique of many aspects of bourgeois society was blended with social utopianism and satire on philistinism. The leading Slovak realists were P. Hviezdoslav (1849–1921), M. Kukučín (1860–1928), B. Timrava (1867–1951), and J. Jesenský (1874–1945). The poets J. Smrek (born 1898) and E. B. Lukáč (born 1900) and the prose writer M. Urban (born 1904) called for an aesthetic and thematic renewal of literature.

Avant-garde trends such as Czech "poetism," expounded by K. Teige (1900–51), and idealist aesthetic theories became popular in the mid-1920's. Despite the pronouncements of the avant-garde writers, however, their finest achievement remained faithful to the tradition of revolutionary humanism, as exemplified by the works of Nezval, Vančura, and Biebl. A tragic view of the world, associated with the memory of the victims of World War I, and a protest against the capitalist world pervaded the poetry of V. Závada (born 1905), published in the collection *Requiem* (1927), and the verse of F. Halas (1901–49), collected in the volume *Sepia* (1927).

From the early 1930's the ideological and aesthetic polarization in literature was reinforced by the economic crisis, the mounting social conflict, and the fascist threat. The progressive intelligentsia formed a united front to combat clerical-nationalist and profascist tendencies. The most promising of the young proletarian poets who joined the literary scene were J. Noha (1908–66), J. Taufer (born 1911), F. Nechvátal (born 1905), and F. Král' (1903–55). The socioanalytical genre was cultivated by J. Kratochvíl (1885–1945), G. Včelička (1901–66), Urban, J. Cíger Hronský (1896–1960), M. Rázus (1888–1937), and G. Vámoš (1901–56); sociorevolutionary proletarian works were produced by Jilemnický, Král', and Poničan; and realist satire flourished in the works of Čapek, Jesenský, and the playwright I. Stodola (1888–1977). A sense of the discrepancy between humanist ideals and reality engendered a neoromantic trend in Slovak prose, best exemplified in the lyrical prose of D. Chrobák (1907–51), M. Figuli (born 1909), L. Ondrejov (1901–62), and F. Švantner (1912–50).

In the late 1920's and early 1930's the avant-garde theory of the autonomy of art was criticized by leftist writers. In their polemics with a group of Czech surrealists founded by Nezval in 1934 and disbanded by him in 1938, the Marxist critics Václavek, Fučík, K. Konrad (1908–41), L. Štoll (born 1902), Neumann, Novomeský, and Poničan developed the aesthetics of socialist realism, drawing on the discussions of the First Congress of Soviet Writers. The Alliance, which included both Czech and Slovak revolutionary writers, was founded in 1935 upon Václavek's initiative.

In the 1930's fine collections of civic and antifascist lyric poetry were published by Neumann, Závada (*The Road on Foot*, 1937), Halas (*Torso of Hope*, 1938), Hora, Lukáč (*Moloch*, 1938), and Novomeský (*A Saint Beyond the Outskirts*, 1939). Outstanding socialist realist novels included *The Untilled Field* (1932) by Jilemnický, *The Siren* (1935) by Majerová, *People at the Crossroads* (1937) by M. Pujmanová (1893–1958), *The Shoe Machine* (1933) by T. Svatopluk (1900–72), *Three Rivers* (1936) by Vančura, and *The Thorny Path* (1934) by Král'. Directed against fascism, Čapek's satirical philosophical novel *War With the Newts* (1936) and his plays *The White Plague* (1937) and *Mother* (1938) won international acclaim. On the initiative of Marxist critics and communist writers, a united cultural front was formed to combat fascism. At a writer's congress held in 1936, Slovak writers spoke out in defense of the republic and democracy.

The Nazi occupation of Czechoslovakia (1939–45) had a devastating impact on Czechoslovak literature. A number of writers, among them Vančura, Fučík, Konrad, Václavek, Kratochvíl, and Urx, perished in fascist prisons and camps. But cruel persecution did not throw the country's progressive literary forces into disarray. The theme of antifascist resistance dominated the poetry of Halas, Neumann, Závada, and Nezval, Vančura's literary chronicle *Scenes From the History of the Czech People* (vols. 1–3, 1939–40), and such underground Czech works as Fučík's *Notes From the Gallows*, published in 1945. The banned poems of Jesenský, Novomeský, Smrek, and Král' circulated in Slovakia. The Slovak people's resistance to the profascist regime was expressed

through symbol and allegory in Poničan's *Strange Janko* (1941), a heroic romantic poem about the Revolution of 1848, in Figuli's lyrical novella *The Lead Bird* (1940), and in Chrobák's lyrical novella *The Dragon Returns* (1943). A fervent antimilitarism marked many works by the Slovak surrealists R. Fabry (born 1915), V. Reisel (born 1919), P. Bunčák (born 1915), and J. Lenko (born 1914), as well as the poems of P. Horov (1914–1975). The wartime lyric poetry of Lukáč and V. Beniak (1894–1973) was imbued with a profound sense of tragedy.

After 1945 the struggle against fascism, the victory over the enemy, and gratitude to the Soviet liberators became the central theme in the poetry of F. Hrubín (1910–71), Nezval, V. Holan (born 1905), Halas, Jesenský, Král', A. Plávka (born 1907), Poničan, and M. Lajčiak (born 1926); the short stories of J. Drda (1915–70), notably his collection *The Silent Barricade* (1946); Jilemnický's novel *The Chronicle* (1947); and the prose of J. Marek (born 1914), J. Bodenek (born 1911), and J. Horák (1907–74). Nevertheless, some groups of bourgeois writers and literary critics continued to cling to their views. Communist writers assailed the resuscitated conceptions of "pure art" and tried to rally the progressive cultural figures around the Communist Party, a line of action that received wide support at the First Congress of Slovak Science and Art Workers, held in 1945, and at the 1946 congress of Czech writers.

The final rout of the bourgeoisie in February 1948 ushered in a new phase in the struggle for a socialist literature that clearly demonstrated the cohesion of the progressive Czech and Slovak literary forces. The Congress of National Culture, held in April 1948, resolved to promote the socialist orientation of literature. The First Congress of Czechoslovak Writers, convened in March 1949, formed the Czechoslovak Writers' Union, which adopted socialist realism as its program. The theory of socialist realism was elaborated by Nejedlý, Štoll, Taufer, J. Hájek (born 1919), and M. Chorváth (born 1910).

With the ascendancy of socialist realism in the 1950's, Czechoslovak writers showed a predilection for vast epic panoramas portraying crucial moments in the country's history. A Marxist interpretation of the historical destiny of the Czechs and Slovaks and their path to socialism was given in the last two volumes of Pujmanová's trilogy, *Playing With Fire* (1948) and *Life Against Death* (1952), in the chronicle novels *New Soldiers Will Arise* (1948), *The Turbulent Year 1905* (1949), and *The Red Glow Over Kladno* (1951) by A. Zápotocký (1884–1957), and in the novel *Red Wine* (1948) by F. Hečko (1905–60). The building of a new life was depicted in the novels *The Offensive* (1951) and *The Battle* (1954) by V. Řezáč (1901–56), *Without a Chief* (1953) by Svatopluk, *The Peasant* (vols. 1–2, 1955–58) by B. Říha (born 1907), *Yesterday and Tomorrow* (1949) by V. Mináč (born 1922), *The Wooden Village* (1951) by Hečko, and *The Wasps' Nest* (1953) by K. Lazarová (born 1914). Nezval's new works, notably the narrative poem *Song of Peace* (1950), gained world renown. Some of the best poetry of these years was written by Závada, Hrubín, J. Kainar (1917–71), J. Kostra (1910–75), Horov, V. Mihálik (born 1926), and S. Žary (born 1918).

An imperfect mastery of the theme of socialist construction sometimes resulted in a superficial and hackneyed treatment of industrial themes in prose, sloganeering in poetry, and oversimplification in criticism. From the mid-1950's the normative antiartistic trends were combated by writers who sought to show the full complexity and the contradictory nature of the modern historical process and contemporary developments. Especially successful in this respect were the novels *Citizen Brych* (1955) by J. Otčenášek (born 1924), *If You Leave Me* (1957) by Z. Pluhař (born 1913), and *Box for the Living* (1956) by N. Frýd (1913–76) and the short-story collection *Hours and Minutes* (1956) by A. Bednár (born 1914). Outstanding achievements of socialist realism in Slovak literature included the trilogy *A Generation* (parts 1–3, 1958–61) by Mináč, the novel *The Dead Don't Sing* (1961) by R. Jašík (1919–60), the lyric and narrative poems of Novomeský, and the poetry of Kainar and M. Válek (born 1927).

Nihilist tendencies grew stronger in the mid-1960's, not infrequently turning into a rejection of socialism, and some writers succumbed to the influence of Western modernism, principally the "new novel," the theater of the absurd, and "concrete" poetry. The literary magazines published articles propounding reactionary-modernist, neo-avant-garde, and structuralist theories. During the political crisis of 1968 the Czechoslovak Writers' Union, whose leadership had adopted revisionist views, virtually ceased to exist as a creative organization. "An outright capitulation to bourgeois ideology . . . could be observed in the field of culture and art" (*Uroki krizisnogo razvitiia*, Moscow, 1971, p. 41). After the April 1969 Plenum of the Central Committee of the Communist Party of Czechoslovakia, a campaign was launched to overcome the consequences of the crisis in ideology, culture, and literature. The Slovak Writers' Union, founded in 1969, and the Czech Writers' Union, established three years later, lent their full support to the party's political and cultural line and set as their primary task the unification of the country's literary forces on the basis of socialist realism.

In the early 1970's continuity was restored with the best traditions of the preceding period. Socialist poetry has been further developed by Závada, Plávka, J. Rybák (born 1904), Taufer, I. Skála (born 1922), Mihálik, M. Florian (born 1931), M. Rúfus (born 1928), J. Mihalkovič (born 1935), and V. Hons (born 1938). Fine historical novels have been written by Říha, M. V. Kratochvíl (born 1904), J. Toman (1899–1977), V. Neff (born 1909), and H. Zelinová (born 1914). The memoir and historical essay genres are best represented by Plávka's *In Love With Life* (1971) and Mináč's *Fanning the Native Hearths* (1970) and *J. M. Hurban's Quarrels* (1974). The antifascist theme is explored in a number of fine novellas and novels: *Wildings* (1973) by J. Křenek (born 1933), *One Piece of Silver* (1974) by Pluhař, *Love the Time That Will Come* (1974) by J. Papp (born 1929), *The Cedar Grove* (1974) by V. Švenková (born 1937), *Hearths* (1976) by E. Dzvoník (born 1933), and *Craftsmen* (1976) by V. Šikula (born 1936).

Contemporary ethical and social issues are raised in the novel *My Boy and I* (1974) by J. Kolárová (born 1919) and in the novels *St. Michael* (1971), *The White Stallion* (1975), and *The Stork's Nest* (1976) by J. Kozák (born 1921). The novel *Little Shepherd From the Valley* (1977) by L. Fuks (born 1923) describes, in a lyrical vein, the new life in the Czechoslovak countryside after 1945. The novel *The Eleventh Commandment* (1975) by J. Jonáš (born 1919) deals with the socialist transformation of the Slovak village. The production theme lies at the heart of the novellas *Hardships of the Plains* (1975) and *Salty Snow* (1976) by M. Rafaj (born 1934) and the novel *The Breakdown* (1976) by J. Švejda (born 1950). A fresh ideological and aesthetic approach to the treatment of socialist reality distinguishes the prose of P. Jaroš (born 1940), I. Habaj (born 1943), L. Ballek (born 1941), V. Klevis (born 1933), J. Navrátil (born 1939), J. Kostrhun (born 1942), and L. Štěpán (born 1943). A noteworthy contribution to modern dramaturgy has been made by I. Bukovčan (1921–75), J. Solovič (born 1934), and O. Zahradnik (born 1932).

The Czechoslovak Writers' Union was revived in December 1977.

Literary scholarship. A number of conflicting trends coexisted in literary criticism in the interwar period. While A. Novák (1880–1939) elucidated the history of Czech literature from the standpoint of official bourgeois ideology, A. Pražák (1880–1956) applied the positivist methodology and J. Mukařovský (1891–1975) and M. Bakoš (1914–72) developed the idea of literary structuralism. The general democratic trend was represented by F. X. Šalda (1867–1937), Š. Krčméry (1892–1955), and F. Votruba (1880–1953). Z. Nejedlý played a major role in the development of the Marxist school. A significant contribution to the Marxist methodology of literary scholarship and to the scholarly study of the history of Czechoslovak literature was made by the Marxist critics of the 1920's and 1930's, notably B. Václavek, the author of *Twentieth-century Czech Literature* (1935).

A general shift toward a Marxist reorientation of literary scholarship began after 1948. Novák's theories were criticized, and Mukařovský and Bakoš gave a critique of the idealist principles of structuralism. Among the newly founded centers of literary scholarship were the Czech and World Literature Institute of the Czechoslovak Academy of Sciences in Prague and the Literature Institute of the Slovak Academy of Sciences in Bratislava. Literary scholars began working on an academic history of Czech and Slovak literature and on Czechoslovak-Soviet literary relations. Structuralist and other idealist theories were resurrected in the

1960's. In overcoming the consequences of the crisis, the positions of Marxist aesthetics and methodology were strengthened.

Of the older generation of Marxist critics, Štoll, Taufer, V. Pekárek (born 1907), and A. Matuška (1910–75) continued to publish prolifically in the 1970's. The leading younger Marxist critics were S. Šabouk (born 1933), V. Dostál (1930–75), H. Hrzalová (born 1929), Š. Vlašín (born 1924), and V. Rzounek (born 1921) in the Czech lands and K. Rosenbaum (born 1920), I. Kusy (born 1921), S. Šmatlák (born 1925), M. Tomčík (born 1922), and J. Števček (born 1929) in Slovakia. A valuable contribution to the elucidation of the history of Czechoslovak literature was made by A. Mráz (1904–64), J. Hrabák (born 1912), and M. Pišút (born 1908).

The main literary journals are *Česká literatura* (since 1953), *Slovenská literatúra* (since 1954), *Literárni měsičník* (since 1972), *Romboid* (since 1965), and *Slovenské pohľady* (since 1884).

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Architecture and art

The architecture, fine art, and decorative applied art of Czechoslovakia have developed out of the artistic traditions of the Czech lands and Slovakia, which maintained close cultural ties from early times (*see* CZECH SOCIALIST REPUBLIC and SLOVAKIA: Architecture and art). The establishment of an independent Czechoslovak state in 1918 stimulated a cultural revival in the two historical regions and contributed to their further rapprochement. In the 1920's and 1930's Czechoslovak art was strongly influenced by the Great October Socialist Revolution of 1917, by the short-lived Hungarian and Slovak soviet republics (1919), and by the growth of the communist and labor movements. Under the bourgeois regime the development of artistic culture was marked by contradiction. Democratic and socially critical tendencies and quests for an indigenous style coexisted with borrowings from European avant-garde currents. A progressive national trend arose and matured in the struggle against modernist tendencies.

In the architecture of the 1920's and 1930's neoclassicism, popular for a short time, gave way to a national school of functionalism, best represented by the buildings of J. Gočár, K. Honzík, and J. Havlíček in the Czech lands and E. Belluš in Slovakia. Along with industrial enterprises, the first housing projects were built using standard designs and industrial construction methods. A rational layout of residential ensembles was attempted at Zlín (now Gottwaldov) and in parts of Bratislava and Košice. However, housing construction was limited in the interwar period, and slums proliferated on the outskirts of cities.

The art of the 1920's and 1930's was characterized by a strengthening of realist and democratic tendencies. Artists of different schools portrayed the life of the people and contemporary reality employing cubist, expressionist, and fauvist techniques. In the Czech lands such an approach was typical of the painting and graphic art of V. Beneš, J. Čapek, V. Rabas, and R. Kremlička and the sculpture of O. Gutfreund. In Slovakia it was represented by the painting and graphic art of M. Benka, M. A. Bazovský, J. Aleksy, and M. Galanda. Some artists were influenced by folk art techniques, as may be seen from the graphic art of J. Čapek and J. Lada in the Czech lands and the paintings of L. Fulla in Slovakia. The national realist traditions of the late 19th and early 20th centuries retained their vigor in the landscapes of V. Rabas, V. Sedláček, and V. Novák, the engravings of M. Švabinský, the illustrations of V. Brunner and F. Kysela, and the portraits and statues of K. Kotrba, K. Pokorný, and J. Lauda, all of them Czech artists.

A critical view of society united the painters K. Holan and P. Kotík and the graphic artists V. Silovský and J. Rambousek, who formed yet another school in the 1920's. The Devětsil association of revolutionary artists, founded in 1920, dedicated itself to the creation of a proletarian art. The artistic aspirations of its members, however, were somewhat inconsistent. The life of the working class was depicted in the 1920's by the Czech graphic artists V. Mašek and F. Bidlo, by the Slovak graphic artist K. Sokol, and by the Slovak painter K. Bauer.

Confronted with the fascist threat, artists of various schools formed a united antifascist front. Some of the best political graphic art was produced by the Czech artists Bidlo and J. Čapek. In the late 1930's and early 1940's a dramatic intensity and at times a heroic quality infused the antiwar compositions and pictures showing the resistance and sufferings of the people of Czechoslovakia under fascist occupation. These themes received eloquent treatment in the works of V. Sychra and V. Tittelbach in the Czech lands and of V. Hložník, J. Želibský, J. Nemčík, and C. Majerník in Slovakia. A number of artists had recourse to allegory and disguised imagery. The homeland theme took on political overtones in the landscapes and peasant scenes of the Czech artists V. Rabas, V. Rada, and B. Dvorský.

The liberation of Czechoslovakia from fascist occupation in 1945 and the establishment of a people's democratic system opened the way for the unfettered development of the finest traditions of the democratic national culture. Large modern industrial enterprises such as the metallurgical combine in Košice were built, as well as dams and hydroelectric power plants on the Labe, Vltava, and Orava rivers. New industrial cities, among them Mladá Boleslav, Ostrava-Poruba, and Havířov, were founded. Comfortable residential quarters were built employing industrial techniques on the outskirts of Prague, Bratislava, Gottwaldov, Olomouc, Nitra, Košice, and other cities. Examples of well-designed public buildings and transportation facilities include the Institute of Macromolecular Chemistry and the Federal Assembly Building in Prague, the agricultural institute and student dormitories in Nitra, and the Bridge of the Slovak National Uprising in Bratislava.

The prewar realist traditions remained strong in art in the late 1940's and early 1950's. The works of many artists held a new, socialist message. Industrial landscapes and compositions depicting labor and the national liberation struggle were created by the Czech painters and graphic artists E. Filla, J. Brož, and V. Sedláček and by the Slovak artists V. Hložník, O. Dubay, R. Dúbravec, J. Želibský, and B. Hoffstädter. Among Czech artists, M. Švabinský revived portrait graphic art; J. Lauda, K. Lidický, and K. Hladík produced outstanding sculpture; and J. Slavíček, B. Dvorský, and F. Jiroudek excelled in landscape painting. In Slovakia, the painters J. Aleksy, M. Bazovský, and L. Fulla and the graphic artists V. Chmel and M. Čechová evoked poetic generalized scenes from the life of the people.

Monumental decorative art reached a high level in the Czech lands in V. Sychra's mosaics, A. Zábranský's sgraffito, and V. Tittelbach's frescoes. There were impressive achievements in decorative applied art, notably glass-making, weaving, pottery, and medallion-making. Splendid memorial complexes commemorating the World War II victory and honoring those who died fighting against fascism were created by V. Makovský, K. Lidický, and K. Pokorný in the Czech lands and by J. Kulich, T. Bártfay, and J. Kostka in Slovakia. Fine book illustrations were produced by C. Bouda, Zábranský, A. Pelc, K. Svolinský, and A. Strnadel in the Czech lands and by V. Hložník and L. Fulla in Slovakia.

From the late 1950's a number of artists showed a growing interest in symbolic and poetic imagery and formal experimentation. The actions of antisocialist elements in the late 1960's had a pernicious effect on the development of Czechoslovak art. Such Western modernist trends as expressionism, neocubism, surrealism, abstractionism, and op art attracted a large following. Since the early 1970's strong efforts have been made to restore the democratic traditions of Czechoslovak art. Monuments commemorating national historical events and the liberation and revolutionary struggle have been executed by J. Kulich, T. Bártfay, and J. Kuzma in Slovakia and by M. Hana, V. Dobrovolný, J. Malejovský, and J. Simota in the Czech lands. The history of the revolution has been recorded in the canvases of the Czech artists Zábranský, K. Souček, and R. Kolář.

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See references under SLOVAKIA and CZECH SOCIALIST REPUBLIC.

Music

Czechoslovak music is rooted in the musical traditions of the Czech lands and Slovakia, which evolved through mutual influence (*see* CZECH SOCIALIST REPUBLIC and SLOVAKIA: Music). After the establishment of an independent Czechoslovak state in 1918, strong efforts were made to preserve and develop the realist traditions of the national classics, but the bourgeois leadership's orientation toward West European culture facilitated the penetration of modernist trends into Czechoslovak music. The Society for Modern Music and the Přítomnost Society were founded in 1920. A. Hába, a leading Czech avant-garde composer of the 1920's and 1930's, invented the quarter-tone and the sixth-tone systems of music.

Concurrently, the foremost composers of the older generation, notably L. Janáček, J. B. Foerster, V. Novák, and J. Suk, who were also the leading teachers, continued to develop the realist national traditions. In his scholarly publications and public activity the eminent man of letters Z. Nejedlý championed the artistic principles of the Czech classics and called for closer cultural ties with the USSR. He was a cofounder of several societies dedicated to promoting a cultural rapprochement between Czechoslovakia and the Soviet Union. A number of progressive musicians rallied around Nejedlý, among them O. Ostrčil, V. Helfert, O. Jeremiáš, and E. Axman. As the conductor and artistic director of the opera company of the National Theater in Prague from 1923 to 1931, Ostrčil staged operas by B. Smetana, Z. Fibich, A. Dvořák, Foerster, Novák, and Janáček.

Instrumental works from the national repertoire were frequently performed by the orchestra of the Czech Philharmonic Society (founded in 1894 and directed by V. Talich from 1919 to 1931 and from 1934 to 1941), the Czech Quartet (founed 1891), the Ševčik Quartet (1900), the Prague Quartet (1920), the Ondříček Quartet (1928), the Prague Wind Quintet (1928), and the Czech Nonet (1924).

The 19th-century composers who founded professional Slovak music, namely J. L. Bella, V. Figuš-Bystrý, M. Schneider-Trnavský, and M. Moyzes, were strongly influenced by the national folk music. Their musical legacy was further developed in the 20th century by Novák and his students E. Suchoň, J. Cikker, and A. Moyzes. Among the finest Slovak compositions of the 1930's were Cikker's orchestral works and Suchoň's Symphony No. 2, his orchestral suite *Down the Váh*, his program overtures, and his cantata *Psalm of the Sub-Carpathian Land*. The most important of the Slovak musical performing groups and organizations that were founded in the interwar period were the Zora Chorus (1919), the Radio Instrumental Ensemble (1928), the opera company of the Slovak National Theater (1920), and the Music School, founded in 1919 and reorganized as an academy of music and drama in 1928 and as a conservatory in 1941.

Many works from the 1930's were devoted to the revolutionary struggle of the working class, among them V. Nejedlý's Second and Third symphonies, J. Stanislav's *Song About Granada*, and E. Schulhoff's cantata *The Communist Manifesto*. The music section of the League of Czechoslovak Friends of the Theater maintained ties with workers' organizations and with the Communist Party of Czechoslovakia. The composer and conductor E. F. Burian, who founded the D-34 Theater in 1933, affirmed that art should serve the working class. Ostrčil's opera *Honza's Kingdom* (1934) developed the antifascist theme.

Patriotic works were composed during the fascist occupation in World War II. Among the most famous were O. Chlubna's *Jiří of Kunštát and Poděbrady*, E. Schulhoff's *Symphony of Freedom* (1941), J. Stanislav's *Red Army Symphony*, J. Hanuš's opera *The Flames*, K. Horký's opera *Jan Hus*, O. Jeremiáš's cantata *Song of the Native Land*, Novak's cantata *St. Wenceslas Triptych*, and B. Martinů's play for orchestra *Memorial to Lidice* (1943) and his Symphony No. 3 (1944). Many composers masked their musical ideas, using cryptograms, allegories, and citations from widely known national patriotic works, such as the Hussite songs. Performers included in their programs revolutionary and humanistic classic works. The Slovak musicians J. Cikker, J. Kresánek, and T. Andrašovan fought in the resistance movement. Among the many progressive musicians who died during the occupation were R. Karel, J. Teklý, E. Schulhoff, G. Klein, and P. Haas.

After the victory over fascism in 1945 and the establishment of a people's democratic system in Czechoslovakia, composers' associations, first Czech and then Slovak, were founded, and a new opera theater, called the May 5 Great Opera, was opened (it merged with the National Theater in 1948). In 1946 the Academy of Arts was founded, higher music schools were opened in Bratislava and Brno, and the international festival Prague Spring was inaugurated. The music of the second half of the 1940's reflects the general revival throughout the country. A feeling of optimism pervades V. Novák's *May Symphony*, J. Seidel's cantata *1945* and his cantata triptych *The Heritage of Julius Fučík*, A. Očenáš's symphonic trilogy *Resurrection*, and J. Cikker's symphonic poems *About Life* and *Morning*.

The victory over bourgeois reaction in 1948 and the onset of socialist construction stimulated a flowering of democratic music. The Czechoslovak Composers' Union was organized in 1949 through a merger of the associations of Czech and Slovak composers. The works of the 1950's were inspired by the building of a new life and glorified free labor and peace on earth, themes that were most fully developed in cantatas and mass songs. Outstanding vocal compositions included V. Dobiáš's cantata *Build Up the Motherland and You Will Strengthen Peace!* and his mass song *Join our Brigade*, J. Stanislav's songs, and J. Seidel's oratorio-cantata *People, Be Vigilant!* and songs. Z. Nejedlý's speeches and articles, notably his "On True Realism and Pseudorealism" (1948) and "Learn to Speak Through Music," were of great ideological importance because they helped to overcome the contradictions between artistic truth and a narrowly conceived populism that had manifested themselves in the works of some Czech and Slovak composers.

In the late 1940's and in the 1950's musical theaters in Czechoslovakia and other countries performed works by Czech and Slovak composers: P. Bořkovec's opera *Paleček* (1947), J. Doubrava's ballet *Don Quixote* (1955), E. Suchoň's operas *The Whirlpool* (or *The Whirlwind*, 1949) and *Svatopluk* (1959), and J. Cikker's *Jánošík* (1953), *Beg Bajazid* (1956), and *Mr. Scrooge* (after Dickens, 1958). Instrumental music was written by J. Řídký, who produced seven symphonies and numerous chamber works, I. Krejčí, and Dobiáš. European music was enriched by the compositions of B. Martinů, who worked in many genres and styles. Although he lived abroad for a long time, Martinů never lost touch with his homeland and made a major contribution to Czechoslovak music. In all, he composed about 400 works, including the operas *Juliette* (1937), *The Marriage* (based on Gogol's play, written for television, 1952), *Mirandolina* (1954), *Greek Passion* (1958), and *Ariadne* (1958); the ballets *Revolt* (1925), *The Judgment of Paris* (1935), and *The Strangler* (1948); and six symphonies.

Among outstanding Czech works produced since the late 1950's are J. Pauer's opera *Zuzana Vojířová* (1959), S. Havelka's Symphony No. 1, V. Sommer's *Vocal Symphony*, V. Kalabis' *Symphony of Peace*, and J. Válek's *Renaissance Symphony* and *Revolutionary Symphony*. Important works have also been written by L. Železný, O. Flosman, J. Boháč, I. Irko, V. Felix, and J. Matěj. Fine Slovak works of this period include Cikker's operas *Resurrection* (1961), *A Play About Love and Death* (1968), and *Coriolanus* (1973), T. Frešo's opera *Martin and the Sun*

(1972), Cikker's *Symphony 1945* (1975), and various works by Suchoň, A. Očenáš, and D. Kardoš.

Since the 1950's operatic art has been fostered by the opening of several opera theaters in Bohemia, Moravia (1954), and Slovakia. The country's musical life has been enriched by the founding of symphony and chamber orchestras, choral groups, string quartets, including the Smetana and Janáček quartets, the Suk Trio, the ensemble of the Czechoslovak People's Army, such song and dance ensembles as the Czechoslovak Song and Dance Ensemble and the Slovak SLUK and Lúčnica ensembles, and various amateur groups.

Czechoslovakia has produced many distinguished performing musicians, among them the conductors V. Neumann, V. Smetáček, J. Krombholc, and L. Slovák, the pianists I. Moravec and J. Páleníček, the harpsichordist Z. Růžičková, the organists J. Reinberger and J. Ropek, the violinists A. Plocek and J. Suk, the cellists I. Večtomov, M. Sádlo, and J. Chuchro, the female singers M. Tauberová, V. Soukupová, and G. Benjačková, and the male singers B. Blachut, I. Žídek, V. Bednář, and E. Haken.

The leading music journals are the Czech-language *Hudba a škola* (1928–33, 1940, and since 1960), *Hudební rozhledy* (since 1948), and *Hudební věda* (since 1964) and the Slovak-language *Hudobnovedné študie* (since 1955), *Slovenská hudba* (1957–71), and *Hudobný život* (since 1966).

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See also references under SLOVAKIA and CZECH SOCIALIST REPUBLIC.

N. A. SIMAKOVA

Ballet

After the formation of the bourgeois Czechoslovak republic in 1918, the first ballet companies were established in Bratislava, Brno, Ostrava, and Olomouc, supplementing the company already existing in Prague, and private ballet schools were opened. The ballet repertoire began to include works by Czech composers, such as B. Martinů's *Istar* (1924, National Theater in Prague) and *Who Is the Most Powerful in the World?* (1925, Brno ballet company) and V. Novak's *Nikotina* (1930) and *Signorina Gioventù* (1930; both performed at the National Theater in Prague). The leading Czech dancers and choreographers of the interwar period were J. Jenčík and I. V. Psota.

Soon after the liberation of the country from the fascist German aggressors in 1945, ballet theaters were opened in Plzeň, Opava, Košice, České Budějovice, Kladno, and Ustí nad Labem. In 1946 choreography departments were formed at the conservatories in Prague, Bratislava, and Brno, and three years later a subdepartment of choreography theory and history was established at the Academy of Arts in Prague. The company attached to the National Theater in Prague was directed by S. Machov (1946–51) and the company of the Janáček Opera and Ballet Theater in Brno by Psota (1947–51).

Czechoslovak ballet is characterized by realism, precise dramatic rendering of the scenario, and highly expressive performing technique. The stylistic versatility and sophisticated stage design of postwar ballet were splendidly revealed in the productions of Z. Vostřák's *A Philosophical Story* (after A. Jirásek, 1949, stage designer V. Fridrichova) and his *Viktorka* (based on B. Němcová's *Grandmother*, 1950, stage designers Z. Rossmann and K. Kropáček), both choreographed by Machov and J. Reimoser. Among the National Theater's finest productions were the *Slavonic Dances*, based on the music of A. Dvořák (1956), A. I. Khachaturian's *Spartacus* (1957), A. D. Melikov's *Legend of Love* (1963), and S. S. Prokofiev's *Romeo and Juliet* (1976). The theater's leading dancers are O. Skálová, M. Kůra (appointed director of the National Theater's company in the mid-1970's), M. Drottnerová, M. Pešíková, and V. Harapes. The foremost choreographers are A. Landa, J. Blažek, J. Němeček (the company's director from 1957 to 1970), and E. Gabzdyl.

The Slovak National Theater in Bratislava, another excellent company, has given memorable performances of R. M. Glière's *The Red Poppy* (1954), J. Kenessey's *The Kerchief* (1955), I. F. Stravinsky's *The Rite of Spring* (1964), and the *Heroic Trilogy* (1975), based on the music of various composers. The company's soloists include G. Starostová, G. Herényiová, V. Kolárová, and J. P. Plavnik, and its principal choreographers are J. Zajko and B. Slovák, who has directed the company since 1973.

The repertoire of the Janáček Opera and Ballet Theater in Brno has included Prokofiev's *Romeo and Juliet* (1938), Dvořák's *Slavonic Dances* (1951), Z. Křížek's *Ballad of a Sailor* (1961), and J. Hanuš' *Othello* (1974). The company's leading dancers are V. Vágnerová, K. Gracerová, and J. Bařinková; Němeček has served as its director since 1974. The New Ballet of Prague, which gave performances from 1964 to 1970 under the direction of the choreographer L. Ogoun and P. Šmok, introduced new dance forms and means of expression. The company toured the USSR from 1965 to 1969 and in 1970.

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N. E. SHEREMET'EVSKAIA

Theater

The Czechoslovak theater has developed the theatrical traditions of the Czech lands and Slovakia (*see* CZECH SOCIALIST REPUBLIC and SLOVAKIA: Theater). After the establishment of a bourgeois state in 1918, the theater reflected the various periods of the country's bitter class struggle. In addition to the National Theater and Vinohrady Theater in Prague and the National Theater in Brno and Plzeň, the country now had several new major theaters: the Municipal Theater in Brno (1919), the Slovak National Theater in Bratislava (1920), and the Municipal Theater in Olomouc (1920). Amateur drama groups sprang up throughout the country. The communist critics J. Fučík, M. Majerová, K. Konrád, B. Václavek, and Z. Nejedlý made a vital contribution to public life and the theater. Progressive directors staged antibourgeois plays preaching humanitarian values and progress.

The National Theater in Prague gave outstanding performances of K. Čapek's *The Insect Comedy* (1922) and *The White Plague* (1937), F. X. Šalda's *The Child* (1930), and Shakespeare's *Romeo and Juliet* (1924), *Hamlet* (1930), and *Julius Caesar* (1936). The Vinohrady Theater staged plays by F. Wedekind, J. Hilbert, and P. Claudel, as well as E. Verhaeren's *Dawn* (1920), A. Dvořák's *The Hussites* (1920), K. Čapek's *The Macropoulos Secret* (1922 and 1927), and Goethe's *Faust* (1932). One of the most successful of the new professional and semiprofessional revolutionary theaters was the Liberated Theater, organized in 1925. Its director, J. Honzl, staged antibourgeois political reviews written and performed by the actors J. Voskovec and J. Werich, with music provided by the composer J. Ježek. At the D-34 Theater, a revolutionary theater founded in 1933, E. F. Burian sought to popularize the principles of the proletarian theater and to learn from the experience of the Soviet theater. An acting style emerged that combined subtle psychological portrayal with close attention to external characterization. Its most gifted exponents were V. Vydra, Z. Baldová, J. Průcha, L. Dostálová, O. Scheinpflugová, and Ž. Štěpánek.

A Slovak school of acting arose in the 1920's under the guidance of J. Borodáč, A. Bagar, and O. Borodáčová-Orszaghová. The Czech stage directors V. Šulc and J. Jamnický were instrumental in developing a Slovak school of directing. Among the finest productions of the Slovak National Theater in the 1930's were J. G. Tajovský's *Confusion*, J. Palárik's *An Adventure at the Harvest Home*, J. Záborský's *The Foundling*, P. Hviezdoslav's *Herod and Herodias*, and M. Gorky's *Lower Depths*.

The development of Czech directing owed much to the young newcomers J. Frejka and O. Stibor. The art of stage design was also perfected, becoming an important element in the productions of V. Hoffmann, F. Troester, F. Kysela, and F. Zelenka.

During the fascist occupation (1939–45) the country's theater companies lost many members, and the repertoire was strictly censored. The progressive men and women of the theater resisted fascism, founding semiprofessional studios, of which Honzl's Theatricum for 99 was the best known. In its productions of F. Schiller's *Wilhelm Tell* and P. Zvon's *A Dance Over Crying*, the Slovak National Theater conveyed the people's protest against the fascist regime. The Chamber Theater in Martin, founded in 1944, became a frontline theater after the outbreak of the Slovak national uprising in August 1944; the next year it was renamed the Theater of the Slovak National Uprising.

After the liberation of Czechoslovakia from fascist occupation, Czech and Slovak theaters participated in the creation of a socialist culture. Private theaters were abolished, a theater law was enacted in 1948, and new performing groups were founded for the ideological and political education of the working people, among them the Realist Theater (later named in honor of Z. Nejedlý) in Prague, the Workers' Theater in Gottwaldov, and the Disk theater workshop. The D-34 Theater staged the first play on the theme of labor, V. Káňa's *Grinder Karhan's Worker Team* (1949), and the S. K. Neumann Theater's production of M. Stehlík's *Village Love* for the first time brought to the stage the acute class struggle in the country. The Union of Creative Theater Workers, founded in 1957, functioned with interruptions until 1972, when it was reorganized as the Union of Creative Theater, Cinema, and Television Workers.

The fine realistic performances of the middle generation of Czech actors and actresses, notably J. Petrovická, J. Švorcová, V. Matulová, J. Větrovec, V. Vejražka, M. Růžek, V. Vlasková, and B. Holišová, demonstrate their mastery of the traditions of the Czech acting school developed by the distinguished stage veterans Průcha, Štěpánek, Dostálová, L. Pešek, B. Záhorský, V. Šmeral, K. Höger, J. Dohnal, S. Amortová, F. Smolík, and J. Kurandová. A major contribution to the art of directing has been made by K. Palouš, M. Macháček, and Z. Míka. In addition to the older theater companies, there are a number of highly successful theaters of miniatures: the Zábradlí (Balustrade), Semafor, Činoherní Klub, and Rococo, all founded in Prague in the late 1950's, and Na Provázku (On the Rope, Brno) and Epsilon (Liberec), both established in the 1970's. Czechoslovak stage design has achieved a high reputation through the work of J. Svoboda, V. Šimáček, and Z. Kolář.

The Slovak National Theater, now one of the country's leading companies, has had a strong impact on the development of the artistic culture of the CSSR. Other major Slovak theaters include the New Stage and the Poetic Stage in Bratislava, the Tajovský Theater in Banská Bystrica and Zvolen, the State Theater in Košice, and the Záborský Theater in Prešov. The most popular of the theaters serving national minorities are the Ukrainian National Theater in Prešov and the Hungarian Regional Theater in Komárno. The foremost Slovak stage directors are J. Budský, P. Haspra, P. Mikulik, and T. Rakovský. L. Vychodil, the principal stage designer of the Slovak National Theater, is credited with founding a national school of stage design. The work of the stage designers M. Hložek and V. Suchánek has also won acclaim. The leading Slovak performers are O. Borodáčová-Orszaghová, M. Prechovska, M. Královičová, N. Hejna, Z. Grúberová, V. Strnisková, B. Turzonová, E. Vášaryová, and M. Huba.

Among the finest productions of the 1970's were V. V. Vishnevskii's *An Optimistic Tragedy* (Drama Theater, Ostrava), J. Solovič's *Meridian* and O. Zahradnik's *Solo for a Striking Clock* (both at the Slovak National Theater, Bratislava), A. Mrštík and V. Mrštík's *Maryša*, I. M. Dvoretskii's *The Stranger*, M. Gorky's *Smug Citizens*, V. Nezval's *Lovers From a Kiosk* (all at the National Theater, Prague), and N. Jirsíková's *May* (Burian Theater, Prague).

Theater artists are trained at the Academy of Arts in Prague and at the Higher Theatrical School in Bratislava. The principal theater magazines are the Slovak *Slovenské divadlo* (since 1953) and the Czech *Amaterska scena* (since 1955). The weekly *Scena*, founded in 1976, focuses on current developments in the Czech theater, cinema, and television.

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Circus. Having come into being at the turn of the 20th century, the professional Czechoslovak circus was developed in the interwar period by the troupes of E. Beránek, Š. Slezák, and K. Kludský, the son of A. V. Kludský, who founded a circus dynasty. In 1951 private circuses were nationalized. The Circus Center, founded in Prague in 1961, has two arenas and various auxiliary buildings for preparing new and perfecting old numbers. In addition, there are three tent circuses: the Prague, the International, and the Umberto.

The most famous of the older circus performers were the animal trainer L. Berousek-Berozini and the Knox tightrope walkers and jugglers. The star attractions of the 1960's and 1970's were the Vallo figure cyclists, the animal trainers J. Valašek, K. Malek, R. Crgak, and A. Šupka, the Bremlov jugglers, the clowns Bedalek, Vencin and Wiki, and I. Löfflör, the jumper Jeniček, and the aerialist M. Richterova.

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Motion pictures

The first film showing took place in Prague in 1896, and documentaries and short acted films were made from 1898. Although the regular production of films had begun before World War I, the first permanent film studio was founded only after the establishment of the independent bourgeois Czechoslovak republic in 1918. The studio produced drawing-room melodramas, adventure and detective films, and comedies in the style of American films, mystical and fantasy dramas influenced by German expressionism, and pseudofolk comedies collectively known as the Kondelík Series (for example, *Father Kondelík and the Bridegroom Vejvara*, 1926).

Attempts to develop an indigenous cinematic art were discernible in the historical films *Czech Sky* (1918, directed by J. A. Palouš) and *Through Thorns to Glory* (1919, directed by R. F. Branald), in such screen adaptations of national literary classics as *The Good Soldier Švejk* (based on J. Hašek's novel, 1926, directed by K. Lamač) and *The Mountain Village* (after B. Němcová, 1928, directed by M. Krňanský), and in the exposé films *The Battalion* (1927, directed by P. Pražský), *Such Is Life* (1929, directed by K. Junghans), and *The Gallows-bird* (1930, directed by K. Anton). During the silent film era the leading film directors were Anton, M. Frič, S. Innemann, Krňanský, Lamač, G. Machatý, V. Kubásek, and J. Rovenský, and famous film stars included V. Burian, R. Deyl (senior), E. Fiala, F. Futurista, K. Hašler, A. Ondráková, J. Struna, and E. Štěpánek.

The first sound film, *When the Strings Are Weeping*, made by the German film director F. Feher, was released in 1930. Innovative techniques and an unusual treatment of the plot marked such films as *Before the Final Exam* (1932, directed by V. Vančura and Innemann), *The Inspector-General* (1933, a screen adaptation of Gogol's play directed by Frič, with V. Burian as Khlestakov and J. Marvan as the Mayor), and *Ecstasy* (1933, directed by Machatý). At the Second International Film Festival, held in Venice in 1934, the Czechoslovak films were awarded the Venice Prize for the best directing. The writers V. Nezval, K. Čapek, and I. Olbracht did much to strengthen the progressive trend in filmmaking. The year 1936 saw the release of the first joint Czech-Slovak film, *Jánošík* (directed by Frič), and of the lyrical film *The River* (directed by Rovenský). Among the talented new directors who emerged in the 1930's were V. Borský, M. Cikán, and O. Vávra. The first Slovak film, *Jánošík*, was made in 1921 by J. Siakel and F. Horlivý, who drew heavily on folk legends. K. Plicka made documentaries about Slovakia. One of Europe's largest film studios, releasing some 40 films annually before the war, was founded in 1933 at Barrandov near Prague.

During the fascist occupation German films were imported on a large scale. Nevertheless, Czechoslovak film-makers were able to produce several patriotic films: *Grandmother* (1940, based on Němcová's novella, directed by F. Čap), *Lawyer for the Poor* (1940, directed by V. Slavínský), and *Romance of May* (1942, directed by Vávra).

The Czechoslovak motion-picture industry was nationalized after the establishment of the people's democratic system in 1945. Besides re-creating heroic episodes from the country's history, as K. Steklý did in *The Siren*, based on M. Majerová's novel, film directors made motion pictures about the radical changes taking place in society and about the collectivization and class struggle in the countryside. These themes were explored in J. Krejčík's *Frona* (1954), Vávra's *The Offensive* (1952), and J. Mach's *Native Land* (1954).

In the late 1950's and early 1960's Czechoslovak cinematographers, eschewing stereotyping and a simplistic approach to the dialectically complex processes involved in the development of the new society and the new socialist personality, tried to portray the new life in all its diversity and complexity and to give meaning to the events of World War II. The finest of these films were J. Sequins' *Escape From the Shadows* (1958), V. Gajer's *Rabbits in the Tall Grass* (1962), A. Kachlík's *June Days* (1961), I. Novák's *Green Horizons* (1962), and Z. Brynych's *Transport From Paradise* (1962). Comedies ranged from satirical films tinged by the grotesque and fantasy to comedies of manners. Among the directors who excelled in this genre were O. Lipský, B. Zeman, V. Vorlíček, Z. Podskalský, and Mach. A number of outstanding cinematographers made their debut in the 1960's, notably Š. Uher, V. Chytilová, J. Jireš, and J. Menzel.

The complex ideological and political struggle that gripped the CSSR in the late 1960's also manifested itself in the production of a number of clearly antisocialist films. The efforts to strengthen the socialist positions in cinematography yielded positive results in the early 1970's. The finest traditions of socialist film art were developed in K. Kachyňa's *I'm Jumping the Puddles Again* (1970), V. Cech's *The Key* (1971), J. Jireš's *And Give My Love to the Swallows* (1972), J. Sequins' *Chronicle of a Hot Summer* (1973), and Vávra's *Days of Betrayal* (1974), *Sokolovo* (1974), and *The Liberation of Prague* (1976). Other excellent films of the 1970's were Lipský's *Three Men on the Road* (1973), Steklý's *Hippopotamus* (1974), J. Balík's *Lovers of the Year One* (1973), and Kachlík's *The Twenty-ninth* (1975). Many of these films deal with current social issues and the complex spiritual development of the contemporary hero.

The best Slovak films of the 1970's were M. Hollý's *The Copper Tower* (1970), J. Režucha's *Perfectly Honest Fellows* (1972), and Š. Uher's *A Great Night and a Great Day* (1975). The animators J. Trnka, K. Zeman, and H. Týrlova have made an international contribution to the development of the cartoon film.

The leading film stars are J. Marvan, F. Smolík, J. Bek, E. Kačírková, R. Hrušinský, J. Abrhám, V. Brodský, R. Růžek, M. Vášáryová, V. Fialová, F. Filipovský, V. Menšík, J. Króner, Š. Kvietik, and J. Sovak.

In 1976 there were six film studios in the country: Barrandov Film and Bratislava Koliba, both producing feature films, the Children's Film Studio in Gottwaldov, the Short Film Studio in Prague, the Newsreel Studio, and the Studio of the Czechoslovak People's Army. Sixty-eight feature films were released in 1976. Personnel are trained by the motion picture and television departments of the Prague Academy of Arts, founded in 1946. Research is conducted at the Czechoslovak Film Institute, which has a museum and a film library.

International film festivals were held in Mariánské Lázné from 1946 to 1949; in 1950 they were transferred to Karlovy Vary, where they have been held every two years since 1958. Children's film festivals were initiated in 1948.

The leading film magazines are *Film a doba* (Prague, since 1955), *Kino* (Prague, since 1946), and *Film a divadvo* (Bratislava, since 1959).

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L. P. ERMILOVA [29–412–1]

CZECHOSLOVAK NEWS AGENCY (Československá Tisková Kancelář), the government-run information agency of the Czechoslovak Socialist Republic. Founded in Prague in Oct. 28, 1918, the agency is the chief source of domestic and international news for newspapers, radio, television, and government institutions. [29–504–3]

CZECHOSLOVAK PEOPLE'S PARTY (CPP; Československá Strana Lidová), a political party founded in February 1948 after the reorganization of a bourgeois party of the same name that had existed since 1918. The party essentially unites citizens holding a Christian world view, including farmers, craftsmen, workers, and members of the intelligentsia and some strata formerly belonging to the petite bourgeoisie. The party is active in the Czech Socialist Republic (CSR).

The party belongs to the National Front of the Czechoslovak Socialist Republic, recognizes the leading role of the Communist Party of Czechoslovakia, and supports the program of socialist construction in the country. It is represented in the Federal Assembly of the Czechoslovak Socialist Republic, the government of the Czech Socialist Republic, the Czech National Council, and the national committees (local governing bodies). The highest organ of the CPP is the Congress, which meets once every five years. Between congresses the party's activities are directed by the Central Committee (elected by the Congress), the Presidium, and the Secretariat of the Central Committee. R. Petera is the party chairman. The main press organ is the newspaper *Lidová demokracie* (People's Democracy). [29–501–2]

CZECHOSLOVAK RADIO (Československý Rozhlas), a government organization of the Czechoslovak Socialist Republic. Founded in 1923 in Prague, Czechoslovak Radio broadcasts in Czech and Slovak over five national networks (1980): Prague, Bratislava, Vltava, Děvín, and Hvězda. In some parts of Slovakia and in the northern Czech Socialist Republic programs are offered in Hungarian, Polish, and Ukrainian. Foreign broadcasts are made in Czech, Slovak, English, German, French, Russian, Italian, Spanish, Portuguese, and Arabic. In 1979 the organization operated 93 studios throughout the country. [29–504–1]

CZECHOSLOVAK SOCIAL DEMOCRATIC LABOR PARTY (CSDLP; Československá Sociálně Demokratická Strana Dělnická), a political party founded in April 1878 at a congress of Czech Social Democrats in Břevnov, near Prague, as a branch of the Austrian Social Democratic Party. It became an independent party in 1893. Until late 1918 the party was called the Czech-Slavic Social Democratic Labor Party.

In the late 19th and early 20th centuries the CSDLP headed the economic and political actions of the Czech proletariat. In 1910–11 the party split into the "autonomists" and the "centralists," the latter advocating a united trade union movement. During World War I the opportunist leaders of the autonomists took a social chauvinist stance. After the creation of a bourgeois Czechoslovak state in 1918, the party merged with the Slovak Social Democrats to form the CSDLP, led by the opportunists A. Němec and V. Tusar. (The centralists joined the CSDLP in March.) In December 1919 a revolutionary opposition crystallized within the CSDLP. Led by B. Smeral, J. Hybeš, and A. Zápotocký, the Marxist left, as the opposition was called, was to become the basis of the Communist Party of Czechoslovakia, founded in 1921. With the exception of a brief interval from 1926 to 1929, Social Democrats held cabinet posts in all the bourgeois coalition governments of Czechoslovakia from 1919 to 1938. After the Munich Pact (1938), the leaders of the CSDLP announced that the party had disbanded.

In 1945 the CSDLP was revived under the chairmanship of Z. Fierlinger, a member of its left wing. In November 1947 leadership was seized by the right wing, which elected as chairman B. Laušman and which collaborated in the preparations for the counterrevolutionary February events of 1948. In June 1948, the CSDLP purged its ranks of reactionary elements and merged with the Communist Party on a Marxist-Leninist basis.

K. P. GOGINA [29–501–3]

CZECHOSLOVAK SOCIALIST PARTY (CSP; Československá Strana Socialistická), a political party formed in February 1948 from part of the Czech National Socialist Party, which had been founded in 1897 and which had been called the Czechoslovak Socialist Party from 1918 to 1926. The CSP draws its support from several strata of the population that formerly belonged to the urban middle and petite bourgeoisie, as well as from a small portion of the intelligentsia, workers, and peasants. The party is active in the Czech Socialist Republic (CSR).

The CSP is a member of the National Front of the Czech Socialist Republic, recognizes the leading role of the Communist Party of Czechoslovakia, and supports the country's program of socialist construction. It is represented in the Federal Assembly of the Czechoslovak Socialist Republic, the government of the Czech Socialist Republic, the Czech National Council, and the national committees (local governing bodies). The party's highest organ is the national Conference, held once every five years. Between conferences, the party's activities are directed by the Central Committee, elected by the Conference. The chairman of the CSP is B. Kučera. The party's main press organ is the newspaper *Slobodné slovo* (Free Word). [29–502–1]

CZECHOSLOVAK TELEVISION (Československá Televize), a government organization of the Czechoslovak Socialist Republic. Founded in Prague in 1953, Czechoslovak Television broadcasts over two channels—Program I and Program II—from television studios in Prague, Bratislava, Brno, Ostrava, Košice, and a number of other cities. Color television was introduced in 1974. In 1979 the organization operated 34 repeater stations. [29–504–2]

CZECHOSLOVAK THEATER (full name, E. F. Burian Czechoslovak Theater), founded in Prague in 1933 by E. F. Burian as the D-34 Theater, the name being derived from the Czech word *divadlo*, meaning "theater," and the first year of the theater's operation.

The striving for modernity, underscored by the theater's name, was also reflected in its repertoire. Among its finest productions of the 1930's were Brecht's *Threepenny Opera* (1934), Hašek's *Good Soldier Švejk* (1935), Pogodin's *The Aristocrats* (1935), and Klicpera's *To Each According to His Deserts* (1936). The theater was subjected to police censorship and persecution for "propagating communism under the guise of art." In 1941 the theater was closed by the fascist authorities, and Burian was imprisoned in a concentration camp.

In 1945 the D-34 Theater reopened under the direction of Burian. Over the next four years it staged memorable productions of Káňa's *Grinder Karhan's Worker Team*, Čapek's *Mother*, Mayakovsky's *The Bedbug*, and Shtein's *Hotel Astoria*. After Burian's death in 1959, the D-34 Theater was renamed in his honor, and K. Novák served as its principal director until 1973. Outstanding productions of the 1970's included M. Bílek and V. Rón's *Play About Oton*, P. Neruda's *Splendor and Death of Joaquin Murieta*, Jirsíková's *May*, Vampilov's *Elder Son*, and Gorky's *Egor Bulychov and the Others*. In 1976, the theater's company included the directors E. Sokolovský and J. Palla and the performers J. Němeček, J. Valla, J. Holý, J. Langmiler, P. Olivá, V. Zinková, K. Burianová, and Z. Podlipná. The principal director (since 1973) is J. Větrovec, and the principal stage designer is V. Nývlt.

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L. P. SOLNTSEVA [29–502–3]

CZECHOWICZ, JÓZEF. Born Mar. 15, 1903, in Lublin; died there Sept. 9, 1939. Polish poet.

A schoolteacher by profession, Czechowicz published the journal *Reflektor* in 1924 and 1925. His collections of verse include *Stone* (1927), *Ballad From the Other Side* (1932), and *The Human Voice* (1939). Czechowicz's verse re-creates the atmosphere of the Polish provinces and reflects a presentiment of the impending destruction of the bourgeois world. After beginning with formalist experimentation, he moved toward a realistic poetics. Czechowicz perished during Hitler's bombardment of Lublin.

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CZECH PROGRESSIVE PARTY (Česká Strana Pokroková), a liberal bourgeois party that existed from 1900 to 1918. T. G. Masaryk was one of its founders and ideologues. Known as the Czech People's, or Realist, Party until 1905, the party drew its support from the Czech industrial bourgeoisie, which was loyal to the Austro-Hungarian monarchy and committed to bolstering its economic and political strength. The party advocated the autonomy of the Czech lands within Austria-Hungary, and in 1907 it sent two deputies to the Austrian Reichsrat. After the creation of a bourgeois Czechoslovak state in 1918, most of the party's members merged with the National Democratic Party, and the rest joined the National Socialist Party. [29–524–4]

CZECHS, a nation (*natsiia*, nation in the historical sense) in Czechoslovakia and the overwhelming majority of the population of the Czech Socialist Republic (CSR). Of the 9.6 million Czechs living in Czechoslovakia, 9.5 million reside in the CSR (1977 estimate). A considerable number of Czechs live abroad, chiefly in Austria, Canada, and the USA. The Czechs speak the Czech language. Most of the believers among them are Catholics, and the rest adhere to Protestant denominations.

In the fifth and sixth centuries, Slavic tribes settled and gained the ascendancy in the area now known as Czechoslovakia. Written sources have preserved the names of some of these tribes: Czechs, Doudlebi, Croats, Lučané, Zličane, Děčané, Pšované, Litoměřici, Hbané, and Glomači. The Czech tribe played a leading role in unifying these groups. In the ninth century, until 895, the Czech lands were part of the Great Moravian State. After its decline in the early tenth century, the center of political life shifted to Bohemia, where a state arose under the Czech Přemyslid dynasty. In the 11th century Moravia was merged with Bohemia. The Czech nationality that began to evolve in the Czech state at this time included the Moravians, who nevertheless preserved some of their ethnic distinctiveness. Beginning in the 13th century the ethnic homogeneity of the country was undermined by German colonization, which the Czech kings and feudal lords encouraged in order to increase their revenues. Growing German domination, increasing feudal exploitation of the Czech peasantry, and the corruption of the Catholic Church precipitated the Hussite revolutionary movement in the first half of the 15th century.

In 1620, after the battle of the White Mountain (Bílá Hora), the Czech lands lost their political independence and became a hereditary possession of the Hapsburgs. For three centuries the ruling circles of the Austrian Empire (after 1867, Austria-Hungary) pursued a policy of germanization in Bohemia and Moravia. By the 18th century, German had become the administrative language, and the popular masses were the sole transmitters of the Czech language and culture. In the late 18th and early 19th centuries, as the feudal system declined and capitalist relations arose, the modern Czech nation began to develop amid a growth of national consciousness. This period, known as the Czech Renaissance, saw the unfolding of a broad national movement and a campaign to revive the Czech language and to use it in all spheres of public life. Progressive writers and artists drew inspiration from the creativity of the people and introduced folklore themes in their works.

The collapse of Austria-Hungary in 1918 led to the creation of the first national state of Czechs and Slovaks, the Czechoslovak

Republic. In 1938–39 the republic was occupied by fascist German aggressors, who tried to suppress any manifestation of national life. The establishment of people's rule in 1945 and the subsequent socialist transformations in the country stimulated a general economic and cultural revival and permitted the formation of a socialist Czech nation.

Folk creativity has played a major role in the development of the Czechs' national culture—their literature, music, and art. In southwestern Bohemia (among the Chods) and in southeastern Moravia the national dress continues to be worn, and traditional crafts are flourishing. For more information about the history, economy, and culture of the Czechs, *see* CZECH SOCIALIST REPUBLIC and CZECHOSLOVAKIA.

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N. N. GRATSIANSKAIA [29–372–6]

CZECH SOCIALIST REPUBLIC (Česká Socialistická Republika, CSR), a republic in western Czechoslovakia (Czechoslovak Socialist Republic), encompassing the historical provinces of Bohemia and Moravia. With an area of 78,900 sq km and a population of 10 million (estimate, Jan. 1, 1976), the republic occupies more than 60 percent of Czechoslovakia's area and accounts for 68 percent of its population. Czechs constitute 94.2 percent and Slovaks 3.6 percent of the republic's population. Prague is the capital of both the republic and the country. The other major cities are Brno, Ostrava, Plzeň, Hradec Králové, Havířov, Olomouc, České Budějovice, Karviná, Pardubice, Liberec, Ústí, Gottwaldov, and Kladno. About two-thirds of the republic's population lives in urban-type settlements. Administratively, the CSR is divided into seven provinces: Central, South, West, North, and East Bohemia and South and North Moravia.

The Czech Socialist Republic is an equal and voluntary member of the Czechoslovak Socialist Republic, a federal state uniting the national states of the Czech and Slovak peoples. The CSR's system of government was established under the 1960 Constitution of the Czechoslovak Socialist Republic and the Constitutional Law of 1968 on the Czechoslovak Federation. The highest governing body is the Czech National Council, whose members are elected by the republic's population for five-year terms by universal, equal, and direct suffrage and secret ballot. The executive body, the government of the republic, is appointed by the Presidium of the Czech National Council.

Natural features. Most of the republic lies within the bounds of the Bohemian Massif, which is encircled by the medium-elevation ranges of the Šumava, the Bohemian Forest, the Ore Mountains, and the Krkonoše, rising to 1,602 m on Mount Sněžka. The interior of the Bohemian Massif, called the Bohemian Basin, consists of several lowlands separated by low-mountain massifs. Moravia, also a land of hills and low mountains, encompasses the Moravian Kras, with its karst formations, and the western spurs of the Carpathians. The Bohemian-Moravian Uplands occupy the southern and central parts of the republic. The climate is temperate, and the annual precipitation ranges from 450 mm to 600 mm in the plains and from 1,200 mm to 1,600 mm in the mountains. The mountain slopes are covered with mixed and coniferous forests.

Historical survey. The territory of the present-day republic was settled as early as the Lower Paleolithic. Celts arrived in the area circa 400 B.C., and from the second century B.C. the region was inhabited by the Celtic Boii tribes, from whom the Latin name Bohemia (German, Böhmen) is derived. At the beginning of the Common Era the Celts were overrun by the Marcomanni and other Germanic tribes. By the middle of the first millennium Slavic tribes had moved into the region, which was included in the state founded by Samo in the seventh century and formed part of the Great Moravian State in the ninth and early tenth centuries. Christianity, first Byzantine Orthodoxy and then Roman Catholicism, spread into Bohemia and Moravia in the ninth century.

Arising in the tenth century under the Přemyslid dynasty, the Prague Principality became the nucleus of an early-feudal Czech state. The princely authority and Czech state were considerably strengthened by Prince Břetislav I (ruled 1034–55). By this time the state ruled by the Přemyslids encompassed not only Bohemia (the historical region that today forms the western part of the Czech Socialist Republic) but also Moravia. In 1085 the Czech prince received the royal title, and in 1198 the Czech lands became a hereditary kingdom. In the period of feudal fragmentation, which lasted from the mid-11th to the late 12th centuries, the Czech lands were invaded by German feudal lords, who were defeated at Chlumec in 1126. The Czechs also routed the Mongol-Tatars who invaded Moravia in 1241.

A feudal estate monarchy arose in the Czech lands in the late 13th and the first half of the 14th centuries. After the Přemyslid dynasty died out in 1306, the Czech lands were incorporated into the domains of the Luxembourgs in 1310. Charles I, who was vicegerent of Bohemia and Moravia from 1333 and king of Bohemia from 1346 to 1378, was elected Holy Roman Emperor as Charles IV. Under Charles the importance of Prague increased, the Czech kings acquired the prerogatives of imperial electors in 1356, the Prague Archbishopric was established in 1344, and the University of Prague (Charles University) was founded in 1348.

Intensified feudal exploitation in the 14th and early 15th centuries strengthened the resistance of the Czech people to the oppression of the secular and spiritual feudal lords and the urban patricians, many of whom were Germans. (Colonization of the Czech lands by Germans had begun in the 13th century.) J. Hus played a leading role in the growth of the antifeudal and national liberation movement. In the first half of the 15th century the Czech lands were engulfed by a strong social-revolutionary, national liberation, and anti-Catholic movement (*see* HUSSITE REVOLUTIONARY MOVEMENT). The tyranny of the Czech magnates after the suppression of the Hussite revolutionary movement impelled the burghers of the Czech royal cities and the lower nobility to elect George of Poděbrady to the throne (ruled 1458–71). After his death the Czech magnates enthroned Vladislav II (ruled 1471–1516) and then Louis II (ruled 1516-26) of the Polish Jagiellonian dynasty.

After the Ottoman Turks defeated the combined Hungarian-Czech forces at the battle of Mohács in 1526, during which Louis II was killed, the Czech feudal lords elected the Austrian archduke Ferdinand I Hapsburg to the throne (ruled 1526–64). The Czech lands were to remain under the rule of the German-Austrian Hapsburgs until 1918. The rights and liberties of the Czech estates were restricted, and Germans became firmly entrenched in the bureaucracy, in the cities, and in commerce. The Reformation spread to the Czech lands in the 16th century. The Czech Uprising of 1547 was the first open rebellion against the Hapsburgs. The pro-German and Catholic policy of King Matthias (ruled 1611–19) fanned the discontent of the Czech estates, and the ensuing Czech uprising of 1618–20 signaled an international conflict that was to escalate into the Thirty Years' War (1618–48).

The defeat of the Czech estates at the decisive battle of the White Mountain (Bílá Hora) on Nov. 8, 1620, was followed by an "age of darkness" brought on by the triumph of feudal Catholic reaction in all spheres of the country's political, economic, and cultural life. Under the Revised Land Ordinance, promulgated in 1627, the Czech lands lost all vestiges of political independence. The growing feudal and national oppression provoked the Peasant uprising of 1680, the struggle of the Chods (*see* CHODS) in the late 17th century, and the Czech uprising of 1775, which obliged the Austrian government to reduce the *corvée* that same year. The personal dependence of the peasants was abolished in 1781.

The expansion of capitalist relations from the late 18th century was accompanied by the formation of a Czech bourgeois nation (*see* CZECHS). A national movement known as the Czech Renaissance unfolded in the Czech lands in the late 18th and the first half of the 19th centuries. Members of the Czech intelligentsia played a prominent role in fostering the people's national awareness and developing a national culture. Among these "awakeners" were J. Dobrovský, F. Pelcl, J. Jungmann, F. Palacký, and P. J. Šafařík. The Matice Česká, a cultural and educational society, was founded in 1831. In the Czech lands the Revolution of 1848–49 culminated in the Prague uprising of 1848. Although the

revolution was defeated, it resulted in the liberation of the peasants from feudal dependence and the abolition of the *corvée* in return for redemption payments.

The industrial revolution, which began in the Czech lands in the early 19th century, accelerated the development of capitalism. From the 1860's the Czech lands were transformed into the most industrialized part of the Hapsburg Empire, renamed Austria-Hungary in 1867. The liberal bourgeoisie that headed the Czech national movement split in 1874 into the conservative Old Czechs and the left-wing Young Czechs. From the late 1860's socialist ideas were disseminated by J. B. Pecka, L. Zápotocký, and J. Hybeš, and the growing strength of the workers' movement was manifested in the Svárov strike of 1870. The Czechoslovak Socialist Democratic Labor Party, founded in 1878, was part of the Social Democratic Party of Austria until 1893. At the end of the 19th century the strike movement assumed mass proportions; May Day of 1890 was marked by rallies and demonstrations. However, the Czech workers' movement was weakened by opportunism and the growing influence of bourgeois nationalism, whose mouthpiece was the Czech National Socialist Party, founded in 1897.

The Old and Young Czechs' support of the Austrian government gave rise to several new Czech political parties that reflected the interests of various groups of the Czech bourgeoisie: the Czech Radical Progressive Party (1897), the Czech Radical State Rights Party (1899), the Czech Agrarian Party (1899), and the Czech Progressive Party (1900). Under the influence of the Revolution of 1905–07 in Russia, large workers' demonstrations took place in the Czech lands, notably the general strike of Nov. 28, 1905. The Austrian government was obliged to consent to the introduction of universal suffrage in 1907.

After the outbreak of World War I a mass antiwar movement unfolded in the Czech lands. The Austrian government established a regime of police terror, suspended political freedoms, and set up military field tribunals. Most of the Czech bourgeois political parties adopted pro-Austrian positions, and the leadership of the Czechoslovak Social Democratic Labor Party pursued an opportunist policy. In 1915 pro-Entente bourgeois politicians headed by T. G. Masaryk founded the Paris-based Czechoslovak Foreign Committee, reorganized the following year as the Czechoslovak National Council. The February Revolution of 1917 and particularly the October Socialist Revolution in Russia gave impetus to the revolutionary movement in the Czech lands. The Czech working class took part in the general strike that spread across Austria-Hungary in January 1918 and in the May Day demonstrations of that year. In May 1918 the garrison of Rumburk in northern Bohemia rebelled in protest against the war. The October general political strike of 1918 in the Czech lands dealt a heavy blow to the Austro-Hungarian monarchy. On Oct. 28, 1918, amidst the collapse of Austria-Hungary, the National Committee in Prague (founded in 1916 and including representatives of all the Czech political parties from the middle of 1918) announced the formation of an independent Czechoslovak state. On Nov. 14, 1918, the Provisional National Assembly in Prague proclaimed the Czechoslovak Republic.

Down to the late 1930's the Czech lands, the most highly industrialized part of Czechoslovakia, were the main arena of class battles and antigovernment demonstrations. Such major confrontations as the December political strike of 1920 and the Most strike of 1932 were part of the struggle of the working class of all Czechoslovakia. The Communist Party of Czechoslovakia (CPC) was founded in 1921. The persecution of the CPC and other progressive organizations that began in the 1920's with the enactment of the Law on the Protection of the Republic (1923) intensified in the 1930's after several emergency laws were adopted in 1932–33. Under these conditions Czech fascist organizations, notably the National Union, stepped up their activity, and the fascist Sudeten German Party began campaigning in the northwest.

After the Munich Pact of 1938, by which the Sudeten region was ceded to Germany on October 1, the authorities disbanded the CPC and other progressive organizations in December. In March 1939, after the further dismemberment of the Czechoslovak state by fascist Germany, all the Czech lands except the areas detached in 1938 were declared the Protectorate of Bohemia and Moravia, to be administered by a Reich protector.

The aggressors established a fascist regime in the Czech lands, arresting about 6,000 Communists. After the outbreak of World War II the Nazis arrested more than 2,000 people, most of them members of the Czech intelligentsia, and incarcerated them in the German concentration camps of Dachau and Buchenwald. Communists headed the resistance movement in the Czech lands, which gained momentum after fascist Germany's attack on the USSR.

After an attempt on the life of the Reich protector R. Heydrich by Czechoslovak patriots on May 27, 1942, the Nazis intensified the mass repression. Some 1,800 people were executed. On June 10, 1942, the village of Lidice was wiped off the face of the earth, and on June 24 the same treatment was meted out to the village of Ležaky in Chrudim District. In the summer of 1942 partisan detachments organized by Czech patriots and by Soviet parachutists and prisoners of war who had escaped from German concentration camps began operating in the Brdy Forest, in the Beskids, and in other areas. The Slovak national uprising of 1944 spurred the resistance movement in the Czech lands. A clandestine Central Committee of the CPC was formed at the end of 1944 for the purpose of uniting all the resistance groups in Czechoslovakia and preparing for an armed uprising. Through the efforts of the CPC the Czech National Council, which included representatives of all the main groups in the resistance, was formed in the spring of 1945. The liberation movement in the Czech lands escalated under the influence of the successful offensive of the Soviet Army. Revolutionary national committees seized power in a number of cities and villages. During the People's Uprising of 1945, which broke out in the Czech lands in early May and which was supported by the Soviet offensive, Prague was liberated on May 9 as a result of the Prague Operation.

The liberation of the country from the fascist German aggressors created favorable conditions for the reunification of the Czech lands and Slovakia within a people's Czechoslovakia. The Košice Program, adopted on Apr. 5, 1945, proclaimed, among other democratic principles, the equality of the Czech and Slovak peoples. The restoration of Czechoslovakia's independence and the establishment of a people's democratic system heralded profound social and economic changes, including an agrarian reform, in both the Czech lands and Slovakia. In February 1948 the working people of the Czech lands, together with the working class and the laboring peasantry of the entire country, decisively defeated the bourgeoisie, which tried to stage a counterrevolutionary coup d'etat (*see* FEBRUARY EVENTS of 1948). The February victory opened the way for the building of a socialist society.

The Czech and Slovak peoples embarked on the building of socialism, whose victory in Czechoslovakia was legally reinforced by the Constitution of July 11, 1960. The CPC and the working people of the Czech lands helped implement measures aimed at eliminating the consequences of the actions of the antisocialist forces that tried in 1968 to detach Czechoslovakia from the socialist community (*see* CZECHOSLOVAKIA). The Constitutional Law, which was adopted by the National Assembly and went into effect on Jan. 1, 1969, transformed the Czechoslovak Socalist Republic into a federal state of two equal peoples, the Czechs and the Slovaks, and made the Czech Socialist Repubiic (CSR) one of two equal socialist republics in a federation.

G. E. SANCHUK (to the 18th century),
K. P. GOGINA (from the 18th century to 1918),
and O. P. SELIANINOV and A. KH. KLEVANSKII (since 1918)

Economy. The CSR has a highly developed industry and agriculture. In 1975 industry and construction employed 49.5 percent of the labor force, compared to 39.1 percent in 1948, and agriculture and forestry engaged 12.5 percent, as against 32.9 percent in 1948. The republic accounts for 74 percent of Czechoslovakia's national income, for 74 percent of its industrial output, for 66 percent of its construction, and for 67 percent of its agricultural output.

In the course of socialist construction, the national income increased by a factor of about 5 between 1948 and 1975, the industrial output by a factor of 7.7, and the agricultural output by a factor of 1.8. The economy of the republic has been radically reorganized and modernized. The structure of industry has been altered by the rapid expansion of the machine-building, metal-

working, and chemical industries, whose output rose by a factor of more than 17 from 1948 to 1975. The main branches of the republic's highly diversified industry are fuel and energy (accounting for 10 percent of the total gross output of the CSR), ferrous metallurgy (10.6 percent), machine building and metalworking (32.8 percent), chemicals (6.8 percent), textiles (6.1 percent), and food and condiments (14.8 percent).

The CSR produces all the bituminous coal mined in Czechoslovakia; most of the 28 million tons extracted in 1975 came from the Ostrava-Karviná and Kladno basins. The republic also accounts for most of the country's brown coal output (more than 80 million tons in 1975), extracted from the North Bohemian and Sokolov basins, and for the greater part of the electric power generated (about 50 billion kW-hrs in 1975). A large metallurgical and machine-building complex has been established. In 1975 most of the republic's output of 9 million tons of coke, more than 6 million tons of cast iron, more than 10 million tons of steel, more than 7 million tons of rolled metals, and more than 1.2 million tons of pipes came from three metallurgical plants in the Ostrava-Karviná Basin. The CSR accounts for three-fourths of the country's machine-building output and for almost its entire output of power equipment, means of transportation, machine tools, tractors, electrical engineering goods, and certain other types of machinery and equipment.

The large chemical industry manufactures, in addition to inorganic chemical products derived from coal, organic chemical products obtained by processing hydrocarbon raw materials, chiefly petroleum. Major products include plastics, chemical fibers, and synthetic rubber. Most of the chemical enterprises are situated in the North Bohemian Brown Coal Basin, along the middle and lower Labe, and around Ostrava. Cement and other building materials are produced on a large scale. North Bohemia has numerous glassworks, and West Bohemia is famous for its porcelain. The logging and woodworking industry of the mountain regions produces paper, furniture, and pencils. The textile industry, a traditional industry in North Bohemia, manufactures cotton, wool, silk, and linen fabrics and clothing. The leather and footwear industry, concentrated in Gottwaldov, produces for the world market. The main products of the thriving food and condiments industry are refined sugar and beer. The most important industrial regions are the Prague-Plzeň region, Brno and its environs, the Ostrava-Karviná region, the area along the Labe River, and central Moravia.

The republic's agriculture is highly intensive, market-oriented, and diversified. In addition to grain crops, beets, potatoes, fodder crops, hops, fruit, and vegetables are widely grown. Wheat, sugar beets, and barley are cultivated mainly in the fertile valleys of Moravia and along the Labe; rye and potatoes are grown in the hilly areas. Animal husbandry is flourishing; beef and dairy cattle, hogs (mechanized farms), and poultry are raised. Commercial pond fishing is important. The CSR is situated at the junction of important European transportation routes. The Vltava and the Labe are used for shipping. L. A. AVDEICHEV

Cultural affairs and public health. In the 1975–76 school year about 317,000 children attended 6,203 kindergartens admitting children between the ages of three and five years. That year about 1.2 million pupils were enrolled in 5,908 compulsory primary schools, about 72,000 students in four-year secondary general-education schools (*Gymnasiums*), about 215,000 students in vocational schools, and more than 183,300 students in three- or four-year secondary vocational schools. The republic's 23 higher educational institutions had an enrollment of about 92,300. The largest and oldest institutions of higher learning in Prague are Charles University (University of Prague), founded in 1348 and attended by more than 24,100 students in the 1976–77 academic year, the Technical University, higher schools of chemical technology, economics, and agriculture, the Academy of Art, and the Academy of Fine Arts. Located in Brno are the University of Brno, the Technical University, and the L. Janáček Academy of Music and Dramatic Art. Two other major schools are the F. Palacký University in Olomouc and the State College of Mining and Metallurgy in Ostrava.

The highest scientific institution is the Czechoslovak Academy of Sciences, some 70 of whose research institutes and other scientific institutions are located in the republic, chiefly in Prague and Brno. In addition, various scientific sections of the Czechoslovak Academy of Agriculture, which was detached from the Academy of Sciences in 1974, are based in the republic. Prague is the site of several research institutes affiliated with ministries and agencies of the Czechoslovak government, notably the Geological Survey (founded 1919), the Hydrometeorological Institute (1920), and the Water Research Institute (1920). Outside Prague, there are major specialized research institutions in Brno, Ostrava, Gottwaldov, Olomouc, and Jihlava. Scientific work is also conducted at higher educational institutions, some of which maintain research institutes. Attached to the University of Prague, for example, are institutes of Marxism-Leninism (1970) and astronomy (1887), and the School of Economics in Prague has established an institute of industrial economics. There are a number of learned societies.

The largest libraries in Prague are the State Library of the Czech Socialist Republic (founded 1958; 4.6 million volumes in 1976), the Library of the Czechoslovak Academy of Sciences (1952; more than 700,000 volumes), the National Museum Library (1818; 2.4 million volumes), the City Library (1891; 2,048,000 volumes), and the State Technical Library (1707; 724,000 volumes). Brno's largest libraries are the State Technical Library (1899; 1.1 million volumes) and the University Library (1815; 1,689,000 volumes). Research libraries have also been established in Opava, Ostrava, Olomouc, Plzeň, and other cities.

The principal museums are the National Museum, founded in Prague in 1818, the National Gallery (1796) in Prague, the Museum of the Capital City of Prague (1883), the Brno Municipal Museum (1904), and the Moravian Museum (1818) in Brno. Also important are the city museums in Karlovy Vary and Pardubice and the regional museums in Gottwaldov, Teplice, and Opava.

In 1975 the republic had 18 daily newspapers, 186 weeklies, 112 biweekly magazines and newspapers, and 282 monthly magazines; 4,310 books and pamphlets were published, totaling more than 58,000 copies. The most influential dailies, all published in Prague, are *Rudé právo* (since 1920; 1975 circulation, about 1 million), the organ of the Central Committee of the Communist Party of Czechoslovakia; *Práce* (since 1945; circulation, about 290,000), the organ of the Czechoslovak Revolutionary Trade Union Movement; *Mladá fronta* (since 1945; circulation, 238,000), the organ of the Socialist Union of Youth; *Svobodné slovo* (since 1945; circulation, 227,800), the organ of the Czechoslovak Socialist Party; and *Lidová demokracie* (since 1945; circulation, 216,900), the organ of the Czechoslovak People's Party.

Czechoslovak Radio, founded in 1923, and Czechoslovak Television, inaugurated in 1953, are government organizations of the Czechoslovak Socialist Republic. Most of the radio broadcasting is done by the Prague Radio Station, which broadcasts five programs. Television studios in Prague, Brno, Ostrava, and Plzeň broadcast two programs each.

In 1975 the republic had 5,762 hospitals and maternity homes, 615 specialized medical facilities, 433 therapeutic sanatoriums, 509 medical research institutes, and 76 clinics for safeguarding the health of mothers and infants. That year there were 27,896 doctors, or one for every 362 inhabitants.

Health resorts such as the world-famous spas of Karlovy Vary, Mariánské Lázně, Františkovy Lázně, and Poděbrady have developed around the republic's many mineral springs.

Literature. The appearance of the earliest Czech literary works—religious songs, saints' lives, and legends written in Old Church Slavonic—was made possible by the educational activity of the brothers Cyril and Methodius and their disciples at the turn of the tenth century. In the late 11th century, as the Roman Church became stronger, Old Church Slavonic was displaced by Latin. The most important medieval work in Latin was the *Czech Chronicle* (1125) by Cosmas of Prague. A vernacular and secular literature emerged in the late 13th century. The spread of Renaissance ideas into Bohemia and Moravia promoted the flowering of Czech literature in the 14th century. A remarkable historical work was the Boleslav (or Dalimil) Chronicle, composed in verse between 1308 and 1314 by Dalimil Mezířičský. Fourteenth-century Czech literature included satirical and didactic works, such as the folk drama *The Seller of Medicinal Ointments*, chivalric tales and epics, love lyrics, and the lyric and satirical songs of the *vagants*, wandering monks and students. The first known Czech

writer was the satirist S. Flaška (mid-14th century to 1403), whose works reflect a conflict between the king and the feudal nobility. The works of T. Štítné (circa 1333–1405) inveighed against foreign domination and foreshadowed the coming struggle for religious reform.

A new phase in literary development opened with the Hussite revolutionary movement of the first half of the 15th century, which produced anti-Catholic sermons (Jan Hus [c. 1371–1415] and Jan Želivský [died 1422]), epistolary works (Jan Hus and Jan Žižka [c. 1360–1424]), leaflets, manifestoes, appeals in verse (*Prague's Dispute With Kutná Hora*), and battle songs ("Those Who Are God's Warriors"). After the suppression of the Hussite movement, its patriotic spirit was kept alive by such writers as P. Chelčický (c. 1390–1460).

In the Czech lands the first printed books were issued in 1468. With the consolidation of feudalism in the late 15th century, Czech authors turned to scholarly writing. Some works protested against ossified medieval traditions. Chronicle writing flourished in the 16th century.

The domination of Catholicism in the 17th and 18th centuries hindered literary development. Latin was once again given preference over Czech, books written in Czech were destroyed, and many writers emigrated. An unwavering humanitarianism distinguished the pedagogical writings and philosophical literary works of the leading writer of that time, J. A. Comenius (1592–1670), one of whose best-known works was *The Labyrinth of the World and Paradise of the Heart* (1623). Apart from the official literature, serving the aims of Catholic propaganda, Czech books circulated in manuscript form, copied by anonymous scribes who wished to preserve them for future generations. Love lyrics were composed in the baroque style. Oral folk poetry played an important role in the spiritual life of the Czech people during these centuries.

L. S. KISHKIN

The literature of the Czech national renaissance, spanning the late 18th and first half of the 19th centuries, was in large measure shaped by the "awakeners." It initially arose as an Enlightenment literature championing the ideals of rationalism (J. Dobrovský, 1753–1829) and the use of the Czech language, in which odes, fables, and secular lyrics were written (A. J. Puchmajer, 1769–1820). In the second and third decades of the 19th century the philologist and poet J. Jungmann (1773–1847) and the publicist P. J. Šafařík (1795–1861) formulated a program for the development of an indigenous national literature. Essentially preromantic, the works produced between 1810 and 1830 drew on folklore, poeticized the heroic past, and affirmed the kinship of the Slavic peoples and their cultures. Two major early 19th-century works, known as the Králové Dvůr (1817) and Zelená Hora (1818) manuscripts, were written by V. Hanka (1791–1861) and J. Linda (1789–1834) in the style of ancient patriotic legends and passed off as genuine historical texts. Other important works included the narrative poem *Daughter of Sláva* (1824, 2nd ed. 1832) by J. Kollár (1793–1852), the bard of Slavic brotherhood, and the verse collections *Echo of Russian Songs* (1829) and *Echo of Czech Songs* (1839) by F. L. Čelakovský (1799–1852). The revolutionary romanticism of the 1830's brought to literature, along with a passionate longing for freedom and subjective lyricism, a broad range of philosophical issues. Its leading exponent was K. H. Mácha (1810–36), best known for his lyrical narrative poem *May* (1836). Dramaturgy was represented by J. K. Tyl (1808–56).

During the Revolution of 1848–49 realist tendencies emerged in Czech literature, whose social criticism and heroic and patriotic overtones became stronger, as illustrated by Tyl's plays *The Miners of Kutná Hora* (1848) and *Jan Hus* (1849). Antiabsolutist and anticlerical satire appeared in the narrative poems of K. Havlíček-Borovský (1821–56), the author of *Tyrolean Elegies* (1852, published 1861) and *The Baptism of St. Vladimir* (1848–54, complete text published 1876). During the Hapsburg reaction of the mid-19th century the novellas of B. Němcová (1820–62) mirrored social antagonisms and portrayed the common people as the main bearer of moral and ethical values (*The Grandmother*, 1855). K. J. Erben (1811–70) carried on the romantic folklore traditions in his *Bouquet* (1853), a collection of ballads.

From the 1860's to the 1880's realism developed further, its principles expounded in the critical articles of J. Neruda (1834–91). Realist poetics are affirmed in the civic verse and intimate lyrics of Neruda's *Book of Poems* (1868), *Simple Motifs* (1883), and *Ballads and Romances* (1883). Neruda also introduced urban themes into literature, frequently ridiculing the petite bourgeoisie, as in the *Tales of the Little Quarter* (1878). Social and moral issues were raised in two fine novellas about rural life: *In the New Village* (1873) by V. Hálek (1835–74) and *A Village Romance* (1869) by K. Světlá (1830–99).

By the early 1890's social criticism became more pronounced in realism, and writers evinced a heightened interest in the individual's relationship to society and man's inner world. Several outstanding historical novels were written. A. Jirásek (1851–1930) re-created critical moments of Czech history, portraying the panorama of the Hussite movement as a people's liberation war in *Between the Currents* (vols. 1–3, 1887–90) and *Against Everyone* (1893). The social conflicts of their own day were depicted by A. Stašek (1843–1931) in the novel *In the Turbid Whirlpool* (1900) and by J. Arbes (1840–1914) in the novel *Modern Vampires* (1882).

Criticism of social evils, patriotism, and a romantic anticipation of revolutionary changes infused the narrative poem *Songs of a Slave* (1894) by S. Čech (1846–1908), the collection *Village Songs and Bohemian Sonnets* (1890) by J. V. Sládek (1845–1912), and the collection *Fragments of an Epic* (1886) by J. Vrchlický (1853–1912). The realist plays *Her Stepdaughter* (1890) by G. Preissová (1862–1946), *Maryša* (staged 1894) by A. Mrstík (1861–1925) and V. Mrštík (1863–1912), and Jirásek's *Woman Warrior* (1890) and *The Father* (published 1895) depicted the tragic fate of the peasants and showed the impact of capitalist relations on the countryside.

At the turn of the century the literary scene was marked by diversity and contradiction. Although literature was clearly influenced by the labor movement and socialist ideas, the rejection of bourgeois reality was often accompanied by individualistic rebellion, which prompted the *Manifesto of the Czech Modernists* (1895). While condemning bourgeois relations, the poetry of J. S. Machar (1864–1942), notably his collections *Tristium vindobona* (1893) and *Golgotha* (1901) and his narrative poem *Magdalena* (1894), offered no clear alternatives. A spirit of spontaneous proletarian class protest animated the *Silesian Songs* (published separately in 1909) of P. Bezruč (1867–1958).

Modernist and decadent trends, finding extreme expression in the magazine *Moderní revue* (1894–1925), had only a partial influence on such writers as V. Dyk (1877–1931), whose principal poetic works were imbued with antimilitarist and patriotic fervor. Dreams of a humane world and freedom were typical of the symbolist poets, notably O. Březina (1868–1929), best known for his collection *Hands* (1901), and A. Sova (1864–1928), author of the collection *The Adventure of Daring* (1906). K. M. Čapek-Chod (1860–1927) portrayed society's ills in a naturalist vein. Anarchist feelings pervaded literature. A spirit of rebellion marked the early symbolist-influenced poetry of S. K. Neumann (1875–1947), gathered in the collections *The Glory of Satan Among Us* (1897) and *A Dream About a Crowd of Desperate People and Other Verses* (1903). The same defiant spirit informed the poetry of K. Toman (1877–1946), F. Šrámek (1877–1952), and F. Gellner (1881–1914). The short stories, pamphlets, and feuilletons of the brilliant Czech satirist J. Hašek (1883–1923) expressed the hatred of the lower classes for the Hapsburg monarchy, the social elite, the bourgeois bureaucratic system, and militarism. I. Olbracht (1882–1952) and M. Majerová (1882–1967) began their careers in the early 20th century.

S. V. NIKOL'SKII

The establishment of the Czechoslovak Republic in 1918 and the upsurge in the country's labor movement opened up new prospects for the development of literature. The Great October Socialist Revolution had a strong influence on the evolution of progressive Czech literature. A revolutionary trend emerged in the 1920's; its leading exponents were Z. Nejedlý (1878–1962), Neumann, Olbracht, Majerová, and young writers and artists of the Devětsil group. The theoreticians of proletarian poetry, which appeared in the early 1920's, were Neumann, J. Hora (1891–1945), and J. Wolker (1900–24). Revolutionary motifs were developed in the collection *A City in Tears* (1921) by

J. Seifert (born 1901), and Neumann's collection *Red Songs* (1923) introduced new kinds of civic and agitation lyrics. Wolker's works, notably his collection *Hour of Birth* (1922), embodied the ideals of revolutionary humanism; his poetics reflected a love of metaphor and experimentation with new forms of free verse. V. Nezval (1900–58) took a highly original approach to revolutionary romanticism in his narrative poem *The Amazing Magician*.

In the mid-1920's Devětsil rejected the program of proletarian poetry and advanced an avant-garde theory of poetics claiming that true revolutionary art was "pure lyricism." This notion was expounded by the theoretician K. Teige (1900–51) and the poets Nezval, Seifert, and K. Biebl (1898–1951). Despite such pronouncements, however, the best works of the Devětsil poets remained in the proletarian tradition. Nezval's narrative poem *Edison* (1928) was an innovative masterpiece of revolutionary art. Among the best proletarian prose works of the 1920's were Hašek's antimilitarist and satirical novel *The Good Soldier Švejk* (1921–23, unfinished), Majerová's realist novel *The Best of Worlds* (1923), Olbracht's realist novel *Anna the Proletarian* (1928), and the novel-parable *The Baker Jan Marhoul* (1924) by V. Vančura (1891–1942). Critical realism was continued by A. M. Tilschová (1873–1957), K. Nový (born 1890), and B. Klička (1897–1943). K. Čapek's novels and plays were an unusual blend of antibourgeois satire and social utopianism.

In the 1930's the Marxist critics J. Fučík (1903–43), B. Václavek (1897–1943), K. Konrad (1908–41), and L. Štoll (born 1902) worked on the theoretical problems of socialist realism. Writers of the Left Front, founded in 1930, polemicized with the group of surrealists formed by Nezval in 1934. The advocates of socialist realism formed the Alliance in 1935, which also included Slovak writers. The progressive camp opposed the Catholic writers, notably J. Durych (1886–1962), and the ruralism that reflected the ideology of the reactionary Agrarian Party. A prominent place was held by the civic and philosophical lyrics of Neumann and the proletarian poetry of J. Noha (1908–66), J. Taufer (born 1911), and F. Nechvátal (born 1905). Besides surrealist poems, Nezval wrote political poems on current themes. The poetry of V. Závada (born 1905) dealt with social concerns, and Neumann and F. Halas (1901–49) wrote poems about the Spanish Civil War. A very different voice was heard in the existential poetry of Halas and V. Holan (born 1905) and in the "pure lyricism" of Hora and Seifert. In the face of Nazi aggression, the progressive Czech poets were united in their dedication to antifascist and patriotic literature.

The socialist realist novel flowered in the 1930's. Social consciousness was combined with profound psychological analysis in the novels *The Siren* (1935) by Majerová, *People at the Crossroads* (1937, first part of a trilogy) by M. Pujmanová (1893–1958), *The Shoe Machine* (1933) by T. Svatopluk (1900–72), *The Sources* (1924–33; unfinished) by J. Kratochvíl (1885–1945), and *Three Rivers* (1936) by Vančura. In Olbracht's novel *Nikolaj Šuhaj, Bandit* (1933) motifs from folk legends are skillfully woven into the realist fabric of the work. Fučík and Pujmanová produced essays, reportage, and books about the USSR. Čapek's satirical and philosophical antifascist novel *War With the Newts* (1936) gained world renown. It was followed by two fine antifascist plays, *The White Plague* (1937) and *Mother* (1938). Vančura abandoned abstract philosophical dramaturgy in favor of realist plays.

Avant-garde literary criticism was represented in those years by Teijge and "academic" criticism by the Prague structuralists (*see* PRAGUE, LINGUISTIC CIRCLE OF). F. Šalda analyzed literature from a general democratic perspective.

During World War II, Vančura, Fučík, Konrad, Kratochvíl, Václavek, and other writers died in fascist prisons and concentration camps. Literature was full of the ideas of the antifascist resistance, eloquently expressed in Vančura's *Scenes From the History of the Czech People* (vols. 1–3, 1939–40), Fučík's *Notes From the Gallows* (published 1945), and the poetry of Halas and Neumann.

In the first postwar years, the people's liberation struggle and the victory over fascism was a central theme in Czech literature, notably in the poetry of F. Hrubín (1910–71), Nezval, Holan, Halas, and Pujmanová and the prose of J. Drda (1915–70). Nevertheless, representatives of bourgeois ideology remained influential. The victory over reaction in February 1948 marked the beginning of a new stage in the struggle for socialist literature.

In the 1950's prose writers showed a predilection for epic panorama. The historical destiny of the Czech people and their path to socialism were depicted in novels by Pujmanová (*Playing With Fire*, 1948; *Life Against Death*, 1952) and A. Zápotocký (1884–1957). Socialist construction was the theme of the novels *The Offensive* (1951) and *The Battle* (1954) by V. Řezáč (1901–56), *Without a Chief* (1953) by Svatopluk, and *The Peasant* (vols. 1–2, 1955–58) by B. Říha (born 1907). The complex conflicts of modern times were explored by J. Otčenášek (born 1904) in the novel *Citizen Brych* (1955) and by Z. Pluhař (born 1913). The antifascist struggle, a persistent theme, was portrayed in *Lame Orpheus* (1964) by Otčenášek and *Box for the Living* (1956) by N. Frýd (1913–76). V. Neff (born 1909) and J. Toman (1899–1977) wrote historical novels. The narrative poem *Song of Peace* (1950) and other works by Nezval became known throughout the world. The poetry of Závada, Hrubín, Taufer, and I. Skála (born 1922), imbued with antiwar fervor, evoked the spiritual world of modern man. Other poets, notably M. Florian (born 1931), chose to write about intimate personal experiences and the beauty of the Czech landscape. Hrubín also wrote psychological plays about contemporary life (*Crystal Night*, 1961), and Nezval created the antiwar philosophical fantasy play *Today the Sun Still Sets Over Atlantis* (1956).

Nihilist tendencies emerged in the mid-1960's, becoming strong during the political crisis of 1968, when they often turned into a rejection of socialism. The influence of Western modernism—the "new novel," the theater of the absurd, and "concrete" poetry—became increasingly apparent. After the April Plenum of the Central Committee of the CPC (1969), a campaign was launched to overcome the consequences of the crisis in ideology, culture, and literature. The Union of Czech Writers, founded in May 1972, united the Czech literary forces around socialist realism.

In the early 1970's continuity was restored with the best traditions of the preceding period, and socialist literature experienced a strong revival. Significant poetic works have been created by Závada, whose collection *On the Threshold* (1970) was widely acclaimed, Taufer, Skála, J. Rybák (born 1904), Florian, and V. Hons (born 1938), best known for his narrative poem *February* (1973). The problems of building a new society and developing a socialist morality are posed in the novels *St. Michael* (1971) and *The Stork's Nest* (1976) by J. Kozák (born 1921), *Doctor Meluzín* (1973) by Říha and *My Boy and I* (1974) by J. Kolárová (born 1919). Influential literary critics have included Štoll, Taufer, J. Hájek (born 1919), V. Dostál (1930–75), Š. Vlašín (born 1924), H. Hrzalová (born 1929), and V. Rzounek (born 1921).

S. A. SHERLAIMOVA

Architecture and art. Archaeological excavations in Bohemia and Moravia have yielded Paleolithic figurines, Neolithic pottery (grooved ware, *Bandkeramik*, and corded ware), and art works of the Proto-Slavs and of the Hallstatt and La Tène cultures. Ancient Slavic pottery of the Prague type has survived from the seventh century. Silver, gold, and bronze jewelry has been found among the remains of fortified Slavic settlements dating from the eighth to the tenth centuries. The most important such sites are in Prague and Staré Město near Uherské Hradište.

After the adoption of Catholicism, stone churches were built, some conforming to Byzantine models (ruins of a ninth-century church near Staré Město) and others to Western European, mainly Carolingian, prototypes (St. Vitus Rotunda in Prague, c. 930). The Romanesque style, which flourished from the 11th to the 13th century, determined the austere forms of the 11th-century St. Vitus Basilica and the 12th-century St. George Basilica in Pražský Hrad. Stone houses and fortifications were built in the cities that arose around the castles of feudal lords. A fusion of German and Byzantine influences is discernible in the art of the 11th to 13th centuries, notably the Vyšehrad Codex miniatures (1085) and the wall paintings depicting members of the Přemyslid dynasty in the St. Catherine Rotunda in Znojmo (1134). The reliefs decorating the 12th-century St. George Basilica in Pražský Hrad are notable for their highly expressive simplified forms.

From the mid-13th to the mid-15th century the consolidation of the feudal state, the rise of an urban culture, and the turbulent social movements that erupted into the Hussite wars contributed to a flowering of Gothic architecture and art. Severely majestic forms and restrained magnificent decoration, clear in design, are characteristic of 14th-century Gothic buildings. The finest examples of the Gothic style in Bohemia may be found in Prague: the eastern section of the St. Vitus Cathedral with its graceful reticulated vaults (the building of the cathedral, begun in 1344, was continued by Peter Parler from 1356 to 1399), the 14th-century Town Hall of the Old Town, and the 14th-century buildings of Charles University. The bridges built in the 13th and 14th centuries in Prague (Charles Bridge, 1357–78, P. Parler), Pisek, and Roudnice are noteworthy for their bold arch design. In the 14th and 15th centuries reconstructed older cities and new urban centers (New Town in Prague) acquired a regular layout and a rectangular central square (České Budějovice, Telč, Český Krumlov). The castles built by feudal lords between the 13th and 16th centuries consisted of a fortified center and a surrounding settlement; the castle proper usually had a donjon, a chapel, inner courtyards with Gothic arcaded galleries, and grand halls with reticulated vaults, as illustrated by the castles in Křivoklát (13th–16th centuries) and Zvíkov (13th century). Blending naturally with the landscape, Karlstein Castle is remarkably harmonious in composition.

In the second half of the 15th and the early 16th centuries the decorative element grew stronger in architecture, and vault patterns became more elaborate, as may be seen in Vladislav Hall in Pražský Hrad (architect B. Rejt) and the Cathedral of St. Barbara in Kutná Hora. Basilican churches were replaced by hall churches, the finest example of which is the Church of the Ascension of St. Mary in Most, built in the first half of the 16th century. Even some town halls, notably that of Tábor (14th–16th centuries), were built as halls divided by aisles.

The fine art of the 14th century creatively assimilated the artistic traditions of France, Germany, and Italy. In sculpture canonically strict images (*Madonna of Strakonice*, mid-14th century) yielded to a penchant for lyricism and elegant representation (statues of the Master of the *Michelska Madonna*, second quarter of the 14th century). In painting, some artists combined delicate drawing with an attempt at modeling (*Roudnice Predella*, c. 1340), while others strove for realistic composition and vibrant coloration (Master of the Vyšší Brod Altar, mid-14th century).

The realist tendencies in Gothic art reached their peak in the second half of the 14th century in the reign of Charles IV. The busts carved in the triforium of the St. Vitus Cathedral in Prague (1374–85, P. Parler) are noteworthy for their striking individual traits and clarity of plastic form. The panels depicting saints in the chapel of Karlstein Castle (c. 1357–67, Master Theodoric) are distinguished by a monumental quality, keen observation, and soft modeling. In the more dramatic paintings of the Master of the Třeboň Altar (fourth quarter of the 14th century) the images are highly individualized, and the color scheme gains an emotional intensity. The "soft style" became popular in the late 14th century. In the early 15th century art became more secular and at times even anticlerical, as evidenced by the early 16th-century miniatures of the Jena Codex. The finest example of Bohemian manuscript illumination of the 14th and 15th centuries is the *Passional of the Abbess Kunhuta*, completed before 1320. Bohemian craftsmen excelled in artistic glasswork, silver and gold embroidery, and the making of jewelry, stained glass, and mosaics.

After the establishment of Hapsburg rule in 1526, the Renaissance style was introduced into Bohemia, chiefly by Italian architects. The most famous Renaissance structures, all in Prague, are the Belvedere Palace, surrounded by an elegant arcaded gallery (c. 1535–63), the games court in the royal garden (1560's), and the Schwarzenberg Palace. Castles rebuilt in the Renaissance style acquired galleries with columned arcades, loggias, and grand halls (Pardubice, Jindřichův Hradec). In the second half of the 16th and early 17th centuries a highly original Renaissance style evolved in urban construction through the mingling of Renaissance and still vigorous Gothic forms. The homes of wealthy burghers were decorated with ornate pediments and attics, arcaded galleries, balconies, and sgraffito murals (Tábor, Telč, Pardubice, and Litoměřice).

In the late 15th and the 16th centuries Renaissance influences affected altar painting, which reached a high level in the work of the Master of the Litoměřice Altar. Secular genres developed, such as stucco decoration, sgraffito wall painting, and simplified tombstone sculpture portraying the dead. At the turn of the 17th century Prague was one of the last centers of European mannerism, which was cultivated by Italian, Dutch, and German masters, notably B. Spranger, G. Arcimboldo, and A. de Vries, who worked at the court of Rudolph II.

A new architectural revival began in the second half of the 17th century, when the baroque style became popular in palace architecture. The baroque buildings erected in Prague, all original interpretations of Italian, Austrian, and French architecture, are marked by flexible composition, festive grandeur, and elegant decoration. The most impressive of them are the Černín Palace (1669–1750), the Kinský Palace (begun 1755, architect K. I. Dientzenhofer), and the Clam-Gallas Palace (c. 1713, architect J. B. Fischer von Erlach). The palaces were surrounded by elaborate garden and park complexes. The Gothic silhouette of the cities was modified by baroque churches, either single-aisled or circular structures with majestic domes, multitier towers, and lavish sculptural decoration. An outstanding example is the Church of St. Nicholas in Malá Strana, Prague (1704–55), designed by the architect K. I. Dientzenhofer.

Bohemian baroque art of the 17th and 18th centuries evinced realist and democratic tendencies, which are especially strong in the portraits and murals of K. Škréta and P. Brandl, the splendid, eloquent frescoes and landscapes of V. V. Reiner, the portraits of J. Kupecký, the engravings of V. Hollar, and the still lifes of R. Byss and J. V. Angermayer. The leading sculptors were M. B. Braun and F. M. Brokoff, who together produced many of the expressively modeled statues on the Charles Bridge in Prague in the late 17th and early 18th centuries. Rococo and classical influences appeared in the mid-18th century in the sculpture of I. Platzer and the fine genre paintings of N. Grund. Artistic glasswork, metalwork, and embroidery reached a high level of excellence in the 17th and 18th centuries.

In the late 18th and early 19th centuries, the period known as the Czech Renaissance, when the national liberation movement spread through the Czech lands, art joined the struggle for national self-assertion. After a brief and limited triumph of classicism, a national romantic style, marked by eclecticism, became firmly established in architecture after 1850. The grand monumentality and rich ornamentation of the neo-Renaissance and neo-baroque edifices built between the 1860's and the 1890's may be seen in the National Theater (1868–83, architects J. Zítek and J. Schulz), the Rudolfinum (1876–84), and the National Museum (1885–90), all in Prague. In the late 19th and early 20th centuries the *art nouveau* style yielded to nationalist trends, reflected in the buildings designed by J. Kotěra in Hradec Králové and Prostějov and by O. Novotný in Prague.

The development of art was promoted by the founding in Prague of the Patriotic Society of the Friends of Art (1796) and the Academy of Arts (1799). In the first half of the 19th century, realistic tendencies emerged alongside the prevailing classicism and romanticism. Themes from national history and representations of contemporaries were skillfully rendered in L. Kohl's etchings and A. Machek's lithographs and portraits. The Czech landscape received poetic treatment in the works of K. Postl, A. Kosárek, and A. Mánes. The genre scenes and still lifes of J. Navrátil are notable for their freedom and refined lightness of style. The common people, who became an important theme during the Revolution of 1848–49, were masterfully portrayed in the romantically inclined works of J. Mánes. In addition to poeticized scenes from folk life and generalized natural panoramas, Mánes produced portraits showing keen observation, as well as lyrical illustrations of folk songs. J. Čermák's works extolled the liberation struggle of the Slavic peoples. In the late 1850's and the 1860's democratic realism was represented by K. Purkyně's portraits and still lifes, executed in a vigorous and sensuous style.

In the last third of the 19th century the artists of the "National Theater generation," headed by the painter M. Aleš, a follower of J. Mánes, had a considerable influence on the development of Czech art. In his paintings of popular legends and events from national history and his illustrations to folk songs Aleš affirmed

democratic principles and the lyrical and epic trend in art. The works of other students of Mánes, notably F. Ženíšek and J. Tulka, as well as the historical compositions of V. Brožík, show the influence of academicism. Two other major painters of the late 19th century were J. Mařák, noted for his monumental epic landscapes, and A. Chittussi, who turned to plein air painting in the 1880's. J. V. Myslbek was the foremost sculptor of the late 19th century.

In the early 20th century, amid conflicting trends in art, a progressive school emerged to oppose the decadent tendencies. The leading landscape painters were Mařák's students F. Kaván, B. Dvořák, and A. Kalvoda. The impressionist A. Slavíček created generalized epic images of his native landscapes. A poetic lyricism infused the landscapes of A. Hudeček and the paintings of M. Jiránek. J. Úprka and L. Kuba painted picturesque scenes from peasant life. A critical view of society underlay K. Myslbek's severe, monumental pictures and etchings. Symbolist elements are present in J. Preisler's visionary canvases and murals, full of vague foreboding, and F. Kupka's compositions and caricatures. In M. Švabinský's pictures and engravings symbolism is combined with a strong faith in life. Graphic art reached a high level in the etchings of Z. Braunerová and T. F. Šimon. The prevailing *art nouveau* style was best expressed in the engravings of V. Preissig, the posters of A. Mucha and A. Hofbauer, and the book illustrations of J. Lada, A. Kašpar, and A. Šajner. The leading sculptors at the turn of the century were S. Sucharda, J. Mařatka, J. Štursa, O. Španiel, L. Šaloun, and F. Bílek.

The early 20th-century aspiration toward a synthesis of the arts gave rise to the creative cooperation of the architect J. Kotěra and the painter J. Preisler. Many artists, notably F. Bílek, A. Mucha, and S. Sucharda, devoted much attention to decorative applied art, chiefly glasswork, ceramics, and interior decoration. From around 1910 to 1920 Czech painters came under the influence of European avant-garde styles (fauvist and cubist paintings of B. Kubišta, E. Filla, V. Novák, and A. Procházka), although some artists sought to reinterpret such styles in a national spirit (painting and graphic art of V. Špála, J. Čapek, J. Zrzavý, and R. Kremlička). The painters V. Rabas, V. Rada, and V. Sedláček followed national artistic traditions.

The establishment of an independent bourgeois Czechoslovak state in 1918 stimulated a flowering of artistic culture, which was increasingly influenced by the communist and labor movement. A national functionalist school of architecture emerged in the 1920's and 1930's; its leading exponents were J. Gočár, K. Honzík, and J. Havlíček. Besides designing villas and public buildings (Gočár's structures in Hradec Králové), architects became involved in planning residential housing complexes using standard designs. One of the first cities to initiate such housing projects was Zlín, now Gottwaldov. Nevertheless, down to the mid-20th century most Czech cities retained their medieval appearance, while slums proliferated on the outskirts. Two notable achievements of the prewar years were the completion of the western part of the St. Vitus Cathedral in Prague (1929) and the construction of the National Liberation Monument on Vitkov Hill (begun 1929, architect J. Zázvorka).

In art, realistic and democratic tendencies were strengthened in the 1920's and 1930's through the clash of opposing views on the nature of art. Some avant-garde artists turned to the traditions of realism, as illustrated by the landscapes, still lifes, and genre paintings of V. Novák, O. Nejedlý, and O. Kubin. The folk aspect was strengthened in the work of J. Čapek, V. Špála, and J. Lada. In their landscapes and scenes from folk life V. Rabas, V. Rada, and V. Sedláček continued to develop the national traditions of realism. The "social" art that arose in the 1920's and 1930's truthfully depicted the life and struggle of the working class. The artists of this school—notably the painters K. Holan, P. Kotík, and M. Holý, the graphic artists V. Silovský, J. Rambousek, and K. Štika, and the sculptors K. Kotrba, K. Pokorný, J. Lauda, and O. Gutfreund—produced intensely dramatic works employing expressionist and primitivist techniques. Several artists close to the communist movement, such as K. Teige, F. Muzika, and J. Šíma, gravitated toward constructivism and "poetism."

The growing threat of fascism gave impetus to antifascist political satire, whose undisputed masters were F. Bidlo, A. Pelc, and J. Čapek. Social art found a brilliant exponent in K. Štěch, and the courage of the proletariat and the beauty of labor were affirmed in the works of K. Pokorný. A fresh approach to the homeland theme marked the landscapes and peasant scenes of V. Rabas, V. Rada, and B. Dvorský. In their antiwar and antifascist works, pervaded by a sense of tragedy, E. Filla, J. Čapek, V. Sychra, V. Tittelbach, and F. Muzika resorted to symbol and allegory and at times even a surrealist mask.

The progressive national traditions were carried on during the German occupation, when many artists died in concentration camps.

The liberation of Czechoslovakia from fascist oppression in 1945 and the victory of the people's democratic system opened up new opportunities for artistic development. Standard designs and industrial techniques were widely adopted in construction. In 1948 new residential districts with schools, hospitals, sports installations, and public centers were built in Prague, Gottwaldov, Horní Litvínov, Olomouc, Znojmo, and other cities. Hydroelectric power plants were built on the Labe and Vltava, and new cities, such as Mladá Boleslav, were founded. The brick apartment buildings erected in the early 1950's were decorated with national ornamental motifs. From the mid-1950's formally severe buildings were constructed using large blocks and panels, and perimetric planning was replaced by a freer layout. The public buildings of the 1960's, marked by rational simplicity and severe elegance of form, show a subtle appreciation of the expressive possibilities of such modern materials as glass, aluminum, and plastic. Since the early 1970's architects have been emphasizing plastic expressiveness and individuality in building design. A fine example of this trend is the Federal Assembly Building in Prague (1970–73, architect K. Práger).

After 1945 the painters and graphic artists E. Filla, J. Brož, Z. Seydl, A. Paderlík, V. Sedláček, and L. Šimák turned to antifascist themes, revolutionary history, and socialist construction. The sculptors V. Makovský, K. Lidický, K. Pokorný, J. Wagner, and J. Malejovský created victory monuments and works honoring the heroes of the Prague uprising, Soviet soldiers, and Czech cultural figures. The older generation of realistic artists, including M. Švabinský, V. Rabas, L. Kuba, V. Sedláček, J. Zrzavý, and V. Novák, embarked on a new fruitful period of activity. Monumental decorative art flourished in the mosaics of V. Sychra and M. Švabinský, the sgraffito of A. Zábranský, and the frescoes of V. Tittelbach. Book illustration was represented by K. Svolinský, C. Bouda, V. Fiala, A. Strnadel, F. Muzika, and O. Hlafsa. Among the finest achievements of those years were the thematic paintings of J. Brož, the poetic generalized landscapes of B. Dvorský, J. Slavíček, and F. Jiroudek, and the still lifes of A. Paderlík. Modern urban life and the world of technology were portrayed by F. Gross, J. Smetana, and K. Souček. Decorative applied art reached a high level in the artistic glasswork of J. Brychta and L. Smrčková, the fabrics of A. Kybal, the ceramics of O. Eckert, the medallions of K. Lidický, M. Knobloch, and Z. Kolařský, and the stage designs of F. Troester and J. Svoboda.

In the late 1950's and the 1960's the younger artists' concern with pressing contemporary themes was joined to a quest for new expressive artistic solutions and a predilection for symbolic and poetic imagery. Some artists were preoccupied with formal experimentation and followed Western neo-avant-garde trends.

The early 1970's saw a return to democratic and realistic traditions and to socialist ideals. In the 1970's events from revolutionary history were depicted in the monuments of J. Malejovský, M. Axman, J. Hana, and V. Dobrovolný and the paintings and graphic art of A. Zábranský, K. Souček, R. Kólař, and J. Brož.

I. L. MATSA (architecture from the ninth to 19th centuries) and E. K. VINOGRADOVA (art)

Music. Czech musical culture evolved out of the ritual folk songs and dances that developed among the Czechs through the ages and that were very different from the Gregorian chant that the Catholic clergy imposed from the ninth century. Among the oldest folk instruments were the bagpipe, the reed pipe (*fujara*), and the tambourine. Flutes and drums were introduced in the 11th century, and the zither, trumpet, kettledrum, harp, and psaltery came into use in the 13th century. In 1256 an organ was installed in one of Prague's cathedrals.

In the 13th century, anonymous authors composed mono-

phonic sacred songs, of which the most famous was "Saint Wenceslas." The melodies of such religious songs as "God the Almighty" and "Jesus Christ, Our Generous Lord," dating from the first half of the 14th century, eventually became folk melodies. From the 12th to the 14th century Christmas and Easter pageants were accompanied by solo and choral singing. Secular music began developing in the 13th century under the influence of the minnesingers. Over the next two centuries wandering musicians entertained audiences with religious and secular performances whose traditions, like those of sacred folk music, would survive down to the 19th century. The influence of *ars nova* spread to Czech music in the early 14th century. The 15th-century Hussite songs marked a flowering of Czech song culture. The melodies of such songs as "Arise, Arise, Great City of Prague" and "Those Who Are God's Warriors" were later used by the greatest Czech composers. Bohemian polyphonic music of the 16th century bore national traits derived from folk music. The leading composers of Bohemian Renaissance polyphonic music were A. Michna of Otradovic, V. Holan Rovenský (second half of the 17th century), J. Rychnovský, T. Turnovský, and K. Harant of Polžic.

After the Czech lands were absorbed into the Hapsburg Empire in 1526, many Czech composers emigrated to Russia, Poland, Italy, Germany, and other countries, whose musical culture they enriched with Czech traditions. Prominent among the Czech composers who worked abroad in the 17th and 18th centuries were J. D. Zelenka (Dresden), B. Černohorský (Padua), and J. V. Stamitz, F. X. Richter, and A. Filtz, who together formed the Mannheim school. Černohorský founded the 18th-century Czech polyphonic school, which included J. Zach, F. I. Tůma, J. N. Seger, and F. X. Brixi. These composers continued to develop the national traditions despite the artificial grafting of German culture. In the 18th century Prague, the "conservatory" of Europe, was the home of outstanding composers who influenced the development of West European music. V. F. Míča was one of the originators of the symphony genre, which was further developed by Stamitz. Operas were composed by J. Mysliveček, melodramas by J. Benda, and violin music by F. Benda. Working abroad in the late 18th and early 19th centuries, the Czech composers J. Mareš, P. Vranický, A. Vranický, J. L. Dusík, and A. Reicha did not lose touch with the folk music of their homeland; they introduced Czech folk melodies into classical European instrumental music. The development of Czech opera was stimulated by the founding in Prague of the Kotcu Theater (1737), Bohemia's first opera theater, and the national Nostitz Theater (1783), renamed the Estates Theater in 1797.

The emergence of a national school of classical music in the 19th century owed much to the educational activity of the "awakeners," who strengthened the national consciousness of the people and promoted their national culture. The national awakening is reflected in the work of F. Dušek, who initiated the Czech school of piano playing, J. J. Ryba, and V. J. Tomášek, whose student J. Voříšek expanded the genres of piano music. F. Škroup, who composed the first opera in Czech, *The Tinker* (staged 1826), and the patriotic song "Where Is My Home" (which was originally written for J. K. Tyl's play *Fidlovačka* and which later became the national anthem), prepared the ground for the operas of B. Smetana, the founder of Czech classical music.

Blending the traditions of national music with the highest achievements of world music in his operas *The Brandenburgers in Bohemia* (1863) and *Libuše* (1872, staged 1881) and in his symphonic cycle *My Country* (1874–79), Smetana evoked the heroes of Czech history, the natural beauty of his land, and scenes from folk life. As the principal conductor of the Provisional Theater in Prague, founded in 1862, and director of the Hlahol Pražský chorus and orchestra, organized in 1861, Smetana encouraged the development of national realistic art and strengthened the ties with Russian music by staging Russian operas. Czech music became world famous through the works of A. Dvořák, who composed ten operas (1870–1903), various works for chorus and orchestra, nine symphonies (1865–93), symphonic poems, such other orchestral works as the *Slavonic Dances* (1878–87) and *Slavonic Rhapsodies* (1878), a cello concerto (1895), and other well-known works. The Czech classical traditions were developed by Z. Fibich, who wrote dramatic and emotionally charged operas and melodramas.

The extremely personal style of L. Janáček marked a new phase in the development of Czech music. Working with a great variety of themes and genres, Janáček drew on Moravian folk music and sometimes chose subjects from Russian literature, as in his Slavonic rhapsody for orchestra *Taras Bulba* (1918) and his operas *Kát'a Kabanová* (based on A. N. Ostrovskii's play *The Thunderstorm*, 1921) and *From the House of the Dead* (after Dostoevsky, 1928). Other prominent composers of the late 19th and early 20th centuries were J. B. Foerster, Dvořák's pupils V. Novák and J. Suk, and Fibich's pupils K. Kovařovic and O. Ostrčil, both distinguished conductors at the National Theater.

Czech musicology, founded by O. Hostinský, has been strongly influenced by Z. Nejedlý, who championed realism in music in his publicistic and scholarly works. The founding in Prague of a conservatory (1811), an organ school (1831), the National Theater (1881), the Czech Quartet (1891), the Czech Philharmonic Society (1901), and other music organizations and schools contributed to a high level of musical performance. From the 1830's Bohemia produced many outstanding performers, among them the violinists J. Slavík, F. Laub, F. Ondříček, O. Ševčik, and J. Kubelík, the cellist G. Vigan, and the singers V. Heš, B. Benoni, J. Lev, J. Paleček, K. Čech, K. Burian, E. Destinová (Destinn), and B. Foersterová-Lautererová.

In the 1920's and 1930's, while composers of the older generation continued to develop the classical traditions and to favor operas based on national folk music, a modernist trend emphasizing formal experimentation emerged under the leadership of A. Hába, the inventor of the quarter-tone system. National music was popularized by the conductors O. Ostrčil and V. Talich and the musicologist V. Helfert. Both new and classical works were performed by the Prague Quartet (1920), the Ondříček Quartet, the Prague Wind Quintet (1928), and the various ensembles formed earlier. Antifascist and patriotic themes, recurrent from the mid-1930's, were brilliantly expressed in Ostrčil's opera *Honza's Kingdom* (1934), E. Schulhoff's *Symphony of Freedom* (1941), and B. Martinů's play for orchestra *Memorial to Lidice* (1943).

After the victory over fascism in 1945 musical life was invigorated by the founding of numerous music institutions (Academy of Arts in Prague, 1946) and performing groups and the holding of regular festivals (Prague Spring, from 1946). The general cultural revival that followed the triumph over reaction in Czechoslovakia in 1948, coinciding with the democratization of music and the affirmation of realism, brought forth optimistic compositions about the building of a new life, principally cantatas and mass songs. V. Dobiáš and E. Axman emerged as major composers, and Z. Nejedlý's articles influenced the development of music. B. Martinů, who did not lose touch with his homeland during his long stay abroad, held a prominent place in Czech music in the 1940's and 1950's, composing 15 operas, some of them on Russian subjects, ten ballets, symphonic works, concerti, and numerous instrumental chamber works. Among other prolific composers were K. Burian (eight operas, cantatas), J. Rídký (seven symphonies), and I. Krejči (operas, ballets, concerti).

Several gifted composers came to prominence in the 1960's and 1970's, notably J. Pauer (operas and ballets), V. Sommer (orchestral and other works), L. Železný, S. Havelka, and V. Kalabis (*Symphony of Peace*). The best-known performing groups—besides those founded before 1918—are the Smetana and Janáček string quartets, the Suk Trio, the Sluk Song and Dance Ensemble, and various choral groups (*see* CZECHOSLOVAKIA: Music).

N. A. SIMAKOVA

Theater. The Czech theater has its roots in ancient pagan rituals and in the peasant festivals of later times. The introduction of interludes into mystery plays in the 14th century signified a shift from religious subjects to everyday-life scenes. The first school drama to be written and performed in Czech was P. Kyrmezer's *Czech Comedy About a Rich Man and Lazarus*, published in 1566. The school theater fostered by the Jesuits stood in marked contrast to the amateur folk theater, which mirrored the struggle of the democratic strata of the population for national independence and their fight against social oppression.

The upsurge in the national liberation movement during the late 18th and first half of the 19th centuries—the period known as the national renaissance—heralded a new phase in the development of the Czech theater. The Czech "awakeners" revived the national traditions, developed a national dramaturgy, and trained actors. The Kotcu Theater, built in Prague in 1737, staged operas and later plays. The Nostitz Theater, founded in 1783 in Prague for the staging of German plays, began presenting plays in Czech in 1785. (In 1797 it was renamed the Estates Theater.) From 1786 to 1789 the Bouda (Patriotic) Theater in Prague staged plays in Czech four times a week.

Performances in Czech were banned in 1806, and Prague's company of Czech actors, which had been playing in various buildings after 1789, disbanded in 1811. In 1824 the Estates Theater began giving regular performances of Czech plays, directed by J. N. Štěpánek and with B. Allramová, J. Grabinger, and V. Šmiller playing the leading roles. When performances in Czech were discontinued at the theater in 1834, the dramatist J. K. Tyl organized the theater's Czech actors as an amateur company calling itself the Kajetán Theater, which existed until 1837.

Under pressure from the progressive intelligentsia, the Estates Theater, now under the direction of Tyl, once again began staging Czech plays in 1846. By this time the stage had become more professional, and the national repertoire was expanding. The leading exponent of romantic theater was the actor, dramatist, and prominent man of the theater J. Kolár. Founded in 1845, the Society for the Creation of a National Czech Theater for many years collected money for the construction of a theater building. The Provisional Theater, which operated in Prague from 1862 to 1883 and which had both an opera and an acting company, attracted the best performers, notably K. Šimanovský, O. Sklenářová-Malá, F. Kolár, and J. Mošna, and the foremost Czech directors, namely J. Kolár and E. Chvalovský. The National Theater, which had drama, opera, and ballet companies, was built in Prague in 1883 with funds collected from the public. The work of the Provisional Theater and the opening of the National Theater stimulated the formation of touring theaters in provincial towns, including Plzeň (1865) and Brno (1884).

Despite the appearance of various artistic trends in the late 19th and early 20th centuries, realism prevailed in the theater, largely owing to the fine acting of Kvapilová, E. Vojan, J. Mošna, J. Šmaha, and M. Hübnerová. The performances given by the Moscow Art Theater in Bohemia in 1906 influenced the development of the Czech realist school.

From the moment the National Theater opened, the progressive segment of the public urged the democratization of the theater and the establishment of close ties with the working-class theatergoer. Professional actors were able to assist workers' drama groups through the Union of Workers' Amateur Theater Activity, organized in 1911. The development of the Czech theater in the bourgeois Czechoslovak republic, founded in 1918, mirrored all the stages of a bitter class struggle. The founding of the Communist Party of Czechoslovakia in 1921 contributed to the spread of socialist ideas in the theater milieu and to the strengthening of contacts with the Slovak theater. Of great importance was the work of J. Fučík, M. Majerová, K. Konrád, B. Václavek, and Z. Nejedlý.

Disregarding official policy, the country's progressive theater men staged antibourgeois plays. The National Theater produced K. Čapek's *The Insect Comedy* (1922, 1926, and 1932), *The White Plague* (1937), and *Mother* (1938) and F. Šalda's *The Child*. New professional and semiprofessional revolutionary theaters were organized. At the Liberated Theater, founded in 1925, the director J. Honzl staged antibourgeois political revues written and performed by the actors J. Voskovec and J. Werich, with music by J. Ježek. The D-34 Theater was founded in 1933 by E. F. Burian, who drew on folklore and the experience of the Soviet theater. Czech theaters staged successful productions of such Soviet plays as M. Gorky's *Egor Bulychov* (D-34 Theater) and *Vassa Zheleznova* (National Theater in Prague), an adaptation of M. A. Sholokhov's *Virgin Soil Upturned* (Vinohrady Theater in Prague), and V. V. Vishnevskii's *An Optimistic Tragedy* (Municipal Theater in Olomouc).

An acting style developed that strove for subtle psychological portrayal and stressed rhythmic movement and external characterization. Its leading exponents were V. Vydra, Z. Baldová, J. Průcha, L. Dostálová, O. Scheinpflugová, and Z. Štepanek. The emergence of a new generation of gifted stage designers, among them V. Hofman, F. Troester, F. Kysela, F. Zelenka, J. Čapek, and M. Kouřil, contributed to the theatrical revival.

After the liberation of Czechoslovakia from the fascist occupation in 1945, the Czech theater took an active part in developing a socialist culture. The government abolished private theaters and enacted the Theater Law in 1948. Among the new theaters founded in the 1940's and 1950's for the ideological education of the working people were the Realist Theater (later the Nejedlý Theater) in Prague and the Workers' Theater in Gottwaldov. Also founded were the Academy of Arts, the Disk Theater Workshop, and the Union of Creative Workers in the Theater (1957). The most famous of the experimental "theaters of miniatures" that sprang up in the 1960's and 1970's are the Zábradlí (Balustrade), Semafor, and Rococo in Prague and the Evening Brno. The achievements of the contemporary Czech theater owe much to the skillful directing of K. Palouš, E. Sokolovský, Z. Míka, Z. Kaloč, J. Kačer, and P. Scherhaufer, the splendid acting of V. Záborský, J. Petrovická, M. Růžek, J. Švorcová, H. Vranová, and V. Šmeral, and the fine stage designs of J. Svoboda, O. Šimáček, and J. Sládek.

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CZECH UPRISING OF 1547, the first large-scale uprising in the Czech lands against Hapsburg rule.

The uprising was provoked by heavy taxation, religious persecution, and the growing power of the German element in the country. Its immediate cause was an attempt by the Hapsburg king Ferdinand I to involve the Czech estates in the war with the Schmalkaldic League. The uprising was incited by the royal cities (headed by Prague), which were joined by the minor and middle nobility and landowners.

The Diet that convened in Prague in March confronted the king with the demands of the estates, set forth in 57 articles providing for regular meetings of the Diet, the Diet's right to elect the king, and other prerogatives. The Diet also elected an administrator for the kingdom and a commander in chief from among the representatives of the estates. Ferdinand responded by besieging Prague in July. Disagreements among the insurgents made it easier to crush the uprising. The Bloody Diet, convened in August, consolidated the victory of the Hapsburgs. Four of the uprising's leaders were executed; the royal cities lost their privileges and paid an indemnity; and the Hapsburgs gained the right to convene the Diet and appoint higher officials. [29–526–1]

CZECH UPRISING OF 1618–20, an anti-Hapsburg uprising of the Czech estates that heralded the Thirty Years' War (1618–48).

The causes of the uprising lay in the Hapsburgs' encroachment, intensified in 1617 and 1618, on the political and religious rights of the Czech lands, which still enjoyed a measure of independence within the Hapsburg monarchy. The uprising was sparked by the defenestration on May 23, 1618, of the Hapsburg vicegerents in the Czech lands, the Catholic landowners J. Martinic and V. Slavata, who were thrown from a window of the Pražský Hrad.

Although the uprising was headed by the great feudal lords, an important role in it was played by the lesser nobility, whose demands figured prominently in the insurgents' program, adopted by the Diet in July 1619. The Hundred Articles of the Act of Confederation, as the program was called, reaffirmed the elective nature of the Czech crown and called for the abrogation of all the Hapsburgs' anti-Protestant decrees. After the death of Emperor Matthias, the Czech estates refused to recognize his successor, Ferdinand II, and in August 1619 elected to the Bohemian throne Frederick V of the Palatinate, the head of the Protestant Union.

Initially, the army of the Czech estates, commanded by J. Thurn, and the mercenary army led by E. Mansfeld dealt a series of defeats to the imperial troops. Twice the insurgent armies besieged Vienna (in June and in October–December 1619) without taking the city. Meanwhile, Ferdinand II concluded a military alliance with the Catholic League and received the support of the pope and Spain. The Protestant Union virtually abandoned the Czech lands to their fate after reaching an agreement with the Catholic League in July 1620. Within Bohemia, the social base of support for the uprising was eroded by the policies of the Czech feudal estates, which ignored the interests of the townspeople and especially those of the peasants, who were rebelling and demanding the abolition of serfdom.

At the decisive battle of the White Mountain (Bílá Hora) on Nov. 8, 1620, the Czech forces were crushed. Frederick of the Palatinate fled Prague. Twenty-seven of the uprising's leaders were executed, and the Czech lands were completely subjugated by the Hapsburgs, losing their national independence for three centuries. The suppression of the uprising, by shifting the balance of power in Europe, ensured the defeat of the anti-Hapsburg coalition in the first, or Czech, phase of the Thirty Years' War. [29–526–2]

CZECH UPRISING OF 1775, the largest antifeudal peasant uprising in Bohemia and Moravia from the 16th to 18th centuries.

Although a "peasant governorship" had been established in the village of Rtyně on the Náchod estate to prepare for and direct the uprising and to work out a plan of action, the uprising began spontaneously in March, spreading outward from the Hradec and Budějovice regions. Peasants refused to perform the *corvée* and sacked and burned estates. The operations of the peasant detachments were not coordinated, however. On March 25 part of the insurgent forces was defeated by imperial troops near the town of Chlumec; the detachments that managed to reach Prague were dispersed. Many rebels were thrown into prison, and several were executed. In June the uprising flared up again, encompassing most of Bohemia and Moravia. At the end of August, however, it was suppressed by the army. In spite of its defeat, the uprising, taking place during a crisis in the *corvée* system, obliged the government to promulgate the Corvée Patent of 1775, which reduced labor services.

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CZEKANOWSKI, JAN. Born Oct. 6, 1882, in Głuchów; died July 20, 1965, in Szczecin. Polish anthropologist and ethnologist. Member of the Polish Academy of Sciences (1924).

Czekanowski studied in Warsaw and Libau (now Liepāja, Latvian SSR) and at the University of Zürich in Switzerland. He received the degree of doctor of sciences in 1906. From 1906 to 1910, Czekanowski was on the staff of the Museum of Ethnology in Berlin; he spent the years 1907 to 1909 on a German expedition to Central Africa. He was a curator of the Museum of Anthropology and Ethnography of the Imperial St. Petersburg Academy of Sciences from 1911 to 1913 and a professor of anthropology at the University of Lwów (L'vov) from 1913 to 1941. Between 1945 and 1949 he taught at the Catholic University of Lublin. He became a professor of anthropology in Poznań in 1946.

Czekanowski's principal works deal with the ethnic composition of Europe and Central Africa, the anthropology of Poland and the eastern Baltic regions, the analysis of races, and the question of the origin of the Slavs and other Central European peoples. Czekanowski was mistaken in some of his ideas about race.

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CZELADŹ, a city in Poland, in Katowice Województwo, in the Upper Silesian conurbation. Population, 34,700 (1976). Economic activities include the mining of hard coal and the production of porcelain and faience. [29–169–2]

CZERNIN, OTTOKAR. Born Sept. 26, 1872, in Dymokury, near Poděbrady, in what is now Czechoslovakia; died Apr. 4, 1932, in Vienna. Austrian political figure; count.

In 1903, Czernin was elected a deputy to the Bohemian diet from the chauvinistic German Party. In 1912 he became a member of the Austro-Hungarian House of Lords. From December 1916 to April 1918 he served as minister of foreign affairs. Recognizing the profound crisis of the Hapsburg monarchy, Czernin sought a compromise peace treaty with the Entente. For this reason he conducted secret negotiations with France; news of the negotiations, however, reached the press and led to his resignation. From 1920 to 1923, Czernin was a member of the National Council of Austria. [29–251–1]

CZERNY, KARL. Born Feb. 20, 1791, in Vienna; died there July 15, 1857. Austrian pianist, teacher, and composer. Czech by nationality.

Czerny was initially taught by his father, Wenzel Czerny; from 1801 to 1803 he studied with L. van Beethoven. He established the Viennese school of piano playing of the first half of the 19th century. His pupils included F. Liszt, T. Leschetizky, T. Döhler, T. Kullak, and A. de Belleville-Oury.

Czerny is the author of more than 1,000 compositions, including symphonies and religious and chamber music. The bulk of his oeuvre consists of works for the piano, among them arrangements and transcriptions of compositions by other composers. His numerous exercises are still used in piano teaching. Czerny's compositions and his approach to pianistic technique reflect both

classical and romantic influences and a striving for a lyric and expressive style of playing.

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CZERSKI, JAN (also Ivan Dement'evich Cherskii). Born May 3 (15), 1845, on the estate of Swolno, Drissa District, Vil'na Province; died June 25 (July 7), 1892. Geologist, paleontologist, and geographer; explorer of Siberia. By nationality, a Pole.

Czerski was conscripted into the army and sent to Omsk for his role in the Polish uprising of 1863–64. Under the influence of G. N. Potanin, he undertook geological and paleontological research in the Omsk region. In 1869 he was discharged from military service because of illness. In 1871 he moved to Irkutsk. From 1873 to 1876, Czerski studied the Saians, the Saian region, and the Angara region. Between 1877 and 1880, he investigated the geological structure of the shores of Lake Baikal. In 1881 and 1882, he explored the Selenga River basin and the Nizhniaia Tunguska River.

In 1878, Czerski introduced the concept of the evolution of relief. He proposed one of the first paleotectonic schemes for Siberia; Czerski's scheme was used and further developed by E. Suess in his work *The Face of the Earth*.

In 1885, Czerski was pardoned and, at the invitation of the Imperial St. Petersburg Academy of Sciences, moved to St. Petersburg. En route to the capital, he carried out geological research along the postal route from Irkutsk to the Urals, making excursions to the Padun Rapids of the Angara and to Minusinsk. In 1891, he went on an expedition to the region of the Kolyma and Indigirka rivers. He died on the lower Kolyma.

A mountain region (the Cherskii Range) in the Yakut ASSR and Magadan Oblast and the Cherskii Range in Transbaikalia have been named for Czerski.

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CZERWONY SZTANDAR (Red Banner), a Polish-language republic newspaper of the Lithuanian SSR. Founded in 1953, it is published in Vilnius six times a week. Circulation, 46,600 (1976). [29–183–1]

CZĘSTOCHOWA, a city in southern Poland. Population, 203,000 (1976). The capital of Częstochowa Województwo, Częestochowa is a transportation junction. It has large linen and woolen mills and an iron and steel plant. It also manufactures glass, matches, building materials, and food products. Częstochowa is the center of an iron-mining region. [29–175–2]

CZĘSTOCHOWA WOJEWÓDZTWO, an administrative and territorial unit in southern Poland. Formed in 1975. Area, 6,200 sq km. Population, 731,000 (1975), of which 45 percent is urban. The capital is the city of Częstochowa.

The economy of Częstochowa Województwo is based on industry and agriculture. The *województwo* has metallurgical, machine-building, metalworking, textile, food-processing, cement, by-product coke, and building-materials industries. Iron ore is mined. Plowland makes up 46 percent of the total area, and forests account for 32 percent. The *województwo* has approximately 250,000 head of beef and dairy cattle and approximately 300,000 swine. The principal crops are rye and potatoes. [29–175–3]

CZESZKO, BOHDAN. Born Apr. 1, 1923, in Warsaw. Polish writer.

Czeszko fought in the ranks of the People's Army against fascism and took part in the Warsaw Uprising of 1944. Between 1947 and 1951 he studied at the Academy of Fine Arts in Warsaw. His work was first published in 1946. He has produced collections of short stories and journalistic pieces, including *Moscow, Volga, Baku* (1956). Particularly well known are his autobiographical novella *Generation* (1951), which depicts the struggle of working-class youth against the Hitlerites, and his novella *Requiem* (1961), which portrays the everyday life and defeat of a Polish Army unit in 1945. Czeszko's prose is characterized by a contrast between idealized and naturalistic description and by the use of colloquial language.

Czeszko became a deputy to the Sejm in 1965. He was awarded the State Prize of the Polish People's Republic in 1952, 1964, and 1976.

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CZYNSZ, in feudal Polish lands, a quitrent rendered in cash or kind by feudally dependent peasants to their lord; equivalent to the German *Zins*, the French *cens*,and the English census. Peasants who paid a *czynsz* were called *czynszownice*. These peasants usually held a hereditary piece of land, in exchange for which they fulfilled certain obligations to the feudal lord; among these obligations, the cash payment of the *czynsz* gradually assumed the greatest importance. [29–612–3]

DANDY ROLL, a skeleton roll on a paper machine, consisting of a wire frame wrapped with netting. It is designed to level the surface of the paper, improve the paper's structure and uniformity, and put watermarks on the paper web.

REFERENCE
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DEMOLITION BLOCK, a compact explosive charge used in demolition work. [29–920–3]

DERMOPTERA (gliding or flying lemurs), an order of mammals. The body length is about 40 cm, and the tail length is about 25 cm. The body weight is 1–1.7 kg. The limbs and tail are joined by a broad fur-covered membrane, with the help of which the animal can glide from tree to tree. Gliding lemurs are found in the Philippines and southern Indochina and on most islands of the Malay Archipelago. The forest-dwelling arboreal animals are nocturnal and herbivorous. The female gives birth to one offspring, occasionally two.

The single genus, *Cynocephalus*, embraces two species: the Phillipine gliding lemur (*C. volans*) and the Malayan gliding lemur (*C. variegatus*). Because the order combines characteristics of insectivores, chiropterans, and prosimians, it is difficult to classify. On some islands the animals are hunted for their meat and fur. [29–1147–1]

DEVIL (Russian, *chert, bes*), in religious and superstitious representations, an evil spirit, unclean force, or supernatural being. Devils are described in folklore and in works by A. S. Pushkin, N. V. Gogol, F. M. Dostoevsky, and other writers. [29–326–2]

DIASPIDIDAE, a family of homopteran insects of the suborder Coccoidea. The insects measure as much as 2 mm in length and

have a waxy carapace. Sexual dimorphism is marked. The females lack wings and legs, while the males, which are smaller than the females, have one pair of wings, normally developed extremities, and reduced mouth organs. The larvae and adult females suck the juices of plants.

The family embraces approximately 1,300 species, which are distributed throughout the globe, mainly in warm latitudes. The USSR has about 130 species. The Diaspididae live in trees and shrubs and occasionally on herbaceous plants. Many species are pests of citrus, apple, plum, peach, and mulberry trees. [29–1612–1]

DJAZIRAH DOBERAI (also Vogelkop), a peninsula in the northwestern part of the island of New Guinea, in Indonesia. The peninsula is about 350 km long and has a maximum width of 200 km; it is connected to the mainland by an isthmus with a width of about 20 km. In the north and east are mountains rising to an elevation of about 3,100 m at Mount Gwamongga; in the south lies a lowland. The peninsula has tropical rain forests that become quite swampy in the south. The local population engages in tropical land cultivation. There are petroleum deposits at Klamono, Mogoi, and Wasian. The port of Sorong is located on the western coast of the peninsula. [29–174–6]

DOWEL, an inserted pin for connecting parts in joinery. It consists of a wooden or plastic cylinder 6–20 mm in diameter and 25–160 mm long. The ends are slightly beveled, and the sides are fluted to allow air to escape when the dowel is driven into a hole. The dowel is smeared with glue before insertion. Dowel joints are more economical than mortise joints. [29–1253–2]

DOWEL-MAKING MACHINE, a woodworking machine for producing wooden dowels. It cuts a square or round workpiece to the necessary diameter, bevels the ends of the dowel, and cuts longitudinal grooves on the cylindrical surface. The machine can produce up to 2,000 dowels per hour. [29–1253–3]

DRAFTING AND DESIGNING EQUIPMENT, the instruments, attachments, and other equipment used to make mechanical drawings. The principal articles of drafting and designing equipment are a drawing board for arranging and securing the drawings, a stand on which the drawing board is mounted, a drafting machine, drawing instruments, and auxiliary equipment.

The drawing board has a flat surface whose dimensions exceed those of the drawing by 100–200 mm. Drawing boards are usually made of linden laths; plywood (for school drawing boards) with an oak or beech frame; glass; plastic; or chipboard with a plastic surface. Drawing boards made from a transparent material and equipped with a light fixture underneath facilitate tracing and copying. Boards made from combinations of materials are also used; one half is made from organic glass with scale grids and regulated illumination from beneath, and the other half is made of wood or laminated chipboard. Portable boards are 300 × 500 mm, designer's boards are 1,000 × 1,350 mm, and boards for particularly large drawings are 1,350 × 5,000 mm. The drawings are secured to the board by tacks or tape.

A stand is used to hold the drawing board in a convenient position for work—at any angle and 300–700 mm above the floor. Fixed stands may have one or two columns. Single-column stands can be rotated 360° about the vertical axis. Stands for designer's drawing boards have a system for balancing the board (for example, by means of weights or springs) or a device for raising, lowering, and turning the board (usually with a mechanical or hydraulic drive).

A drafting machine is a precision device that makes it possible to draw straight lines of a given length at any angle in the plane of the drawing board. Two types are used: the pantograph, which consists of a system of levers hinged together in the shape of a parallelogram, and the coordinate type, which has two mutually perpendicular bars along which carriages are moved. The parallelogram mechanism (in the first type) and one of the carriages (in the second) have protractor heads with two mutually perpendicular, scaled straightedges. The straightedges may have different scales and lengths; the horizontal one is usually 500 mm long, and the vertical 300 mm. The straightedges are made from metal-reinforced plastic or a thin-walled steel section. The protractor head provides an accuracy of up to 5′ (with continuous settings or detents for increments of 15°). The head has two scales for reading (positive and negative) and a device to shift the scales in order to construct projections at an angle. The machine has a lock mechanism to set the position of the head and turn it 90° from the plane of the board, attachments to align the straightedges, parallel rules for hatching, and lettering devices.

Drawing instruments consist of sets of marking and drawing compasses and outside calipers of various types and sizes, in addition to (when necessary) auxiliary attachments, ruling pens and holders, and the like. The range of radii inscribed with the various types of compasses is generally 0.5–300 mm or wider. Sets of drawing instruments also include cases for storing compasses, leads, and spare pen points, often made in the form of a screwdriver, point holder, or extension device. Brass buttons with a point and an indentation for the support leg of a compass are used to protect the surface of drawing boards and paper when inscribing concentric circles. Brass is used to make the most accurate instruments for critical work; less accurate instruments are made of steel.

A set of drawing instruments often includes devices for sharpening pencils and removing lines drawn by mistake. Leads, except those of calibrated thickness, are sharpened by manual or electric sharpeners. Pencil lines are removed from drawings with rubber erasers. For the correction of drawings executed in certain paste-like media that are absorbed deep into the paper, a white paste is used to cover up the unwanted elements of the drawing. The india and regular inks used in calibrated pens with reservoirs can be removed from a drawing with erasers that have a microporous structure; in the pores of the erasers is an india ink solvent, which dissolves the ink and removes it at the same time.

Auxiliary equipment is used to draw characters, letters, or numerals. Manual writing devices include various types of pencils, ball-point pens, soft-tip pens, and calibrated pens with ink reservoirs (in Russian, *rapidografy*). Mechanical pencils with graphite cores and graphite-containing pastes in metallic, calibrated tube holders are widely used; they do not need sharpening and allow one to draw lines 0.2–1 mm thick. Lines of varying thickness are also obtained with ball-point pens. Soft-tip pens produce lines of consistent width. They have cores made of glass fiber, polyamide (for example, *kapron*), or ceramic material. When drawings are made with india or special inks, calibrated pens with ink reservoirs are used; they draw lines 0.1–2.5 mm wide and are manufactured in seven or eight standard sizes.

Various types of rulers (including T-squares) and triangles are used in making mechanical drawings. Among the devices used to speed up drafting work are templates (for writing in inscriptions and standard designations and drawing standard parts), french curves (for drawing complex curved and connecting lines), and decals, which are small, dry, transferable illustrations of often-used fasteners, standardized circuits, and fixture representations. Mechanized means, such as typewriters, are also used to print letters, numerals, and standard symbols. The use of the templates, the simplified representation of often-used elements, and the pasting up of drawings from standard elements are other techniques designed to reduce the volume of drafting work.

The use of computer-controlled automated equipment improves the quality and increases the productivity of design work. Such equipment includes board- and roll-type graph-plotting devices, scanning and discrete-processing graphic copiers, and graphic displays. Drawings and other documents can be executed on paper, microfiche, or microfilm; the information they contain can also be converted into digital form and be recorded on machine information carriers, such as punched cards or magnetic tape, for subsequent computer processing. The use of automated equipment in drafting and design work speeds up the design process.

Drafting and designing equipment and supplementary fittings and devices are used in organizing the designer's work position. The designer keeps the necessary reference works, templates, and a calculator at a writing desk used for making calculations. Drawings and auxiliary materials, calibrated pens, and other items are kept on a preparation table, which is usually set be-

tween the writing desk and the drawing board stand; drawing instruments and various reference materials are kept in the drawers of the table or in roll-out stands. Work positions equipped with a display and a graph-plotting device are usually combined into complexes for use by groups of designers working together.

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R. G. VARLAMOV [29–327–3]

DRILL HOLE (*shpur*), a man-made cylindrical cavity in a solid medium, such as rock or concrete, with a diameter up to 75 mm and a depth up to 5 m. Drill holes are used to place blasting charges, to anchor supports, and to force water or cement into the surrounding rock. The holes are drilled with hammer drills, electric drills, and other light-duty drilling machines. [29–1410–6]

DROSS, an intermediate product obtained from the liquation separation of heavy nonferrous metals with low melting points: lead, bismuth, and tin. As the metals are cooled during the refining process, impurities of low solubility, such as copper and iron, crystallize. Denser and possessed of a higher melting point than the metal being refined, the impurities (in the elemental state or in compounds) float to the surface of the bath as solids to form dross. Additives of sulfur or carbon are sometimes introduced into the metal being refined in order to remove a higher percentage of impurities. The deeper the cooled metal, the more complete the crystallization and purification; however, there is also an increase in dross yield and in the amount of refined metal found in the dross.

Dross is removed from the surface of the liquid bath with a skimmer. The liquid metal entrained mechanically with the dross drains into the bath. Dross is highly complex with respect to its chemical and phase composition; the refined metal constitutes its base. The dross obtained in the refining of lead is reprocessed by smelting in a reverberatory or electric furnace with the addition of a sulfidizing agent and fluxes. The smelted lead is returned to the primary production cycle, and the matte and speiss produced are sent to copper mills. The dross obtained in the refining of bismuth and tin is recycled.

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M. P. SMIRNOV [29–1289–1]

DRYOPTERIS, a genus of ferns of the family Aspidiaceae. There are about 150 species, distributed in the temperate zone of Eurasia and North America and, to a lesser extent, in the tropical regions of Asia, Africa, and South America. The USSR has about 15 species. Especially widely distributed is the male fern (*D. filix-mas*). *D. carthusiana* (formerly *D. spinulosa*) is found in damp, mossy forests of the European USSR, the Caucasus, and Siberia. Both species are used medicinally as anthelmintics. *D. fragrans* grows on cliffs and slopes of the northern European USSR, in Siberia, and in the Far East; *D. cristata* grows in humid regions and swamps in the European USSR and Western Siberia. [29–1612–2]

DUFF (Russian, *shtyb*), particles of hard coal less than 6 mm in size. [29–1508–1]

DUNLIN (*Calidris alpina*), also red-backed sandpiper, a bird of the family Charadriidae of the suborder Limicolae. The body length is about 20 cm. The upper parts are reddish brown, and underparts are dark. The dunlin is distributed in the tundras of Eurasia and North America, as well as along the shores of the Baltic and North seas. It is a migratory bird. Unmated birds roam the steppes of Western Siberia and Kazakhstan in the summer. The nests are on the ground. The clutch contains four eggs, which are incubated by both the male and female for 21 to 22 days. The diet consists of small invertebrates. [29–287–1]

EA, one of the three great gods of Assyro-Babylonian religion and mythology, the other two being Enlil and Anu. Among the Sumerians, Ea was known as Enki. He was the deity of the world ocean and of the fresh water beneath the ground. He was also the god of wisdom. Ea was considered benevolent. [29–1627–2]

EAKINS, THOMAS. Born July 25, 1844, in Philadelphia; died there June 25, 1916. American painter.

Eakins studied at the Pennsylvania Academy of the Fine Arts in Philadelphia, and from 1866 to 1869 he studied at the Ecole des Beaux-Arts in Paris. Eakins is the greatest American realist painter. He introduced into American painting themes from the life of the big city as well as an interest in various occupations, in people involved in art and science, and in sport, as seen in *Max Schmitt in a Single Scull* and *The Thinker* (1871 and 1900, respectively; both Metropolitan Museum of Art, New York) and in *The Surgical Clinic of Professor Gross* (1875, Jefferson Medical College, Philadelphia). Eakins combined strict objectivity and liveliness in depicting nature and the effects of light with profound psychological characterization (the portrait *Walt Whitman*, 1887, Pennsylvania Academy of Fine Arts).

REFERENCE
Porter, F. *Thomas Eakins*. New York, 1959. [29–1706–3]

EANNATUM. Ruler of the state of Lagash (c. 2450–2425 B.C.).

Various economic and legal documents from the period of Eannatum's rule have been preserved; some inscriptions on contemporary buildings have also survived. Through victories over the rulers of neighboring city-states in Sumer and Elam, Eannatum extended the boundaries of his state from the city of Ur to the city of Kish. His victory over Ush, the ruler of the city of Umma, is depicted on the famous Stela of the Vultures; Eannatum was fighting Ush for control of the region of Gu-eden, which bordered on Lagash.

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D'iankonov, I. M. *Obshchestvennyi i gosudarstvennyi stroi drevnego Dvurech'ia Shumer*. Moscow, 1959. [29–1627–4]

EBBINGHAUS, HERMANN. Born Jan. 24, 1850, in Barmen; died Feb. 26, 1909, in Halle. German psychologist. Proponent of associationism.

Ebbinghaus was a professor at the University of Breslau from 1894 to 1905 and the University of Halle from 1905 to 1909. He founded, with A. König, the journal *Zeitschrift für Psychologie und Physiologie der Sinnesorgane*, which brought together psychologists who did not belong to the school of W. Wundt. Ebbinghaus initiated the experimental study of the higher mental functions, especially memory.

In his work *Memory* (1885), Ebbinghaus demonstrated that the process of memorization is influenced by the number of items to be memorized, the number of times the items are repeated, and the strength of the associations between the items, which is inversely proportional to the distance between them; his "forgetting curve" related forgetting to the passage of time. He developed a test to determine degrees of mental development. Ebbinghaus' textbooks on psychology have been reprinted many times.

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Ocherk psikhologii. St. Petersburg, 1911. [29–1627–5]

EBEKO, an active volcano in the northern part of the island of Paramushir, one of the northern Kuril Islands. The volcano, which rises to an elevation of 1,138 m, has three craters, each with a diameter of 250–350 m. The craters contain lakes, thermal springs, and solfataras. The volcano is composed of andesites and basalts. Eruptions occurred in 1793, 1859, 1934–35, 1963, and 1967. [29–1628–1]

EBENACEAE, a family of dicotyledonous trees and shrubs. The leaves are usually alternate and entire. The regular flowers are

for the most part unisexual and three- to seven-parted. The fruit most often is a berry. There are about 450 species, making up five to seven genera. The plants occur mainly in the tropics and subtropics. In the USSR species of the largest genus—*Diospyros* (persimmon)—grow in the Caucasus. Many Ebenaceae yield valuable lumber (ebony) and edible fruit. [29–1629–1]

EBERS, GEORG. Born Mar. 1, 1837, in Berlin; died Aug. 7, 1898, in Tutzing, Bavaria. German Egyptologist.

Ebers was a professor at the universities of Jena (1865–70) and Leipzig (1870–89). While traveling in Egypt in 1872–73, he acquired the most extensive (known up to that time) ancient Egyptian medical treatise, which he published in 1875 and which has become known as the Ebers Papyrus. Ebers gained fame for his illustrated, popular descriptions of ancient and modern Egypt and particularly for his historical novels drawn from the life of ancient and Greco-Roman Egypt and medieval Germany, most of which were translated into Russian, including *An Egyptian Princess* (1883 and 1913), *Uarda* (1892), and *The Burgomaster's Wife* (1882). These novels quite accurately depict details of everyday life and mores, but they seldom accurately interpret historical events or truthfully portray historical figures.

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Sobr. soch., vols. 1–13. St. Petersburg, 1896–99. [29–1629–4]

EBERSWALDE (also Eberswalde-Finow), a city in the German Democratic Republic, in Frankfurt District, on the Finow Canal. Population, 47,200 (1975). Eberswalde manufactures crane equipment, rolled steel, ship fittings, chemicals, and paper. [29–1630–1]

EBERT, FRIEDRICH. Born Feb. 4, 1871, in Heidelberg; died Feb. 28, 1925, in Berlin. German political and state figure. One of the right-wing leaders of the German Social Democratic movement.

Ebert was a saddler by trade. He became a member of the Social Democratic Party of Germany (SDPG) in 1889. In 1905 he was elected to the administrative board of the SDPG, and in 1913 he became one of the chairmen of the board. In 1912, Ebert was elected to the Reichstag, and in 1916 he became the leader of the Reichstag's Social Democratic faction. During World War I, he held socialist and chauvinistic views.

On Nov. 9, 1918, during the Revolution of November 1918, Ebert accepted the position of chancellor from Prince Max of Baden. On November 10 he became cochairman of the provisional government, which was called the Council of People's Commissioners. On the same day, he concluded a secret agreement with members of the supreme military command concerning the introduction of military units into Berlin in order to suppress the revolution. In January 1919 the Ebert-Scheidemann government suppressed a revolutionary demonstration by the Berlin proletariat.

In February 1919, Ebert was elected president of the Weimar Republic. [29–1630–3]

EBERT, FRIEDRICH. Born Sept. 12, 1894, in Bremen. Party and state figure of the German Democratic Republic (GDR). Son of F. Ebert.

Ebert joined the Social Democratic Party of Germany (SDPG) in 1913 and was editor of a number of Social Democratic newspapers. From 1928 to 1933 he served as a deputy to the Reichstag. After the establishment of the fascist dictatorship in 1933 he carried on illegal antifascist work; as a result he was arrested and imprisoned in a concentration camp. In 1945 and 1946, Ebert served as chairman of the administrative board of the SDPG organization in Brandenburg.

From 1946 to 1948, Ebert served as chairman of the Brandenburg organization of the Socialist Unity Party of Germany (SED) and president of the *Landtag* of Brandenburg. In 1946 he became a member of the Central Board (later the Central Committee) of the SED, and in 1949 he was named a member of the Politburo of the Central Committee. From 1948 to 1967, Ebert was *Oberbürgermeister* (lord mayor) of Berlin. In 1949 he became a deputy to the People's Chamber of the GDR; from 1950 to 1963 he served as deputy chairman of the body, and in 1971 he was again named deputy chairman. In 1960 he became a member of the Council of State of the GDR, and in 1971 he became the council's deputy chairman. From 1949 to 1958 he served as president of the Society for German-Soviet Friendship.

Ebert has been named a Hero of Labor of the GDR twice. Among the orders awarded to him by the GDR are several Orders of Karl Marx. Ebert has also been awarded Soviet orders, including the Order of Lenin and the Order of Friendship of Peoples. [29–1630–4]

EBERT, MAX. Born Sept. 4, 1879, in Stendal; died Nov. 15, 1929, in Berlin. German archaeologist.

In 1922, Ebert became a professor at the University of Königsberg. He was a specialist on the archaeology of the Baltic region and of the southern part of Eastern Europe. Ebert published the multivolume archaeological *Dictionary of Prehistory* (vols. 1–15, 1924–32).

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Südrussland im Altertum. Bonn-Leipzig, 1921. [29–1630–2]

EBI NOR (also Ebi Nur), a brackish salt closed lake in northwestern China, the largest lake on the Dzungarian Plain. Ebi Nor is situated near the southern entrance to the Dzungarian Gates, at an elevation of 189 m. It covers an area of 1,070 sq km, although at times it shrinks to approximately 800 sq km, dividing into two bodies of water. The shores are low. Depths reach 15 m. Three main rivers flow into the lake: the Dzhergalan, Ching, and Boro-Tala.

The water level varies considerably from year to year, sometimes by as much as 5 m. On the whole the lake is in the process of shrinking; its shore terraces are situated at an elevation of 50 m. The lake freezes in the winter. [29–1631–1]

EBNER-ESCHENBACH, MARIE VON. Born Sept. 13, 1830, in Zdislavič Castle, Moravia; died Mar. 12, 1916, in Vienna. Austrian writer; baroness.

Ebner-Eschenbach, a master of realistic prose, was the author of the short-story collections *Stories of Life in the Village and the Castle* (1883) and *New Stories of Life in the Village and the Castle* (1886). Satirizing the Austrian bourgeoisie and aristocracy, she sympathized with the common people, who were deprived of rights. The moral superiority of simple people is asserted in her novels *Božena* (1876) and *Lotti the Watchmaker* (1889). Ebner-Eschenbach's works are somewhat flawed by a moralizing tone and sentimentality.

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EBOLOWA, a city in Cameroon, located in the South Central Province. Population, 24,000 (1970). Ebolowa is linked by highway with the city of Yaoundé and the port of Douala. It is a trade and transportation center of a region specializing in the cultivation of cacao and lumbering. [29–1631–3]

EBONITE, a product resulting from the vulcanization of rubber with large quantities of sulfur, about 30 to 50 percent per mass of rubber. Ebonites are hard materials and, unlike "soft" rubbers, display no high-elastic properties at ordinary temperatures. They lend themselves readily to mechanical processing, are nonhygroscopic and impermeable to gas, and are resistant to the action of solutions of acids, bases, salts, plant oils, and animal fats. They are decomposed by strong oxidizing agents and by aromatic and

chlorinated hydrocarbons. Ebonites have a density of 1.15–1.68 g/cm^3, a Young's modulus of 2–3 giganewtons/m^2 (20×10^3 to 30×10^3 kilograms-force/cm^2), a tensile strength of 52–67 meganewtons/m^2 (520–670 kilograms-force/cm^2), and a volumetric resistivity of 1–10 teraohm·m (10^{14}–10^{15} ohm· cm).

Ebonites are used to manufacture electric insulating components of devices and to rubberize various vessels used for corrosive liquids. In many areas of technology, ebonites are being replaced by plastics, which have superior dielectric properties and chemical stability.

REFERENCE
Entsiklopediia polimerov, vol. 3. Moscow, 1977. [29–1631–4]

EBONY, the dark wood of several species of tropical trees of the family Ebenaceae and several other families (Mimosaceae, Papilionaceae). Its color ranges from green to black. The best grades of ebony come from the tropical *Diospyros crassiflora, D. ebenum, D. haplostylis, D. melanoxylon*, and *D. reticulata*. The black heartwood is uniform in structure, heavy (with a density greater than 1), and hard. The annual rings and medullary rays are unnoticeable. Green ebony is obtained chiefly from the Central American *Tecoma leucoxylon* of the family Bignoniaceae.

Ebony is used as an ornamental facing for expensive furniture. It is also used in inlaid work and for the manufacture of musical instruments and various other wooden articles. The wood of *D. lotus*, from Transcaucasia and Middle Asia, is used in the USSR as an ebony substitute. It is used for various lathed objects, in joinery, and in the manufacture of shuttles for looms. [29–1628–3]

EBRO, a river in northeastern Spain. The Ebro measures 928 km in length and drains an area of 86,800 sq km. It originates on the southern slopes of the Cantabrian Mountains and in a deep valley intersects the northeastern part of the Old Castile Plateau; in its middle course it intersects the Aragon Plain, where it divides in places into channels. In its lower course, along narrow, meandering gorges, it bursts through the spurs of the Catalonian Mountains, below which it reaches the maritime plain. It flows into the Mediterranean Sea, forming a delta (approximate area, 250 sq km), within which it flows in a straightened, embanked channel.

The water level increases in winter and spring, sometimes by as much as 4–6 m during floods. In summer and autumn the flow rate decreases, although flash floods occur. The mean flow rate in the lower course is 560 cu m per sec, with a maximum of 8,000 cu m per sec.

Within the Aragon Plain the Aragon and Tauste irrigation canals extend from the Ebro, watering more than 100,000 hectares (ha) of the Ebro valley. Hydroelectric power plants are found on the river. The Ebro is navigable below the city of Zaragoza. Other cities situated on the river include Miranda de Ebro, Logroño, and Tortosa. [29–1631–5]

EBULLIOSCOPY (also ebulliometry), a method of physicochemical analysis based on measuring the increase in the boiling point of a solution in comparison with the boiling point of a pure solvent.

According to Raoult's laws (*see* RAOULT'S LAWS), for an infinitely diluted solution of a nonvolatile substance and in the absence of electrolytic dissociation, this increase, Δt_b, is proportional to the molal concentration m of the solution; $\Delta t_b = E_e m$, where E_e is the coefficient of proportionality (ebullioscopic constant), which is characteristic of each solvent and does not depend on the nature of the solute. Thus, E_e for water is equal to 0.526; for benzene, 2.57; for dioxane, 3.27; for camphor, 6.02; and for dibromoethane, 6.43; all quantities are expressed in °C. Along with cryoscopy, ebullioscopy is used to determine the molecular mass of a solute, the activity of the solvent and the solute, or the degree of dissociation of the weak electrolyte. The molecular mass M of the solute is computed according to the equation

$$M = \frac{P_1 E_e \times 1{,}000}{P_2 \Delta t_b}$$

where P_1 and P_2 are the masses of the solute and the solvent, respectively, expressed in grams. The temperature difference Δt_b is measured by means of a Beckmann thermometer or sensitive thermocouples.

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Kurs fizicheskoi khimii, 2nd ed., vol. 1. Edited by Ia. I. Gerasimov. Moscow, 1969. S. A. POGODIN [29–1632–1]

ECCARIUS, JOHANN GEORG. Born Aug. 23, 1818, in Friedrichroda; died March 1899 in London. Figure in the German and international working-class movement.

A tailor by profession, Eccarius was a member of the League of the Just and, later, of the Communist League; when the Communist League split in 1850, he sided with K. Marx. In London he was a leader of the German Workers' Educational Society. Eccarius helped found and took part in the First International; he served as a member of the General Council from 1864 to 1872, as general secretary from 1867 to 1871, and as corresponding secretary for America from 1870 to 1872. After the London Congress of the International in 1871 he aligned himself with reformist trade union leaders, and he supported the bourgeois and reformist elements in the International. After the First International ceased its activities, Eccarius took part in the trade union movement. [29–1765–5]

ECCLES, JOHN CAREW. Born Jan. 27, 1903, in Melbourne. Australian physiologist.

Eccles graduated from the University of Melbourne in 1925 and from Magdalen College, Oxford, in 1929. He worked in Oxford from 1927 to 1937 under C. Sherrington and was director of the Kanematsu Memorial Institute of Pathology in Sydney from 1937 to 1944. He was professor of physiology at Otago University, New Zealand, from 1944 to 1951 and professor of physiology at the Australian National University in Canberra from 1951 to 1966.

Eccles served as president of the Australian Academy of Sciences from 1957 to 1961. He worked in the Institute for Biomedical Research in Chicago from 1966 to 1968 and became a distinguished professor and director of the Institute of Neurobiology and dean of the department of public health of the State University of New York at Buffalo in 1963.

Eccles has mainly done research on electrical processes in nerve cells. He made an important contribution to the study of the ionic mechanisms of excitation and inhibition of nerve cells. He showed how nerve impulses arise in one cell and are then transmitted to an adjacent cell. Eccles has been a fellow of the Royal Society since 1941. He was awarded a Nobel Prize in 1963, along with A. L. Hodgkin and A. F. Huxley.

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A. S. BATUEV [29–1770–1]

ECCLESIA, the most common name for the popular assembly in ancient Greece. In the Athens of Pericles (mid-fifth century B.C.) and in other democratic poleis, or city-states, the ecclesia was the highest governmental body. It elected officials and exercised legislative, executive, and judicial power. In oligarchic poleis the authority of the ecclesia was limited by other governmental bodies, such as councils and collegia.

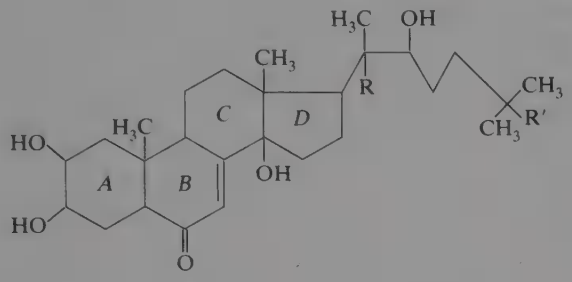
In many poleis, the popular assembly was given a special name; the term *apella* was used in Sparta, the term *agora* in Delphi and the cities of Thessaly, and the term *alia* in Argos, Epidaurus, Gela, and Acragas (present-day Agrigento). Writers of late antiquity used the word "ecclesia" to refer to the place where a popular assembly was held.

In Christian writings, "ecclesia" may mean either the community of believers or the church as a whole. [29–1766–2]

ECDYSONE, any of the group of steroid hormones that stimulate molting and metamorphosis in arthropods. Some varieties—especially α-ecdysone and ecdysterone, either separately or to-

gether—function as molting hormones in different groups of arthropods.

In 1954, A. Butenandt isolated α-ecdysone from silkworm cocoons; in 1965 the chemical structure of the hormone was determined by chemical methods and by X-ray diffraction analysis. α-Ecdysone has the structural formula



where R = H and R′ = OH. (In ecdysterone, R = R′ = OH, and in ponasterone, R = OH and R′ = H.) Ecdysones are solid, optically active substances that are slightly soluble in water but readily soluble in polar organic solvents. They contain 27 or 28 carbon atoms. Four structural features are characteristic of most ecdysones: the cis linkage of rings *A* and *B*, the *cis*-glycol group in ring *A*, the α- and β-unsaturated ketone groups in ring *B*, and at least one hydroxyl group (usually two or three) in the sterol side chain.

Ecdysones are formed by the thoracic gland in insects and by the Y organ in crustaceans; the activity of the organ increases at the time the shell is shed. Ecdysones cause the epidermis to release the molting secretion that causes the formation and hardening of a new cuticula. Ecdysones also initiate pupal molting, which is accompanied by the transformation of the larvae into pupae and by the formation of a special melting cocoon (puparium). For this reason, ecdysones are used by sericulturists in Japan to hasten the formation of silkworm cocoons and facilitate manual sorting. At present, the use of ecdysones as insecticides that work by hormonal action does not appear promising.

Ecdysones act on insects by inducing chromosome puffs (zones of genetic activity). Successively arising puffs sequentially activate genes involved in the transmission of genetic information. In this manner ecdysones activate, for example, dioxyphenylalanine decarboxylase, an enzyme needed to synthesize the substances responsible for sclerotization of the insects' cuticula. Ecdysones induce the formation of protein by stimulating the biosynthesis of messenger ribonucleic acids (mRNA). The balanced action of ecdysones, combined with that of the juvenile hormones, regulates the stages of insect development.

The concentration of ecdysones in arthropods is very low, ranging from 0.1 microgram per gram (μg/g) to 1.0μg/g. Certain ecdysones, including amarosterone and cyasterone, are also found in plants in concentrations ranging from 0.1 percent to 1–2 percent, but their physiological function is still unknown. Plant ecdysones contain 27, 28, or 29 carbon atoms. The assumption that the hormones protect plants against herbivorous insects has not been experimentally proved. It is worth noting that ecdysones stimulate the growth of such plants as peas and rice and that the plant hormone gibberellin induces molting in the locust.

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E. P. SEREBRIAKOV [29–1750–3]

EÇEVIT, BÜLENT. Born May 28, 1925, in Istanbul. Turkish state and political figure; a literary critic and theorist by education.

Eçevit graduated from Robert College in Istanbul in 1944. Between 1946 and 1950 he was on the staff of the Turkish press attaché in London. From 1950 to 1961 he was employed in various capacities by the newspaper *Ulus*, an organ of the Republican People's Party (RPP).

Eçevit became an RPP member of the Grand National Assembly in 1957. Between 1961 and 1965 he served as minister of labor in the coalition governments led by I. Inönü. He was secretary general of the RPP from 1966 to 1971 and general chairman of the party from May 1972 to October 1980. Eçevit served as prime minister from January to November 1974 and again from January 1978 to November 1979. [29–1681–4]

ECKERMANN, JOHANN PETER. Born Sept. 21, 1792, in Winsen, Bavaria; died Dec. 3, 1854, in Weimar. German literary figure. Secretary and friend of Goethe.

From 1821 to 1823, Eckermann studied literature and aesthetics at the University of Göttingen. His *Conversations With Goethe in the Last Years of His Life* (parts 1–3, 1837–48; first abridged Russian translation, 1891; complete translation, 1934) is more complete and of higher literary quality than any other memoir about the poet. Eckermann put Goethe's archives into order and prepared his works for publication. He was also the author of lyric poems, which were published in collections in 1821 and 1838.

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ECKERSBERG, CRISTOFFER VILHELM. Born Jan. 2, 1783, in Blaakrog; died July 22, 1853, in Copenhagen. Danish painter.

Eckersberg began his art studies at a school affiliated with the Academy of Arts in Copenhagen, and from 1810 to 1813 he studied in J. L. David's studio in Paris. He lived in Rome from 1813 to 1816. He was a Professor at the Academy of Arts in Copenhagen from 1818 and served as its director from 1827 to 1829.

The works of Eckersberg, strongly influenced by classicism, had an important influence on the development of the national Danish school of painting. They include expressive portraits executed in a severe style, for example, *Portrait of Thorwaldsen* (1814, Charlottenborg, Copenhagen), and landscapes noted for their delicate and light palette. [29–1766–1]

ECK'S FISTULA, an experimental method of partly interfering with liver function. The operation was proposed in 1877 by the Russian surgeon N. V. Eck (Ekk) and was successfully used in 1892 by I. P. Pavlov. It involves the surgical connection of the vena cava inferior to the portal vein, which is simultaneously ligated above the point of connection. As a result, the blood bypasses the liver, flowing directly into the vena cava inferior. Eck's fistula is a classical method of studying liver function. Various ways of improving and simplifying it have been suggested. [29–1765–4]

ECLAMPSIA, a serious disease occurring during pregnancy, labor, or the postpartum period. Eclampsia is a late stage of toxemia of pregnancy. The condition is characterized by convulsions that develop in a definite sequence. Slight fibrillar contractions of the facial muscles (15–30 seconds) are followed by tonic spasms of the total skeletal musculature and loss of consciousness (15–20 seconds). Clonic muscular spasms of the trunk and limbs occur, and, finally, the woman lapses into a brief or prolonged coma. Consciousness returns gradually. In particularly severe cases, eclampsia may occur without convulsions (comatous forms). Eclampsia is often manifested by only a few convulsions, and high blood pressure may not be a symptom. Death may occur during or after convulsions as a result of pulmonary edema, hemorrhages into the brain, and asphyxia. The fetus often dies *in utero* from hypoxia. The prognosis depends on the number and duration of the convulsions or on the duration of the coma.

Current treatment of eclampsia is based on principles developed by the Soviet obstetrician-gynecologist V. V. Stroganov in 1928. Total physical and mental rest is prescribed. Functioning of the vital organs is restored: Drugs are administered to decrease

the excitability of the central nervous system, to lower blood pressure, and to stimulate urination. Oxygen is administered in cases of pronounced hypoxia, and labor is induced quickly but cautiously. The patient should not be moved during convulsions or while in a coma. Prompt hospitalization is required as soon as consciousness is regained. Prophylaxis includes the prevention of advanced toxemia and prompt hospital treatment of neuropathy and preeclampsia.

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Nikolaev, A. P. *Pozdnie toksikozy beremennykh*. Moscow, 1972.
A. P. KIRIUSHCHENKOV [29–1766–3]

ECLECTICISM, in art and architecture, the combination of artistic elements of diverse origin; the phenomenon usually occurs during the period of decline of major artistic trends.

Elements of eclecticism are noticeable in late ancient Roman art, mainly in the combination of forms borrowed from Greece, Egypt, and Southwest Asia. The artists of the Bolognese school favored eclecticism, believing that they could attain artistic perfection by combining what in their opinion were the best aspects of works by the great masters of the Renaissance.

Eclecticism is characteristic of the architecture, especially the interior design, of the middle and second half of the 19th century, when different motifs were mixed indiscriminately, including those of the Renaissance and rococo styles; however, the eclecticism typical of 19th-century architecture and design, with their universal range of architectural and ornamental motifs, had a significant impact on the birth of *art nouveau*, which was essentially a distinct, integral style although influenced by the most diverse sources.

Eclecticism has remained typical of salon art. Eclectic trends became widely popular in Western European and American artistic culture of the mid-20th century as a result of the vogue for retrospective styles of artistic design, which copy stylistic trends of the past.

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Patetta, L. *L'architettura dell'eclettismo: Fonti, teorii, modelli, 1750–1900*. Milan, 1975. [29–1767–1]

ECLECTICISM, the combination of diverse views, ideas, and theories. The term was introduced in the second century by Potamon of Alexandria, who called his school eclectic. The sources of eclecticism lie in the substitution of one set of logical foundations for another. The shallowness and futility of such constructions have been noted by many philosophers, beginning with Socrates and Aristotle. The classics of Marxism-Leninism were sharply critical of eclecticism. V. I. Lenin pointed out the substitution of foundations—the undermining of the integrity of an object—that is a characteristic feature of eclecticism: "the substitution of eclecticism for dialectics is the easiest way of deceiving the people. It gives an illusory satisfaction; it seems to take into account all sides of the process, all trends of development, all the conflicting influences, and so forth, whereas in reality it provides no integral and revolutionary conception of the process of social development at all" (*Poln. sobr. soch.*, 5th ed., vol. 33, p. 21).
[29–1767–2]

ECLIPTIC, the great circle on the celestial sphere along which occurs the apparent annual motion of the sun or—more precisely—the apparent annual motion of the center of the sun. Since the apparent annual motion of the sun reflects the actual motion of the earth about the sun, the ecliptic may be regarded as the intersection of the celestial sphere and the plane of the earth's orbit.

The plane of the ecliptic is inclined to the plane of the celestial equator by an angle of $\epsilon = 23° 27' 8''.26 - 0.4685t$, where t is the number of years that have elapsed since the beginning of 1900. The equation is valid for several centuries after the 20th century. The angle of inclination, which is called the obliquity of the ecliptic, varies periodically over hundreds of thousands of years.

The term "ecliptic" is associated with the fact, known since ancient times, that solar and lunar eclipses occur only when the moon is near one of the points where its orbit intersects the ecliptic. These points on the celestial sphere are called the lunar nodes. The ecliptic passes through 12 constellations, which are known as the zodiacal constellations. The plane of the ecliptic is the fundamental plane in the ecliptic system of celestial coordinates. [29–1768–2]

ECLOGA, a brief code of Byzantine law, promulgated by Emperor Leo III the Isaurian in the year 726. The Ecloga was a revision of parts of the codification of Justinian, the Rural Code, and other acts promulgated by Byzantine emperors. It was drawn up in order to make the legislation less cumbersome and more comprehensible to the people of Byzantium. It dealt mainly with liability, the family, inheritance, and norms of criminal and procedural law. Although it provided for slavery as before, it reflected a more advanced stage of feudal relations; in particular, the procedure for liberating slaves was simplified. The Ecloga influenced several legislative works of the Slavic peoples. [29–1769–3]

ECLOGITE, a metamorphic rock, composed chiefly of clinopyroxene and garnet. The clinopyroxene (omphacite) is a mixture of diopside, hedenbergite, and jadeite components; the mixed-composition garnet contains pyrope and almandine, as well as variable amounts of grossularite and andradite. Eclogite varieties with significant amounts of grossularite and disthene (kyanite) are called grospydites.

Various types of eclogite are distinguished according to the content of secondary minerals, including amphibole, enstatite, olivine; plagioclase, kyanite (disthene), corundum, rutile, graphite, and diamond-containing eclogites. Three types are distinguished on the basis of geological conditions of occurrence: the eclogites of the metamorphic zone, which are associated with glaucophane schists and alpine-type hyperbasites; the eclogites of granulite, gneiss, and amphibolite metamorphic complexes; and eclogites that form inclusions (xenoliths) in kimberlites and alkali basaltoids. The first two are formed within the crust; the last is of mantle origin. Deposits of rutile are associated with eclogite, and diamonds are found among the most deep-seated eclogites in kimberlite pipes. A. A. MARAKUSHEV [29–1769–4]

ECLOGITE FACIES, conditions of thermodynamic stability of eclogites, defined with respect to the principal factors of metamorphism: pressure, temperature, and partial pressures of volatile components in fluids. Eclogites correspond to conditions of high pressure attained in the earth's crust (almandine eclogites, 7–15 kbar) or in the mantle (pyrope eclogites, more than 15 kbar).

In terms of temperature, a distinction is made between medium-temperature eclogites, which are part of alpine-type glaucophane metamorphic zones (500°–600°C), and high-temperature eclogites, which form associations with gneisses and granulites (600°–900°C). The pyrope eclogites that form inclusions in kimberlites and alkali basaltoids have even higher temperatures (above 900°C).

A number of scientists, such as A. A. Marakushev and L. L. Perchuk, believe that the metamorphism leading to the formation of eclogites originates under reduction conditions with the participation of fluids with low partial pressures of water and carbon dioxide. Under such conditions, the processes of hydration and carbonatization of minerals are relatively suppressed, which gives anhydrous minerals (omphacite, garnet) stability in both high- and medium-temperature facies.

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A. A. MARAKUSHEV [29–1769–5]

ECLOGUE, a type of idyll. An eclogue is a genre scene, usually a love scene, of conventional pastoral life. It may be written in narrative or dramatic form. In classical literature no distinction was made between the idyll, for example, those of Theocritus, and the eclogue, for example, Vergil's *Bucolics*. Writers of the 18th-century classical school considered that the idyll required more emotion, and the eclogue more action; such were the first Russian eclogues, by A. P. Sumarokov. However, the distinction was not strictly observed. The genre had become obsolete by the early 19th century. [29–1769–2]

ECNOMUS, the ancient Roman name for the promontory now called Poggio Sant'Angelo, which is located on the southern coast of Sicily at the mouth of the Himera Meridionalis (now Salso River), near modern Licata.

In 256 B.C., during the First Punic War (264–241 B.C.), a naval battle between the Roman and Carthaginian fleets took place near Ecnomus. The Roman fleet, comprising 330 ships under the command of the consul M. Atilius Regulus, was escorting transports of landing forces headed for North Africa. Two detachments of ships sailed ahead, and two formed a protective line behind the transports. Near Ecnomus the Roman fleet was met by the Carthaginians, whose fleet comprised 350 ships under the command of Hamilcar.

The advance Roman detachments attacked. Hoping to divert the advance Roman detachments, Hamilcar ordered his two central detachments to withdraw; the two flank detachments were ordered to sail toward the transports and destroy them. The advance Roman detachments, however, defeated the enemy's central detachments, which were forced to flee; they then returned to aid the rear detachments, which had waged a stubborn battle with the Carthaginians' flank detachments, and proceeded to rout the enemy. Of the Cathaginian ships, 30 were sunk and 64 captured. The Romans lost 24 ships. The victory at Ecnomus made it possible for the Romans to land safely in North Africa.

[29–1770–4]

ECOBIOMORPH, a certain type of adaptive structure, including related physiological features, characterizing a group of plants that usually are not related but that inhabit similar environments. The term was proposed by E. M. Lavrenko in 1965 to replace the term "life form," or "biomorph." It differs from the latter two in that it takes into account physiological as well as morphological features. [29–1771–1]

ECOGENESIS, the development in the course of evolution of ecological relations between organisms and their environment. The term "ecogenesis" was introduced in 1904 by the German scientist K. Detto, who used it to denote the process of adaptation in general. Ecogenesis is sometimes defined as the process whereby new forms appear under the influence of the environment. Ecogenesis, or ecogenetic succession, is also used for floral succession, the main cause of which is a change in ecological conditions engendered by the plants themselves (endogenous succession) or by external factors (hologenetic succession). [29–1771–2]

ECOLOGICAL AMPLITUDE (also ecological valence), the degree of adaptation of a living organism to changes in its environment. A species trait, ecological amplitude is expressed quantitatively as the range of environmental changes within which a given species is able to carry on its normal vital activities.

Ecological amplitude can be examined as either the reaction of a species to individual environmental factors or to an aggregate of factors. In the first case, species that are able to tolerate a wide range of changes in the strength of an acting factor are designated by a term consisting of the name of the given factor and the prefix "eury," such as eurythermal (referring to the effects of temperature), euryhaline (salinity), and eurybathic (depth). Species that are adapted to only a narrow range of changes in a given factor are designated by the same term with the prefix "steno," for example, stenothermal and stenohaline. Species that exhibit broad ecological amplitude with respect to an aggregate of factors are called eurybionts, while species with low adaptability are called stenobionts. Inasmuch as euroky makes it possible for a species to occupy a variety of habitats while stenoky sharply curtails the range of suitable habitats, these two groups are often referred to as eurytopic and stenotopic, respectively.

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I. A. SHILOV [29–1771–3]

ECOLOGICAL NICHE, the role of a species (more precisely, its population) in a biological community (biocenosis). The interaction of a given species (population) with other members of the community establishes its role in the cycle of matter, determined by food and competition ties in the biocenosis.

The term "ecological niche" was proposed by the American scientist J. Grinnell (1917). The interpretation of the ecological niche as the position of a species in the food chain of one or several biocenoses was proposed by the British ecologist C. Elton (1927). Such an interpretation makes it possible to assign a quantitative value to the ecological niche of each species or its individual populations. In order to accomplish this, a comparison is made, within a system of coordinates, between the abundance of a species (the number of individuals or the biomass) and an indicator of the temperature, humidity, or some other environmental factor. In this way, it is possible to establish the optimum zone and the limits tolerated by a species (the maximum and minimum for each factor or combination of factors).

As a rule, every species occupies a specific ecological niche, to which it has become adapted by the entire course of evolutionary development. The location that a species (population) occupies in space (spatial niche) is usually called the habitat.

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N. P. NAUMOV [29–1772–1]

ECOLOGY, a biological science that studies the organization and functioning of supraorganismic systems at various levels: populations, species, biocenoses (communities), ecosystems, biogeocenoses, and the biosphere. Ecology is also often defined as the science of the interrelations of organisms and the science of the relations between organisms and their environment. Modern ecology also studies man's interaction with the biosphere.

Main subdivisions. Ecology is subdivided into general ecology, which investigates the fundamental principles of the organization and functioning of various supraorganismic systems, and specialized ecology, which is restricted to the study of concrete groups of a given taxonomic rank.

General ecology is classified according to the organizational levels of the supraorganismic systems. Population ecology (*see* POPULATION ECOLOGY) studies populations—assemblages of individuals of a particular species united by a common territory and gene pool (*see* GENE POOL). Community ecology (or biocenology) studies the structure and dynamics of natural communities (or cenoses), which are assemblages of populations of different species living together (*see* POPULATION). Biogeocenology is a subdivision of general ecology that studies ecosystems (biogeocenoses). (*See* BIOGEOCENOLOGY; ECOSYSTEM; and BIOGEOCENOSIS.) In the USSR and some European countries, biogeocenology is sometimes treated as an independent science, separate from ecology. In the USA, Great Britain, and many other countries, the term "ecosystem" is more commonly used than "biogeocenosis," and biogeocenology is not differentiated as a separate science.

Specialized ecology comprises plant ecology and animal ecology. Microbial ecology and the ecology of fungi have emerged relatively recently. A more detailed subdivision of specialized ecology is also proper, such as the ecology of vertebrates, the ecology of mammals, and the ecology of the blue hare.

There is no consensus among scientists with respect to the principles according to which ecology should be subdivided into general and specialized ecology. According to some, the main object of study of ecology is the ecosystem, while the subject of specialized ecology reflects the subdivision of ecosystems, for example, terrestrial and aquatic ecosystems; aquatic ecosystems are subdivided into marine and freshwater ecosystems, freshwater ecosystems are, in turn, subdivided into the ecosystems of rivers, lakes, reservoirs, and so on. Hydrobiology studies the ecology of aquatic organisms and the systems that they form (*see* HYDROBIOLOGY).

Ecology is often also subdivided into autecology, which studies the relationship of individual species to the environment, chiefly abiotic factors, and synecology, which studies communities and biogeocenoses; this subdivision was proposed by the Swiss botanist Schröter (*see* AUTECOLOGY and SYNECOLOGY). The two are linked by population ecology.

There is no consensus in the world literature regarding the definition of plant ecology. In the USSR and European countries, with the exception of Great Britain, plant ecology is limited to autecology, and the study of plant communities is relegated to phytocoenology or geobotany (*see* PHYTOCOENOLOGY). In the USA and Great Britain, plant ecology studies both individual species and communities.

Many branches of ecology have a manifestly practical purpose, for example, agricultural ecology, which studies agricultural ecosystems created by man (*see* AGROPHYTINOENOSIS).

The effect of the environment on human society and the features of urbanized biogeocenoses are the subject of human ecology, which emerged in the mid-20th century. The increased danger of the radioactive contamination of the environment gave rise to radioecology (*see* RADIOECOLOGY). The study of the biosphere, which as yet has no name, is being developed in close association with biogeochemistry (*see* BIOGEOCHEMISTRY). The relations between organisms and the abiotic and biotic environment in past geological epochs and the problems of reconstructing ancient biocenoses from buried remains is the subject of paleoecology (*see* PALEOECOLOGY).

History. The term *oekologie* was proposed in 1866 by the German zoologist E. Haeckel, who defined ecology as the general science of the relations of organisms to their environment, to which are relegated, in the broad sense, all "conditions of existence."

The history of ecology can be traced back to the works of ancient Greek and Roman natural philosophers. Valuable ecological observations are found in the works of 18th-century naturalists, especially C. Linnaeus, G. de Buffon, P. S. Pallas, and I. I. Lepekhin. The concept of ecology originated in the sciences of botany and zoology. Its development was influenced, first and foremost, by works that studied the mode of life of organisms and the distribution and development of organisms as a function of various environmental factors. The importance of research on the geographical distribution of plants was especially significant, since it was ecological by nature from the outset.

In the early 19th century, the German naturalist A. von Humboldt, on the basis of long-term observations in Central and South America, showed the dependence of altitudinal and latitudinal zonality on temperature and gave the first classification of the life forms of plants (*see* LIFE FORM). The Swiss botanist A. P. de Candolle even distinguished the science of "epirrheology" (1832) for the study of the interrelations of plants and the environment.

The work of K. F. Rul'e was important in the development of ecology in Russia. Rul'e emphasized the necessity of studying animals in relation to other organisms and to the abiotic environment and gave special consideration to the role of conditions created by man (the anthropogenic factor). N. A. Severtsov's *Periodic Phenomena in the Life of Animals, Birds, and Reptiles of Voronezh Province* (1855) was a true ecological study, analyzing extensive material on seasonal phenomena in the life of terrestrial vertebrates of Voronezh Province.

By the mid-19th century, many successes were achieved in agricultural chemistry. According to the law of the minimum, formulated by the German scientist J. von Liebig, under actual conditions not all nutrient substances limit a harvest but only those that are present in quantities that are inadequate for the plant. With certain refinements, this principle later became one of the most important ones in examining the factors that limit the reproduction or growth of organisms.

C. Darwin's *The Origin of Species* (1859) was instrumental in the establishment of ecology as an independent science. It emphasized the importance of studying the mechanisms of the struggle for survival and of intraspecific and interspecific relations. Under the direct influence of Darwin's idea, Haeckel concluded that ecology must be established as a separate biological discipline. An important stage in the development of ecology was the acceptance of the need for a holistic approach to the study of natural plant and animal communities, which was facilitated by the introduction of special terms for describing such communities. The term "biocenosis," proposed by the German zoologist K. Möbius in 1877, quickly spread throughout the European, including Russian, scientific literature. The term "community" is more commonly used by American scientists.

At the beginning of the 20th century, the complex problem was posed of studying the assemblage of plants and animals in their relation to the abiotic environment. To this end, much success was achieved in the study of inland bodies of water, which can more easily be viewed as integral systems and described by means of generalized indicators (the Swiss scientist F. Forel and the German researcher C. Knauth). The study of various forms of life in an aquatic environment came to be called hydrobiology. Hydrobiologists were the first to study the role of organisms in the cycle of matter and the transformation of energy in nature (the American scientists E. Birge and C. Juday). They formulated concepts that proved important for the development of ecology in general, such as biomass (the German scientist R. Demoll) and productivity (the German scientist A. Thienemann). (*See* BIOMASS.)

The quantitative study of the cycle of matter on land began in the 1930's, 1940's, and 1950's. Necessary prerequisites for this were the advances in soil science, which originated in Russia; of particular importance was V. V. Dokuchaev's introduction, at the end of the 19th century, of the idea of the soil as a special body in natural history, created by the interaction of the abiotic and biotic components of the environment. V. I. Vernadskii described such natural bodies as biologically integral.

Much of the ecological research on land in the late 19th and early 20th centuries was carried out independently by botanists and zoologists, reflected in the publication of the first ecological summaries: on plant ecology (more precisely, ecological geography) by the Danish botanist J. Warming (1895) and the German scientist A. Schimper (1898) and on animal ecology by the German zoologist R. Hesse (1912) and the American scientist C. Adams (1913). At the beginning of the 20th century, attention was focused on plant communities. Phytosociology (later called phytocoenology), which studies the organizational regularities of plant communities (I. K. Pachoskii, S. N. Korzhinskii, P. N. Krylov), emerged in Russia (*see* PHYTOCOENOLOGY). The regularities of the process of community replacement—succession (*see* SUCCESSION)—were also studied intensively (the Finnish scientist R. Hult and the American scientist H. Cowles). The American botanist F. Clements, who studied succession, attempted to draw analogies between the structure and development of the organism and the community. Among the milestones in the study of plant communities were G. F. Morozov's *A Study of the Forest* (1912) and V. N. Sukachev's *Introduction to the Study of Plant Communities* (1915). Prominent scientific schools of phytocoenology developed in Western Europe, including the Franco-Swiss school, first in Zürich (C. Schröter, E. Rübel, H. Brockman-Jerosch) and then in Montpellier (J. Braun-Blanquet), and the Scandinavian school in Uppsala (G. Du Rietz).

Animal ecologists also became increasingly interested in the study of communities. Consequently, the American scientist V. Shelford, who contributed much to various areas of ecology, defined ecology as the science of communities, relegating autecology entirely to physiology. Theoretical ecology was greatly influenced by C. Elton's *Animal Ecology* (1927), in which the problem of studying the organization (structure) of communities was formulated, the regularities of the relations between the numbers of organisms at different trophic levels (pyramid of numbers) were described, the concept of the ecological niche, proposed earlier by the American zoologist J. Grinnell (1917), was clarified, and attention was focused on variations in the size of populations. The experimental study of populations was begun in animal ecology. The American scientist R. Chapman introduced the concept of biotic potential, which characterizes the rate of growth (reproduction and survival) of a population. The Australian entomologist A. Nicholson (1933) described population dynamics as a self-regulating process. By the 1930's, a population came to be understood in animal ecology as an integral assemblage of individuals that was endowed with certain characteristics and that could not be reduced to the simple sum of its parts.

In the 1920's and 1930's, the methods of mathematical statistics (including those used earlier in demography) and modeling began to be used in ecology. The Italian researcher V. Volterra (1926) and the American scientist A. Lotka (1925) developed mathematical models of the growth of individual populations and

of the dynamics of populations interrelated by competition and predation.

In the years after the Great October Socialist Revolution, Soviet ecologists began an intensive study of the plants and animals in various topographical and geographical zones of the USSR. L. G. Ramenskii developed the concept of the continuum of the plant cover (*see* CONTINUUM OF VEGETATION) and introduced the concept of the ecological individuality of a species and the concept of consortium (*see* CONSORTIUM).

The Soviet scientist V. I. Vernadskii established the study of the biosphere in the 1920's and 1930's (*see* BIOSPHERE). His ideas greatly influenced ecological thought in the USSR and abroad, generating particular interest in the 1950's and 1960's, in great measure in connection with the increased threat of global disruption of the biosphere as a result of man's activities.

The experimental work of Soviet scientist G. F. Gauze (Gause) on protozoans and microorganisms became internationally known. Gauze formulated the principle of competitive exclusion, according to which two species occupying the same ecological niche cannot exist in the same place for an unlimited period of time.

Of great importance in the USSR in the dissemination of ecological ideas and the training of ecological researchers were D. N. Kashkarov's compendiums *The Environment and the Community* (1933) and *The Fundamentals of Animal Ecology* (1938). As ecology developed, its content and definition gradually changed. Thus, in the 1930's ecology emphasized the study of the adaptation of organisms to their environment. The study of communities of organisms was sometimes considered to be the subject of an independent science—biocenology. Using extensive material on the population dynamics of vertebrates, S. A. Severtsov tied in (1941) new sociological ideas with concepts of the theory of evolution, defining ecology as the science of the mechanisms of the struggle for survival.

Soviet plant ecologists are continuing the experimental course set by V. N. Sukachev in phytocoenology, whose main task is the study of the mechanisms of intraspecific and interspecific competition.

In the 1930's, 1940's, and 1950's, animal ecologists in the USSR conducted field studies: they analyzed fluctuations in the numbers of harmful rodents and game mammals (B. S. Vinogradov, N. P. Naumov, O. I. Semenov-Tian-Shanskii, S. P. Naumov, A. N. Formozov), studied the effects of snow cover on animals (A. N. Formozov, A. A. Nasimovich, V. P. Teplov), and investigated soil invertebrates (M. S. Giliarov).

The extensive use of quantitative methods also became characteristic of marine hydrobiology (S. A. Zernov, I. I. Mesiatsev, A. A. Shorygin, V. G. Bogorov, V. P. Vorob'ev), in whose development the scientific, organizational, and pedagogical activities of L. A. Zenkevich played an important part. A new direction emerged in hydrobiology, involving the study of the biological productivity of bodies of water (*see* BIOLOGICAL PRODUCTIVITY). Important work was carried out in this area by Soviet scientists, particularly at the Kosino Limnological Station near Moscow by L. L. Rossolimo, E. V. Borutskii, S. N. Kuznetsov, G. S. Korzinkin, and others. The primary production of a body of water was first determined there from the rate of photosynthesis (G. G. Vinberg, 1932).

The formulation of the concept of ecosystem and the concept of biogeocenosis was of great significance for the development of ecology. The English botanist A. Tansley defined (1935) an ecosystem as any assemblage of organisms living together (autotrophs and heterotrophs), along with the abiotic environment necessary for their existence. The more specific concept of a biogeocenosis, as established by V. N. Sukachev, presupposes the unity of the plants, animals, and microorganisms that inhabit a particular section of the earth's surface, taking into account its terrain, climate, soil, and hydrological conditions. The introduction of these concepts helped bring together the different divisions of ecology and made it possible to pose such general problems in ecology as the study of the cycle of matter and energy flow in an ecosystem. The concept of trophic (feeding) levels made it possible to describe quantitatively the process of the conversion of matter and energy upon moving from one level to another (the American ecologists G. E. Hutchinson, R. Lindeman, and H. Odum). The Soviet scientist V. S. Ivlev, who investigated the energy and production aspects of trophic levels, is also known for his research into the quantitative characteristics of fish nutrition.

In the 1940's and 1950's the Soviet botanist T. A. Rabotnov, and in the 1960's A. A. Uranov, developed the study of plant populations. Similar work was later carried out abroad (the British scientist J. Harper).

Along with the increased study of populations and ecosystems, autecology also developed in the USSR. Autecology is closely related to physiology and makes extensive use of experimental methods (I. D. Strel'nikov, I. V. Kozhanchikov, V. V. Alpatov, N. I. Kalabukhov, A. D. Slonim). The Soviet scientist A. S. Danilevskii made important contributions to the study of photoperiodism in animals. In general, ecology in the USSR is characterized by practically oriented research, with emphasis on the solution of national economic problems. Ecological trends in parasitology (V. A. Dogel', K. I. Skriabin, V. N. Beklemishev) led to the new study of the natural sources of human diseases and diseases of domestic animals (E. N. Pavlovskii and others).

General ecology was established in the 1950's. Its development was predicated on the following: the achievements of hydrobiology, primarily the energy and production aspects; the interpretation of much factual material gathered on the ecology of terrestrial animals and on plant ecology; the formulation of the concepts of ecosystem and biogeocenosis; and the wide application of mathematical methods, a systematic approach, and conceptions about the levels of organization of living matter. In the first compendiums on general ecology (the American ecologists G. Clarke and E. Odum), much attention was devoted to ecosystems. General ecology also studies the basic principles of the organization of populations and communities.

A rapid growth in ecological research was observed throughout the world in the 1960's and 1970's. Among the reasons for this are the acceptance of ecology as a science, the precise definition of the objects and methods of study, and the pressing need to improve the productivity of ecosystems and protect the environment, a need that has increased dramatically in the course of the scientific and technological revolution. Also observed was a parallel growth in the theoretical aspects of ecology (the American ecologist R. MacArthur and the Spanish ecologist R. Margalef), which make extensive use of mathematical modeling.

Modern ecology is characterized by the study of processes that encompass the entire biosphere. The interaction between man and the biosphere is studied particularly closely. The main aim of the International Biological Program, which was inaugurated in 1964, was to study the productivity of ecosystems in various parts of the world. In carrying out the program, the methods of determining the productivity of various trophic links in the food chain were standardized. Research on biological productivity was extended through the international Man and the Biosphere program, in which attention is focused on the analysis of the effects of man's activities on the biosphere. Ecologists of different countries are united in the International Association for Ecologists (INTECOL), whose first congress was held in 1974 in The Hague.

Principal tasks and problems. The principal problem faced by ecology at the present time is the detailed study, using quantitative methods, of the fundamentals of the structure and functioning of natural and man-made systems. The study of populations, that is, natural assemblages of individuals of a particular species, who are at the same time elements of the species system and of the biogeocenotic system, has shown that populations have complex hierarchical structures (the Soviet scientist N. P. Naumov). Population ecology studies the spatial distribution of individuals and the age, sex, and ethological (behavioral) aspects of the population, among other things. A central question is that of population dynamics and the related regulatory mechanisms, which are viewed as processes involving intrapopulational mechanisms (for example, competition for food) and biocenotic mechanisms (the effect of predators, parasites, and pathogens and epizootic factors). An important contribution to population ecology was made by the Soviet scientist S. S. Shvarts. The Soviet entomologist G. A. Viktorov showed that the orderly succession of regulating mechanisms is a function of the size of a population. In the study

of the regulation of the size of populations of mammals, much attention is devoted to the analysis of interrelated behavioral, physiological, and hormonal mechanisms. Particular attention is focused on the population dynamics of practically important species, such as agricultural and forest pests, carriers and transmitters of pathogens, and species that are hunted or fished. Many problems in population ecology are solved using model laboratory populations of various organisms. Demographic and mathematical modeling methods are used to evaluate the rate of population growth. The relationship between the genetic composition of a population and its ecological characteristics is one of the problems of evolutionary ecology. Of particular importance is the study of the interaction between populations of different species—competition and predation. In the study of competition, use is made of the concept of ecological niche, for which methods of quantitative analysis are being developed.

Much attention is focused on the study of the structure and functioning of communities (biocenoses) and on the establishment of regularities in the number of species in a community. The relationship between the number and the biomass of different species is also subject to certain rules. The species composition of a community changes in the course of its development (succession); it is also affected by various factors associated with the agricultural activities of man. Another important task is the study of the stability of communities and the ability of communities to withstand adverse conditions.

When studying ecosystems, the opportunity presents itself of quantitatively analyzing the cycle of matter and changes in energy flow accompanying a transition from one feeding level to another. This type of production-energy approach at the population and biocenotic levels makes it possible to compare various natural and man-made ecosystems.

The principal stages in the cycle of matter and the flow of energy are well known for freshwater ecosystems. For some bodies of water, a relationship has been established between the energy that is fixed by green plants within the body of water itself and the energy that comes in with organic matter from terrestrial ecosystems. Such research makes it possible to attempt a solution of the little-studied problem of the exchange of matter and energy between different ecosystems. Ecology has yet to deal with the complex problem of the quantitative evaluation of production processes in the ocean. The extent of primary production in aquatic ecosystems is established from the oxygen output rate or by the incorporation of radioactive tracers in photosynthesis. Despite great procedural complexities, success has been achieved in production-energy research on land.

The cycle of biogenic elements and primary production in the principal types of land ecosystems have been studied. It has been demonstrated that the total volume of primary production on land is approximately double that of the total production of the world ocean and that the productivity of tropical forests is particularly high. The earth's surface is photographed in the visible and infrared regions of the spectrum from spacecraft in order to evaluate the biomass reserves in terrestrial ecosystems. Research on the utilization of organic matter synthesized by autotrophs has shown that on land only a small portion of organic matter is used directly by herbivorous animals, while the bulk of it, in the form of dead plant tissue, is consumed by saprophagous and saprophytic organisms. In addition to feeding links, other links exist between organisms in ecosystems, particularly those involving metabolic products released by organisms into the environment. They are being actively studied in both terrestrial and aquatic ecosystems.

The study of the biosphere as a whole is particularly important, including the determination of primary production and decomposition worldwide and the global cycle of biogenic elements. These problems can only be solved through the concerted efforts of scientists from various countries.

The diversity of the phenomena studied by modern ecology explains its extensive ties with numerous natural and humanistic sciences. Population ecology involves genetics, physiology, ethology, biogeography, taxonomy, and demography. Biogeocenology involves landscape science, biogeochemistry, soil science, hydrology, hydrochemistry, climatology, and other environmental sciences. Under the influence of ecology, many biological sciences have begun examining various aspects of life from the ecological point of view. These include environmental physiology (also ecophysiology or physiological ecology), ecological morphology, ecological cytology, and ecological genetics.

Advances in mathematics, physics, chemistry, and philosophy have had a significant effect on ecology. In its turn, ecology has posed new mathematical problems, especially in statistics and modeling. Ecology has made important contributions to the development of ideas about the systems organization of living matter. Ecology's ties with the humanities—sociology, political economy, jurisprudence, and ethics—are growing significantly. Through the study of agrocenoses ecology is closely linked with the entire range of agricultural sciences. Ecology and biogeochemistry together study the processes of migration in the biosphere of biogenic elements, which limit the production of agricultural products (*see* BIOGENIC ELEMENTS).

Practical importance. At the present stage of the development of human society, with man's increasing influence on the biosphere as a result of the scientific and technological revolution, there has been a dramatic rise in the practical importance of ecology. Ecology must serve as the basis of all measures regarding the utilization and protection of natural resources and the maintenance of the environment in a condition favorable to man (*see* CONSERVATION). An understanding of the basic principles of the transformation of matter and energy in natural ecosystems provides a theoretical basis for the development of practical measures for increasing the quantity and improving the quality of food products produced in the biosphere. The investigation of the natural mechanisms that control the size of populations serves as the basis for the planning and development of measures for controlling the number of economically important species. A knowledge of the fundamental factors of population dynamics is helpful in combating agricultural and forest pests and transmitters and carriers of diseases. Thus, the achievements of ecology make it possible to revise measures against agricultural and forest pests, shifting from attempts to completely eradicate them using broad-spectrum pesticides, which are harmful to the entire biogeocenosis, to the effective control of the number of certain species using primarily biological and agrotechnical methods, with only limited use of chemical methods.

Ecology provides a theoretical basis for the development of measures for the domestication and other forms of efficient utilization of wild plants and animals. The efficient management of fishing, fish culture, and hunting is based on ecological data.

Ecology studies the interaction between agricultural and natural ecosystems and the relationship between cultivated and natural landscapes. One of the most important practical tasks of ecology is the study of the eutrophication of inland bodies of water, occurring as a result of the disruption of their biological and hydrochemical regimes and resulting in such consequences unfavorable to man as the mass proliferation of planktonic blue-green algae, the disappearance of valuable fish species, and the deterioration of water quality. The development of measures for the protection and efficient utilization of nature in the wild, the creation of a network of wildlife preserves, sanctuaries, and national parks, and landscape planning are also carried out on the basis of recommendations developed by ecologists. A highly practical direction is characteristic of human ecology (*see below*: Social aspects).

In developing the national economy, the Communist Party of the Soviet Union singles out as its most important objectives the efficient utilization of natural resources and conservation, the achievement of which requires the broad dissemination of ecological knowledge among all strata of society and the formation of basic scientific and ecological concepts. The responsibility of the Soviet population to respect nature and protect its treasures is written into the Constitution of the USSR.

Principal scientific organizations and periodicals. In the USSR ecological research is conducted at institutes and various organizations of the Academy of Sciences of the USSR, including the A. N. Severtsov Institute of Evolutionary Morphology and Animal Ecology in Moscow, the Institute of Animal and Plant Ecology in Sverdlovsk, the Zoological and Botanical institutes in Leningrad, the Forestry Laboratory in Moscow, the Institute of Geography in Moscow, the Institute of Biology in Novosibirsk,

and the Institute of Biology and Soil Science in Vladivostok. Ecological research is also carried out by the zoological and botanical institutes of the academies of sciences of the Union republics, the Institute of Deserts of the Academy of Sciences of the Turkmen SSR in Ashkhabad, and the All-Union Institute of Plant Protection of the V. I. Lenin All-Union Academy of Agricultural Sciences in Pushkin, near Leningrad.

Research on aquatic ecology is carried out at the Institute of the Biology of Inland Waters of the Academy of Sciences of the USSR in the settlement of Borok, Yaroslavl' Oblast, the Institute of Hydrobiology of the Academy of Sciences of the Ukrainian SSR in Kiev, the Institute of Oceanography in Moscow, the All-Union Scientific Research Institute of Fisheries and Oceanography in Moscow, and the Institute of the Biology of Southern Seas of the Academy of Sciences of the Ukrainian SSR in Sevastopol'. Ecological research is also carried out at scientific institutions and in sanctuaries, hunting preserves, antiplague institutions, health and epidomiological stations, and other antiepidemic institutions.

The main Russian publications that discuss the results of ecological research are *Zhurnal obshchei biologii* (Journal of General Biology; since 1940), *Ekologiia* (Ecology; 1970), *Zoologicheskii zhurnal* (Zoological Journal; 1916), *Botanicheskii zhurnal* (Botanical Journal; 1916), *Biulleten' Moskovskogo obshchestva ispytatelei prirody: Otdel biologicheskii* (Bulletin of the Moscow Society of Naturalists: Biological Section; 1922), *Gidrobiologicheskii zhurnal* (Hydrobiological Journal; 1965), *Okeanologiia* (Oceanography; 1961), and *Biologiia moria* (Marine Biology; 1975). Problems of applied ecology are dealt with in the journals *Lesovedenie* (Forestry; since 1967), *Okhota i okhotnich'e khoziaistvo* (Hunting and Game Management; 1955), *Rybovodstvo i rybolovstvo* (Fish Farming and Fishing; 1958), *Vodnye resursy* (Water Resources; 1972), and *Zashchita rastenii* (Plant Protection; 1956).

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A. M. GILIAROV and N. P. NAUMOV

Social aspects. The scientific and technological revolution is closely linked with the unceasing growth and expansion of society's industrial activities. This has aroused increasing interest in ecological problems, particularly the following: the direct and indirect effects of industrial activity on the composition and properties of the atmosphere; the thermal regime of the planet; background radiation; the pollution of the world ocean and inland bodies of water; the decrease in freshwater reserves and nonrenewable sources of energy and raw materials; the release into the biosphere of wastes that have not been detoxified or wastes that cannot be treated biochemically; the ecological effects of anthropogenic, particularly urbanized, landscapes; and the effects of ecological factors on man's physical and mental well-being and on the gene pool of human populations.

The social aspects of ecology became the subject of special scientific research in the 20th century. As early as the 19th century, G. P. Marsh, after analyzing the many ways in which man had violated the balance of nature, proposed a program for its protection. A number of 20th-century French geographers (P. Vidal de la Blache, J. Brunhes, E. de Martonne) advanced the idea of the geography of man, which studies phenomena on our planet involving human activity. Man's influence on the geographic landscape and the embodiment of his activities in social space have been studied by representatives of the 20th-century Dutch and French schools of geography (L. Febvre, M. Sorre) and by the constructive school of geography, developed by the Soviet scientists A. A. Grigor'ev and I. P. Gerasimov.

The development of geochemistry and biogeochemistry has transformed man's industrial activities into a powerful geochemical factor, heralding new eras in geology—the anthropogenic era (the Russian geologist A. P. Pavlov) and the psychozoic era (the American scientist C. Schuchert). V. I. Vernadskii's teachings about the biosphere and its transformation into the noosphere are tied in with new views on the geological consequences of the social activities of mankind.

Social aspects of ecology are also the concern of historical geography, which studies the links between ethnic groups and the natural environment, and especially of sociology, particularly social ecology, which studies the interrelations of social groups and the environment. The founders of the Chicago school of sociology (R. Park, E. Burgess, R. D. McKenzie), who formulated one of the first theories of human ecology, or social ecology, showed the relationship between the spatial organization of a city, the location of various social groups, and the mechanisms of economic competition.

The subject matter and status of human ecology are a matter of dispute; human ecology is variously defined as the systematic study of the environment, the science of the social mechanisms of interaction between human society and the environment, or the ecological science emphasizing man as a biological species (*Homo sapiens*). Nevertheless, ecology has significantly changed the thinking of both naturalists and humanists, having given rise to new theoretical approaches and methodological orientations in various sciences and to new ecological ideas. Using a systems approach, ecologists analyze the natural environment as a complex differentiated system whose various components are in dynamic equilibrium. They examine the earth's biosphere as the ecological niche of mankind, linking the environment and man's activities into a single "nature-society" system. They uncover man's influence on the equilibrium of natural ecosystems and pose the problem of controlling and improving man's interrelation with nature.

Ecological ideas are reflected in various proposals to reorient technology and industry. Some are associated with a mood of ecological pessimism and alarmism, with the revival of reactionary romantic Rousseauistic concepts, according to which the main cause of the ecological crisis is scientific and technological progress itself, and with the emergence of such doctrines as limits to growth and steady state, according to which it is imperative to limit considerably or end entirely technological and economic development.

Other ecologists, in contrast to this pessimistic view of man's future and the prospects for the utilization of nature, have proposed a radical restructuring of technology, ridding it of the miscalculations that have resulted in environmental pollution (for example, the program of alternative science and technology proposed by the American researcher D. Gabor and the model of closed industrial cycles developed by the American ecologist B. Commoner), and the development of new equipment and technological processes (transportation, power engineering) that are ecologically acceptable.

The realization of the importance of the social aspects of ecology has resulted in the emergence of ecological economics, which takes into account not only the costs of the utilization of natural resources but also the costs of protecting and rehabilitating the exosphere. It emphasizes not just profitability and productivity but also the ecological basis of technical innovations and ecological control over the planning of industry and the utilization of nature. Key steps in the development of ecological economics were taken by Soviet economists (S. G. Strumilin and others).

The development of ecology has been a powerful force in the emergence of new human values—the preservation of ecosystems, the view of the earth as a unique ecosystem, and a careful approach to all that is living. A tendency toward the ecological reorientation of ethics is evident in various concepts in ethics, for example, A. Schweitzer's teachings about reverence for life, the land ethic of the American ecologist A. Leopold, K. E. Tsiolkovskii's cosmic ethics, and the ethics of the love of life developed by the Soviet biologist D. P. Filatov.

The development of ecological thinking under capitalism conflicts with the absence of adequate mechanisms for the efficient control of the exchange of matter between society and nature. Under these circumstances, the negative consequences of these actions on the biosphere are so imposing that they are referred to as the ecological crisis.

The prerequisites for the rational control by man of his exchange of matter with nature have been created for the first time in a socialist society. Early in its existence, the Soviet government was not always able to devote proper attention to ecological problems, as a result of which certain large-scale industrial measures were not given a comprehensive ecological basis. In contrast to capitalist countries, where ecological measures are unavoidably of a limited nature, the socialist social order makes it possible to carry out systematically comprehensive long-term programs intended to preserve and improve the environment and to overcome the negative ecological consequences of scientific and technological progress.

The global nature of man's influence on the environment calls for international cooperation and the implementation of multinational and intergovernmental measures.

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ECONOMETRICS, the study of the specific quantitative regularities and interrelationships of economic objects and processes by means of mathematical and statistical techniques and models. The models used in econometrics yield numerical results on the basis of statistical, forecasting, and planning data. Econometrics is sometimes broadly construed as the modeling of economic processes in general, including abstract theoretical models.

The potential uses of econometrics depend on the degree to which a model reflects the objective laws discovered by economics, on the availability and quality of the data, and on the techniques employed in their evaluation and processing. In some instances, on the other hand, econometrics makes it possible to use factual material in order to concretize and verify theoretical hypotheses and models in the economic sciences.

K. Marx noted the possibility of "mathematically deducing . . . the main laws of crises" from the analysis of such factors as price dynamics and discount rates (K. Marx and F. Engels, *Soch.*, 2nd ed., vol. 33, p. 72). Some early attempts at the mathematical formalization of economic and statistical data were made in the 19th and early 20th centuries—for example, V. Pareto's derivation of the hyperbola equation to describe income distribution in the capitalist countries (1897), the works of R. Hooker (Great Britain) on correlation analysis in economics, and the works of the

Russian statistician A. A. Chuprov. But it was not until the 1920's and 1930's that econometrics—owing particularly to the works of H. Moore and H. Schultz (USA)—emerged as an independent scientific school that combined economic theory, statistics, and mathematics. The term "econometrics" was introduced by the Polish economist P. Czompa (1910); it was adopted as a scientific term by the Norwegian economist R. Frisch (1926), who was a founder of the International Econometric Society (1930) together with the Americans I. Fisher and C. Roos.

It was within the framework of econometrics that analytical-statistical models were first developed to express the correlation between an economic process and other factors presumed to influence it. An early example of such a model was the "economic barometer," which was based on the empirically observed tendency of some business indicators to lag behind others. The model that was best known—the "Harvard barometer," which W. Mitchell helped design—proved incapable of predicting the major economic crisis of 1929–33. The failure of purely empirical constructions led to increased interest in the theoretical validation of econometric models; in bourgeois economics, such validation was based on the subjectivist theory of marginal utility, the general theory of equilibrium of the market, and the works of J. M. Keynes.

Analytical-statistical econometric models are usually represented by regression equations, whose parameters are obtained from statistical processing of the data; in most instances the relationship between variables (or their logarithms) is assumed to be linear. Such equations serve to express various functions, including demand (that is, its dependence on such factors as prices, volume of output, income, and taxes), supply, costs, imports, and exports. This category also includes production functions that reflect the technological dependence of output on the expenditure of labor and means of production. The first and simplest production function was formulated by C. Cobb and P. Douglas (USA, 1928); it was subsequently generalized by R. Solow and K. Arrow (USA), who took into account the influence of various factors—for example, scale of production and technological advances. Such regression models can be constructed for individual products, enterprises, firms, and branches, or for the national economy as a whole.

A number of multiple-factor correlation models were developed by J. Tinbergen (Netherlands) in the 1930's and by L. Klein (USA) and R. Stone (Great Britain) in the 1950's. These models describe the statistical interrelation of many variables—including production, ultimate private and state demand, prices, taxes, foreign trade, depreciation and accumulation of capital, and supply of labor power—in the economies of various capitalist countries. Such models include aggregates of hundreds of equations and identities, which increases the difficulties involved in the statistical identification of the objects under study and in the evaluation of the models' parameters.

An example of the type of model that is used to analyze the structure of the national economy is the intersector balance model, which serves to reveal intersector and interregional relations and cost components, as well as the distribution of gross output and final product. The first intersector balance of the national economy was compiled in the USSR under the supervision of P. I. Popov (1925–26). This method was subsequently developed by W. Leontief (USA). R. Frisch was among those who used this method to analyze the flow of money, thus leading to the establishment of the national accounts system adopted by the UN.

In the analysis of economic dynamics, economic growth models are used in order to examine the relationship between consumption and accumulation, with due regard to the influence of various economic factors on this process. An early model of this type, based on Marx' proposed plan of reproduction, was developed by the Soviet economist G. A. Fel'dman (1928). Various models of economic dynamics, especially geared to the analysis of the capitalist cycle, were developed abroad—for example, by Tinbergen, Frisch, M. Kalecki, J. Hicks, R. Harrod, and P. Samuelson.

Econometric methods are based on the extrapolation of trends as revealed by the statistical processing of time series. Inasmuch as extending the forecasting range of economic dynamics reduces the reliability of such methods, it is necessary to resort to expert evaluations of the changes in certain factors that are specifically associated with scientific and technological progress and sociopolitical conditions.

While the various types of models—that is, correlation, balance, and dynamic models—were developed independently of one another, today's aggregate econometric models bring together different types of analytical models in reciprocal association. Such aggregate models are extensively used for economic forecasts and for analyzing alternative economic policies; in the socialist countries they are used for alternative calculations in national economic planning. These issues are discussed in the works of V. S. Nemchinov, B. N. Mikhalevskii, A. G. Aganbegian, A. N. Efimov, E. F. Baranov, L. Ia. Berri, E. B. Ershov, F. N. Klotsvog, V. V. Kossov, L. E. Mints, S. S. Shatalin, and M. R. Eidel'man of the USSR, O. Lange of Poland, and J. Kornai of Hungary.

Many specialists define the task of econometrics as the formalized description and forecasting of economic processes based on the statistical analysis of data; they restrict econometrics to the development and application of analytical models, and sometimes they use only the traditional analytical-statistical, or regression, models. In the 1930's, however, another class of models emerged—namely, the normative models. These models make it possible not only to evaluate the varying structure and dynamics of economic objects but also to select the optimal alternative according to a given criterion of evaluation.

A significant contribution to the development of normative models was made by the Soviet scientist L. V. Kantorovich, who devised linear programming (1939); this enabled him, together with others—such as V. V. Novozhilov and A. L. Lur'e of the USSR and T. Koopmans and G. Dantzig of the USA—to formulate and resolve a broad spectrum of economic problems related to the optimal distribution and utilization of resources. The refinement of optimization methods led to new types of normative models; the works of J. Von Neumann had a major impact in this area.

Types of models vary with the nature of the variables and the form of relationship between them; for example, models may be linear or nonlinear, continuous or discrete, predetermined or stochastic. Depending on the models' specific features, appropriate methods of mathematical programming, operations research, and game theory are applied in each case. In the socialist countries, normative models are widely used in the optimization of national economic planning at all levels (as exemplified by the works of N. N. Nekrasov and N. P. Fedorenko on chemicalization and on the development of the chemical industry in the USSR). In the capitalist countries, optimization methods are applied by individual firms and are also used in the development of state programs. The USSR and other socialist countries are engaged in wide-ranging studies of the internal relationship between normative and analytical models and are developing aggregate models that incorporate both the normative and the analytical type.

Econometric research and development in the USSR are the concern of the Central Economic Mathematical Institute, the Institute of Economics and Management of Industrial Production, and the Institute of World Economics and International Relations of the Academy of Sciences of the USSR, as well as by the institutes of the State Planning Committee of the USSR and of other Union republics, and many branch institutes and higher educational institutions. Works on econometrics have been regularly published since 1965 in the journal *Ekonomika i matematicheskie metody*. The best-known journal abroad is *Econometrica* (since 1933).

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E. Z. MAIMINAS [29–1787–2]

ECONOMICALLY ACTIVE POPULATION, the segment of the population employed in the national economy, including persons engaged in private subsidiary farming. In the USSR, the economically active population is the aggregate of all persons engaged in paid or income-producing, socially useful labor.

The statistical criteria of the economically active population vary in different countries primarily according to their inclusion of economically dependent family members working in agriculture or in handicrafts. In some instances, the economically active population includes persons who do not participate in production but who have unearned income. There exists in the statistics of a number of capitalist countries, for example, the concept of the economically independent population, which comprises all persons living on their own income, including those with unearned income and those with pensions.

The percentage of the economically active population is a function of the proportion of working-age persons in the total population (a demographic factor) and of the extent of their employment (an economic-organizational factor). This percentage ranges from 35 to 50 percent in certain countries; in the USSR, it is approximately 48 percent. It is always higher for the male segment of the population. The percentage of the economically active population is considerably larger in socialist and developed capitalist countries than in developing countries. In 1970 the world's economically active population comprised more than 1.5 billion persons.

V. V. POKSHISHEVSKII [29–1844–1]

ECONOMIC AND SOCIAL COMMISSION FOR ASIA AND THE PACIFIC (ESCAP), a regional body established in 1947 by the Economic and Social Council of the United Nations. The purpose of the commission is to promote regional economic development in Asia and to support and strengthen economic cooperation among Asian countries as well as between Asian states and states on other continents. As of Jan. 1, 1980, 35 Asian and Pacific states, together with Great Britain, the Netherlands, the USA, and France, are members of ESCAP; the regional members include India, Pakistan, Afghanistan, Iran, the Mongolian People's Republic, the People's Republic of China, the USSR, and Japan. The commission conducts research; collects, summarizes, and disseminates information and statistical data; and makes recommendations to the governments of ESCAP members on all matters falling within its competence.

The highest organ of ESCAP is the plenary session, which is held once a year. Between sessions, day-to-day work is carried out by standing committees, such as the committees on industry and natural resources, trade, transport and communications, and typhoons. Conferences are held to study problems of, for example, industrialization, planning, statistics, and social development.

The executive organ of ESCAP is the Secretariat, which is located in Bangkok, Thailand. Special regional bodies that operate within the framework of ESCAP include the Council of Ministers for Asian Economic Cooperation, the Asian Industrial Development Council, the Asian Institute for Economic Development and Planning, and the Asian Statistical Institute. [29–1822–1]

ECONOMIC AND SOCIAL COUNCIL (ECOSOC), a principal organ of the United Nations. The Economic and Social Council has 54 members, which are elected by a two-thirds majority of the General Assembly for three-year terms. One-third of the membership is renewed each year.

The main tasks of ECOSOC are to carry out, under the supervision of the General Assembly, the specific functions of the UN in the field of international economic and social cooperation. Article 55 of the UN Charter defines these functions as the creation of conditions of stability and well-being that are necessary for peaceful and friendly relations among nations based on respect for the principle of equal rights and self-determination of peoples.

In order to discharge its responsibilities, ECOSOC is empowered to initiate studies, prepare reports, and make recommendations to the General Assembly, the members of the UN, and the specialized agencies of the UN. The council may call international conferences and prepare draft conventions with respect to matters falling within its competence for submission to the General Assembly. ECOSOC may enter into agreements with specialized agencies of the UN to define the terms of their relationship with the UN and may coordinate the activities of such agencies through consultation with and recommendations to the agencies. It is also empowered to assist the Security Council, furnish the Security Council with necessary information, and perform such other functions as may be assigned by the General Assembly.

Regular sessions of ECOSOC are held twice a year. Each year, the council elects a president and two vice-presidents. Decisions of the council are made by a simple majority of the members present and voting.

The standing and ad hoc committees of ECOSOC include the following: the Economic Committee; the Social Committee; the Committee on Non-Governmental Organizations; the Committee on Housing, Building, and Planning; the Committee on Natural Resources; the Committee for Program and Coordination; the Committee for Industrial Development; and the Committee on Science and Technology.

ECOSOC carries out its duties through various functional commissions, including six statistical commissions, the Population Commission, the Social Development Commission, the Commission on Human Rights, the Commission on the Status of Women, and the Commission on Narcotic Drugs. The Commission on Human Rights has a subcommission on the prevention of discrimination and the protection of national minorities.

The following regional economic commissions have been established under ECOSOC: the Economic Commission for Europe, the Economic and Social Commission for Asia and the Pacific, the Economic Commission for Latin America, the Economic Commission for Africa, and the Economic Commission for Western Asia.

The UN Children's Fund (UNICEF) was created under ECOSOC in 1946 to aid children who are victims of war and to implement measures for the protection of the health of children.

V. I. MENZHINSKII [29–1866–2]

ECONOMIC CARTOGRAPHY, the branch of cartography that is associated with economic geography and with national economic activity. Economic cartography deals with the theory, techniques, and practice of compiling and using economic maps and atlases.

In the USSR, economic cartography was developed in the early 1930's in connection with the increased need for economic maps owing to the rapid development of the republic and regional economies and of the various sectors of the national economy. Such maps were also required to illustrate the achievements of the Soviet economy and for the study of economic geography in educational institutions. Major contributions to the development of economic cartography were made by N. N. Baranskii, A. I. Preobrazhenskii, M. I. Nikishov, and V. P. Korovitsyn.

The evolution of contemporary economic cartography is associated with the growth of theoretical and systematic research in economic geography and cartography, with the use of the achievements of the scientific and technological revolution to solve the problems of planning and forecasting the development of productive forces, and with the formation of territorial-production complexes. It is also related to the fulfillment of long-term economic programs, the combination of sectoral and territorial management of production, and the development of both regional planning and environmental protection. (*See* CARTOGRAPHY.)

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A. A. LIUTYI [29–1825–1]

ECONOMIC CATEGORY, a theoretical (abstract) expression of actual production relations. The economic category as a means of reflecting the objective world through a system of scientific concepts was first analyzed scientifically by Marxism. In the methodology of political economy, economic categories are treated as stages in the cognition of production relations; they express phenomena and processes characteristic of each historical stage in the development of social production.

Economic categories form a system comprising three sets of categories: (1) general economic categories characteristic of all modes of production, such as the categories division of labor and necessary product; (2) particular economic categories common to a few modes of production, such as the categories of commodity-money relations—commodity, value, and price; and (3) specific economic categories that pertain to a specific mode of production only, such as the categories feudal rent, capital, surplus value, conformity to plan, or fixed capital.

Economic categories are also differentiated according to degree to which they reflect production relations—that is, whether they express the essence of economic processes or phenomena that are nearer the surface of economic life. Examples are value and price, surplus value and profit, conformity to plan and planning, distribution according to labor, and specific forms of wages.

Economic categories are used in the analysis of the parties specific to social production, which are treated in political economy as an embodiment or personification of objective production relations. In commodity production based on the private ownership of the means of production, a reification of production relations takes place, expressed in commodity fetishism: economic categories create a distorted view of reality in which relations between human beings act as relations between things.

Production relations manifest themselves as economic interests in any society. The scientific delineation and analysis of economic categories presupposes their use in studying the interaction and realization of economic interests in a given society.

Economic categories occupy a prominent place in the cognition and application of economic laws, especially under socialism, in which the spontaneous regulation of production through competition is replaced by the planned and conscious use of economic laws in conjunction with the planned management of the national economy.

Political economy as a science and a course of study develops a total and internally consistent system of economic categories and laws for a given mode of production. It is of great importance to delineate and differentiate the initial and basic economic category; this was done with respect to the analysis of the capitalist mode of production by K. Marx, whose ideas were further developed by V. I. Lenin, notably in his theory of imperialism. Marxist scholars in the socialist countries are engaged in working out the economic categories of socialism.

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L. I. ABALKIN [29–1826–1]

ECONOMIC COMMISSION FOR AFRICA (ECA), a regional body established in 1958 by the Economic and Social Council of the United Nations. The members of the ECA are 49 African states.

The main functions of the ECA include the study of problems of the economic and social development of the African countries, the promotion of the economic development of the African states, and the strengthening of their economic relations both with one another and with other countries. The commission makes recommendations and offers advice to its members on matters falling within its competence. It carries out appropriate studies and compiles surveys, reports, and other types of information.

The highest organ of the ECA is the plenary session, which is held every two years. Between sessions, the highest organ is either the Technical Committee of Experts, which meets once a year, or the Executive Committee, which meets every two years. The executive organ of the ECA is the Secretariat, which is located in Addis Ababa. The commission has the following four subsidiary divisions: one for North Africa, with offices in Tangier, Morocco; one for West Africa, with offices in Niamey, Niger; one for East Africa, with offices in Lusaka, Zambia; and one for Central Africa, with offices in Kinshasa, Zaïre.

The African Development Bank and the African Institute for Economic Development and Planning operate within the framework of the ECA. [29–1827–1]

ECONOMIC COMMISSION FOR EUROPE (ECE), a regional body established in 1947 by the Economic and Social Council of the United Nations. Thirty-two European states, including the USSR, the Byelorussian SSR, and the Ukrainian SSR, are members of the ECE, as are the USA and Canada. The tasks of the ECE include the promotion of trade, especially between states with different social systems; long-range economic projections and planning; scientific and technical cooperation; and the study of environmental problems. The commission makes recommendations to its members on matters falling within its competence.

The highest organ of the ECE is the plenary session, which, as a rule, is held once a year. Between sessions, day-to-day work is carried out by subsidiary bodies, such as committees, subcommittees, conferences of experts, and expert groups. The subsidiary bodies deal with specific sectors of the economy. They include the committees on electric power; ferrous metallurgy; steel; coal; gas; the chemical industry; timber; housing, building, and planning; the development of trade; inland transport; and water problems. Other subsidiary bodies are the Senior Economic Advisers to ECE Governments, the Senior Advisers to ECE Governments on Science and Technology, the Senior Advisers to ECE Governments on Environmental Problems, and the Conference of European Statisticians.

The executive organ of the ECE is the Secretariat, which is located in Geneva. The Secretariat publishes the annual *Economic Survey of Europe*, the quarterly *Economic Bulletin for Europe*, and various surveys and statistical bulletins on individual sectors of the economy. [29–1827–2]

ECONOMIC COMMISSION FOR LATIN AMERICA (ECLA), a regional body established in 1948 by the Economic and Social Council of the United Nations. The Latin American states, the USA, Great Britain, France, the Netherlands, Canada, and Spain are members of the ECLA. The purposes of the ECLA are the development and implementation of measures that promote the economic development of the Latin American states and strengthen economic cooperation both among the Latin American countries and between those countries and states on other continents. For these purposes, ECLA conducts studies of economic, social, and technical problems; collects, summarizes, and disseminates information and statistics on such problems; and offers advice and makes recommendations to its members on matters falling within its competence.

The highest organ of ECLA is the plenary session, which is held every two years. Between sessions, a committee meets periodically to review the commission's work and prepare the ECLA report for the Economic and Social Council. The permanent executive organ is the Secretariat, which is located in Santiago, Chile. It has subsidiary offices in Mexico City; Washington, D.C.; Rio de Janeiro; Montevideo; Bogotá; and Port-of-Spain.

Various subsidiary bodies operate within the framework of ECLA. They include the Central American Economic Cooperation Committee, the Trade Committee, and the High-level Governmental Committee on the Regional Evaluation of the Interna-

tional Development Strategy. The Latin American Institute for Economic and Social Planning and the Regional Center for Demographic Training and Research in Latin America operate under the aegis of ECLA. [29–1828–1]

ECONOMIC COMMISSION FOR WESTERN ASIA (ECWA), a regional body established in 1973 by the Economic and Social Council of the United Nations. The members of the ECWA are 13 Arab entities in Asia.

The purposes of the ECWA include the study of problems of the economic and social development of the countries in the region. The commission makes recommendations to its members, prepares surveys and studies, and disseminates the surveys and studies among its members.

The highest organ of the ECWA is the plenary session, which, as a rule, is held once a year. The executive organ is the Secretariat. [29–1827–3]

ECONOMIC COMPARISONS, INTERNATIONAL, the aggregate of economic and statistical techniques used in comparing various countries' economic indicators (both in physical terms and in terms of value) in close association with the scientific analysis of such techniques. International economic comparisons are employed in objective studies of the levels, structure, and trends of economic development of different countries and can thus reveal production reserves as well as potential efficiency of production.

International comparisons of physical indicators require that both the range of components and their quality be homogeneous. For example, in order to achieve comparability between the steel output of the USSR and the USA, one must take into account the steel produced at US machine-building plants, amounting to 2 or 3 million tons a year. In comparing meat production in the two countries, the official American figures are modified to take into account the production of poultry and lard. In addition, comparable physical indicators are frequently corrected because of obvious qualitative differences; for example, coal output is calculated in terms of hard coal, allowance is made for variations in the sulfur content of extracted petroleum and for the varying proportion of usable matter in mineral fertilizers, and analyses are made of the structure of rolled metal. Thus comparisons are not limited to overall production in millions of tons.

Special difficulties arise with respect to international comparisons of value indicators, which show, for example, gross and final output for different branches of the economy, labor productivity, national income, capital investments, and prime costs. The problem of international comparisons of value indicators can be solved through the consistent use of a single indicator for data from different countries, the reclassification of data from different countries into a uniform system of branch categories, and the conversion of different countries' value indicators to a single currency.

The recalculation of the original data is an essential prerequisite for their comparison; the reason is that such indicators as the national income and the final social product of socialist and capitalist countries are based on fundamentally different concepts. The same applies, albeit to a lesser degree, to international comparisons of industrial and agricultural output and capital investments.

The need for a uniform classification system stems from the fact that different countries classify various branches of production differently. For example, industrial statistics in the USA and in other capitalist countries do not take into account the cost of equipment repairs, which in the USSR is reflected in the value of industrial output; in Soviet statistics, fishing is classified under food industry, while in capitalist statistics it appears under the heading of agriculture.

Conversion to a single currency is a crucial element in comparisons of different countries' value indicators. Various methods can be used to convert national indicators to a single currency. The selection of one or another method for international comparisons depends on the research objective and on the existing statistical base for the countries being compared. Methods that have been used include calculations based on official exchange rates or on a single set of commodities (C. Clark's "international units" and S. Strumilin's "workers' consumption rations"), the use of average and individual prices of representative commodities, and direct weighting of physical indicators in terms of value. Depending on the nature of the available data, several methods are commonly used; the usual procedure is to compute two territorial indexes, correlating the currencies of the countries being compared (parities) and indexes of the volume of their output (first by individual branches or other components of the indicators being compared, with subsequent weighting for the structure of production in the countries involved). Corrections are then made for qualitative differences between products and for the varying degree of specialization of production in the countries being compared.

International comparisons of the interrelated economic indicators of various countries constitute one of the functions of international economic organizations. Thus the Statistical Office of the United Nations makes comparisons of the national accounting systems of the various countries of the world (without converting the indicators to a single currency). The Economic Commission of the Council for Mutual Economic Assistance calculates the socialist countries' national income, industrial and agricultural output, and other economic indicators.

A component of international economic comparisons is the economic and statistical analysis of trends in the economies of various countries—an analysis based on statistical indicators computed on a single conceptual base, albeit without their conversion of a single currency. The data used in such comparisons are published by the United Nations and other international organizations; this makes it possible to analyze the rates, proportions, structural changes, and dynamics of the indicators of production efficiency in various countries.

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V. M. KUDROV [29–1860–2]

ECONOMIC COMPETITION BETWEEN THE TWO WORLD SYSTEMS, a major form of global class struggle between the proletariat and bourgeoisie, involving, on the one hand, those states ruled by the working class and, on the other, those states ruled by the imperialist bourgeoisie. Economic competition between the two world systems is based on peaceful coexistence among countries with different sociopolitical systems.

A radical change in the mutual relations of countries belonging to opposing systems in the world economy took place as a result of the ceaseless efforts of the CPSU and the Soviet government to implement the peace program put forward at the Twenty-fourth Congress of the CPSU in 1971. Relations among countries of the two world systems, previously marked by open hostility and even military confrontation, now shifted to a truly peaceful coexistence based on purposeful and mutually advantageous long-term cooperation (*see* INTERNATIONAL ECONOMIC COOPERATION).

The conditions for coexistence and cooperation on a broad front came about through the strengthening of the socialist economy, a fundamental realignment of world forces in favor of socialism, and the recognition by the leaders of several capitalist countries that stable trade and other mutually advantageous relations with socialist countries were both necessary and economically advisable.

Competition between the two opposing socioeconomic systems, which is objective and global, has economic, scientific, technological, political, ideological, and military aspects. While socialism was still weak and was struggling to establish itself, the ruling circles in imperialist countries sought to smother it by means of economic blockades and military intervention. In that period, competition between the two systems was primarily political and military in nature. As the balance of forces changed, as the socialist economy became stronger, as a developed socialist society was constructed in the USSR, and as the socialist countries became better able to defend themselves, competition between the two systems shifted to the areas of economics and of science and technology.

V. I. Lenin pointed out that socialism would decisively influence world developments through its economic successes and through the strengthening of its economy. "The struggle in this field," he wrote, "has now become global. Once we solve this problem, we shall have certainly and finally won on an international scale" (*Poln. sobr. soch.*, 5th ed., vol. 43, p. 341). The new social order conquers the old through its greater social productivity of labor: "those who have the greatest technical equipment, organisation and discipline, and the best machines," Lenin stated, "will gain the upper hand" (*ibid.*, vol. 36, p. 116).

Historically, economic competition can be divided into three stages. During the first stage, which lasted from the October Revolution of 1917 to the formation of the world socialist system, socialism was represented virtually by one country—the USSR. In the second stage, from the end of World War II to the end of the 1960's, the advantages of the world socialist economic system developed and became apparent. In the present stage which began in the late 1960's and early 1970's, the world socialist economic system is becoming more integrated.

The results of economic competition between the USSR and the USA are of major importance in the economic competition between the two world systems: in the mid-1970's the USSR accounted for approximately 50 percent of the industrial output of the socialist countries, and the USA accounted for nearly 40 percent of the industrial output of the capitalist countries. The USSR is responsible for approximately 20 percent of world industrial production. In the 1960's and 1970's the USSR achieved important successes in several areas of economic development, thereby reducing the gap between the levels of development of the USSR and USA.

In 1950 the USSR's national income and industrial output were less than one-third the USA's; in 1976 the USSR's national income was greater than two-thirds, and industrial production was greater than four-fifths, the USA's. In industry the USSR comes closest to the USA in the production of equipment and building materials—that is, in the branches that create the framework of industry. Taken as a whole, the output of industrial means of production in the USSR is approximately 90 percent of that in the USA, and the USSR's output is more than 60 percent of the USA's.

Economically, prerevolutionary Russia lagged 50–100 years behind some of the leading capitalist countries; as early as the 1930's, however, the economy of the USSR, as measured by the volume of output, ranked first in Europe and second in the world. In the mid-1970's the Soviet Union surpassed the USA in the production of coal, petroleum, iron, chromium, manganese ores, coke, steel, pig iron, steel pipes, metalcutting machine tools, main-line locomotives, logs, lumber, cement, prefabricated reinforced-concrete structures and structural members, woolens, butter, and a number of other important products.

Table 1. Average annual growth rates in the economies of selected socialist countries
(percent)

	National income	*Industrial output*	*Labor productivity in industry*
USSR	6.6	8.0	5.3
Bulgaria	7.7	10.4	6.8
Czechoslovakia	4.8	6.2	4.9
German Democratic Republic	4.6	6.2	5.8
Hungary	5.5	6.6	4.9
Poland	7.3	9.1	6.1
Rumania	9.4	12.9	7.3

The USSR nevertheless lags behind the USA in the production of several types of advanced output, including certain types of sophisticated equipment; in the production of automation devices and equipment, electronics equipment, plastics, synthetic fibers, and electric power; in the degree to which production is automated; and in the application of sophisticated production processes. This technological deficiency has caused the USSR to lag behind the USA in the overall technological level of production. The more rapid rates of economic development in the USSR, however, provide a basis for overcoming this lag: between 1961 and 1976 the average annual increase in industrial production in the USSR was almost two times greater than in the USA, 4.4 times greater than in Great Britain, and 1.8 times greater than in France and the Federal Republic of Germany. All countries in the socialist community have shown higher rates of economic growth than the capitalist countries (see Tables 1 and 2).

Table 2. Average annual growth rates in the economies of selected capitalist countries
(percent)

	National income	*Industrial output*	*Labor productivity in industry*
USA	3.4	4.3	3.7
Federal Republic of Germany	3.9	4.4	4.9
France	5.1	4.5	4.4
Great Britain	2.4	1.8	2.8
Italy	4.6	5.5	4.6
Japan	8.8	9.7	8.2

The USSR is overtaking the USA with respect to absolute increase in national income and in industrial and agricultural output. Between 1951 and 1976, for example, the average absolute increase in steel production was 4.5 million tons annually in the USSR, compared with 1.2 million tons in the USA. The corresponding figures were 3.3 and 0.8 million tons for pig iron, 18.5 and 5.1 million tons for petroleum, and 4.4 and 1.2 million tons for cement.

The national income of the member nations of the Council for Mutual Economic Assistance (COMECON) increased by a factor of seven between 1950 and 1976; in the developed capitalist countries national income increased by a factor of approximately 3.3. The corresponding increases in the volume of industrial output were 11.5 and 3.2. Industry in the COMECON countries grew in this period at an average annual rate of 9.8 percent, compared with 4.7 percent in the developed capitalist countries. Although high growth rates in the USSR and other socialist countries in the past often were based on the production of traditional output of a lower technological level than in the developed capitalist countries, the fulfillment of the ninth five-year plan (1971–75) brought the USSR to a higher level, marked by substantial increases in scale of production and by improved quality.

Growing international economic cooperation and the objective demands of the scientific and technological revolution have pushed production efficiency and the rate of scientific and technological progress to the fore in economic competition between the two world systems. Of crucial importance now are indexes that measure scientific and technological progress, the extent to which technology and output are modernized, the quality of goods and their relevance to changing demands, managerial efficiency, the ability of the economy to absorb progressive changes and innovations, the rate of structural changes in production, the rate of circulation, and the payoff periods for production resources.

The socialist countries are already surpassing the capitalist countries with respect to several indexes of efficiency. First and foremost is the superiority of socialism in the use of labor resources and in the absence of unemployment. The Soviet Union was a pioneer in the exploration of space, in the peaceful use of atomic power in electric power production and maritime transport, in the production of several types of hydroelectric power equipment, and in the long-distance transmission of electricity at extremely high voltages. The USSR and the other socialist countries lead in many technologically advanced branches and types of production, although there are still many hidden intraproduction reserves and unresolved problems regarding production quality and the efficient use of all production resources.

The overall increase in production efficiency reflects the objective requirements of the present stage in the progress of productive forces, in which all economic processes are tending to intensify and in which a transition is taking place from extensive to intensive factors of economic development. World socialism, an established integrated economic system, has shown that it can attain not only higher production growth rates but that it can con-

centrate resources in the required direction on a scale unprecedented under capitalism. Countries of the world socialist system have demonstrated their superiority in the planned development of the national economy, in the equitable distribution of income according to labor contributed, in the consistent implementation of social programs on a national scale, and in the creation of a progressive mode of life and a new type of international economic integration that rests on a mutually advantageous foundation and genuinely fraternal cooperation (*see* SOCIALIST ECONOMIC INTEGRATION).

An important part of economic competition between the two world systems lies in various aspects of mode of life and in the mode of life of the population as a whole (*see* MODE OF LIFE). As the scale of production expands, developed socialism implements social programs designed to raise still further the standard of living of the working people and to improve their mode of life.

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V. M. KUDROV [29–1877–2]

ECONOMIC COMPULSION TO WORK, the relation, inherent in capitalism, of economic dependence and compulsion between hired workers and capitalists. The economic base of the economic compulsion to work is the capitalists' monopoly of private ownership of the means of production. Deprived of the material conditions for the application of labor and the means of livelihood, workers, though legally free, must sell their labor power to the owners of the means of production and work for the capitalists. The material conditions of labor thus become a means of subordinating another's labor in order to exploit it. The capitalist has command over labor, manages it, determines how long it will last and how intense it will be, and organizes and monitors it. As the scale of production grows, the capitalist transfers these functions to special hired administrators, who manage labor on behalf of capital.

As the owner of the means of production, the capitalist becomes the owner of the product of the workers' labor. The relations of economic dependence and compulsion are reproduced by the entire production process, which is continuous: the product of the worker's labor steadily becomes farther removed from the worker as the property of another and is returned only partially, in the form of wages; the remainder is continuously transformed into means of production and the capitalist's income. Labor is reproduced as hired labor, and the means of production are reproduced as capital. Unlike extraeconomic constraint, which is characteristic of slaveholding and feudal societies and is based on relations of direct subordination, the economic compulsion to work outwardly appears to be a relation of free, legally equal commodity owners, and the labor of workers appears to be voluntary. In reality, the workers' labor for the capitalist is hired slavery.

In the modern scientific and technological revolution, capitalism makes use of science and technology to strengthen and extend economic compulsion. Capital intensifies labor, forces out some workers from production, and demands only an educated and highly skilled labor force. Thus, scientists and engineers are increasingly drawn into the orbit of capitalist exploitation. These facts demonstrate the groundlessness of contemporary bourgeois theories of the "harmony of interests," of "social partnership," of a "collective" or "people's" capitalism, theories that attempt to depict capitalism's objectively inherent relations of dominance and subordination as equal cooperation. Economic compulsion to work cannot be eliminated under capitalism. It can be eliminated only by making the working people owners of the means of production, that is, by abolishing private ownership of the means of production.

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L. G. KRYLOVA [29–1876–1]

ECONOMIC COOPERATION BETWEEN THE USSR AND NONSOCIALIST COUNTRIES, an important part of the foreign economic relations of the USSR and a trend in its participation in international economic cooperation. Nonsocialist countries, both industrialized and developing, account for more than two-fifths (44.4 percent in 1976) of the foreign trade of the USSR and a considerable part of the long-term foreign credits granted and received by the Soviet Union.

Various objective factors have led to an expansion of economic cooperation between the USSR and nonsocialist countries. Chief among these, in addition to the need to develop productive forces, is the interrelationship and complementarity of national economies—with respect to natural resources, industrial and scientific-technological potential, knowledge, and experience—in the system of the international division of labor. These factors have made it mutually advantageous for the USSR and nonsocialist countries to exchange goods and services. The expansion of economic cooperation is made possible by the accelerating internationalization of productive forces in the modern scientific and technological revolution.

The USSR has pursued a consistent policy of developing mutually beneficial economic ties with nonsocialist countries and making rational use of the advantages afforded by the international division of labor. This policy, which is true to the nature of socialism, is based on the directives of V. I. Lenin and the decisions of plenums and congresses of the CPSU regarding the need to strengthen the alliance of peoples that are resisting imperialism, to establish closer links with them, to aid and support such peoples in their liberation struggle, and to expand economic cooperation in order that countries of different social systems may peacefully coexist. (*See also* INTERNATIONAL ECONOMIC COOPERATION.)

[29–1882–1]

ECONOMIC COOPERATION OF THE SOCIALIST COUNTRIES, a system of international economic relations that ensures that full use is made of the advantages of the international socialist division of labor.

Unlike the economic cooperation of the capitalist countries, which is marked by a fierce competitive struggle between monopolies, individual countries, and groups, the economic cooperation of the socialist countries is based on the principles of socialist internationalism, full equality, mutual respect, independence and sovereignty, and fraternal mutual aid. The economic cooperation of the socialist countries strengthens the economy of each participating country and reinforces the mutual ties of countries belonging to the socialist community. Under this system, countries are increasingly bound together in the areas of politics, economics, and public life; levels of development are gradually equalized; and the economic power of the world socialist system is increased.

The economic cooperation of the socialist countries dates from the emergence of cooperation between the USSR and the Mongolian People's Republic in the mid-1920's. When the world socialist system took shape after World War II, this process underwent further development. Immediately after the war, the economic cooperation of the socialist countries was primarily concerned with rebuilding and restructuring the various national

economies and with creating the foundations for a modern economy in countries that had inherited a backward material and technical base.

The cooperation of the socialist countries became more varied as their economic, scientific, and technological potential grew. Improvements were made in the cooperative system, which was based on the planned regulation of international economic relations. In addition to bilateral economic cooperation, there was continuous development of multilateral economic cooperation among the socialist countries, enabling them to deal more effectively with important economic problems. The Council for Mutual Economic Assistance (COMECON), established in 1949, and the International Bank for Economic Cooperation, created in 1963, were instrumental in further developing and improving cooperation.

Beginning in the early 1970's, economic cooperation among the COMECON member nations has been based on the Comprehensive Program for Socialist Ecónomic Integration, adopted at the Twenty-fifth Session of COMECON in 1971. This program has made it possible to increase cooperation among the COMECON member nations in order to collectively resolve common socioeconomic problems, to jointly develop natural resources, to carry out major construction projects designed to meet the needs of all the interested countries, and to develop long-term international cooperation among enterprises and branches of industry.

At present, the consistent use of the advantages of economic integration makes it possible to coordinate the COMECON member nations in their efforts to jointly resolve problems involving the expanded extraction and production of the major types of raw materials, fuel, supplies, machine-building output, food, and consumer goods. It also facilitates the development of transportation in accordance with long-term special-purpose programs, worked out jointly, and leads to more closely coordinated and united efforts among the COMECON member nations in the area of scientific and technological progress (*see* SCIENTIFIC AND TECHNICAL COOPERATION OF THE SOCIALIST COUNTRIES).

As the socialist countries become integrated, national economic complexes take shape and interact with one another in a highly sophisticated way; it is against this background that the socialization of socialist production develops on an international scale.

As the international socialist division of labor in various branches and areas of the economy increased, stable international relations were established—notably in the areas of production, science, and technology—that reflected the socialist integration and internationalization of the economic life of socialist countries. As economic cooperation developed, international specialization and cooperation of production and scientific and technical cooperation became more widespread and substantial. Economic organizations and associations created by the COMECON member nations are becoming more active. Increased economic cooperation of the COMECON member nations in all areas is manifested in the growing trade among the countries, which more than doubled in volume between 1971 and 1976 and amounted to 79.2 billion rubles in 1976. Trade among the COMECON countries represented about 56 percent of their total commodity turnover (*see also* WORLD SOCIALIST MARKET).

In accordance with agreements concluded while coordinating national economic plans, the exchange of goods produced by the machine-building industry will be developed at an especially rapid rate. The cooperation of COMECON countries with other socialist countries is expanding on a multilateral and bilateral basis. (*See also* INTERNATIONAL ECONOMIC COOPERATION.)

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IU. S. SHIRIAEV [29–1881–1]

ECONOMIC CRISIS, a phase in the capitalist cycle in which the basic proportions of reproduction that have been disturbed during the development of the capitalist economy are forcibly restored. Economic crises are manifested in such economic disruptions as an absolute decline in production, a curtailment of capital investment, a rise in unemployment, an increase in the number of bankruptcies, and a fall in the price of stocks.

Economic crises are caused by the basic contradiction of capitalism—the contradiction between the social character of production and the private capitalist form of appropriation of the results of production. Division of labor, specialization of production, and cooperation in industry unite capitalist enterprises in a single economic mechanism; in order for the mechanism to function normally, certain proportions must obtain between branches of the economy, between the production of the means of production and the production of consumer goods, and between the accumulation of capital and consumption. The dominance of private property, however, generates anarchy of production, fierce competition, and the exploitation of labor by capital, which result in the continual disturbance of the proportions of reproduction. Some of these disturbances pass away of their own accord, but others intensify and accumulate.

The disproportions of reproduction that arise as the economy develops are always accompanied by disturbances of the proportions between capital accumulation and consumption.

The tendency of capital toward self-expansion and the race for profits require that the growth of income and consumption of the working people slow down or even come to a halt. The resulting contradiction between production and consumption builds up pressure, reaches the bursting point, and becomes, as a rule, the direct cause of an economic crisis. "The contradiction between production and consumption that is inherent in capitalism is due to the tremendous rate at which production is growing, to the tendency to unlimited expansion which competition gives it, while consumption (individual), if it grows at all, grows very slightly. . . . The productive forces of society increase without a corresponding increase in consumption by the people, without the employment of these productive forces for the benefit of the working masses" (V. I. Lenin, *Poln. sobr. soch.*, 5th ed., vol. 4, pp. 158–59).

Since commodity production exceeds the narrow bounds of the effective monetary demand of the population, an economic crisis assumes the character of general overproduction and an overaccumulation of capital. The economic crisis completes one capitalist cycle and paves the way for the next by equalizing the disturbed proportions between capital accumulation and consumption and between the production of the means of production and the production of consumer goods. Economic crises exacerbate class contradictions, since the misfortunes they bring with them are borne primarily by the working people. This exacerbation intensifies the class struggle, in which the working people attain greater class consciousness, organizational maturity, and solidarity.

Economic crises result in enormous economic losses to society, since a considerable part of the physical plant stands idle and hundreds of thousands or even millions of working people lose their jobs.

The onset, depth, and duration of an economic crisis depend above all on the extent to which the basic economic proportions of reproduction have been disturbed during times of economic upsurge. In addition, economic crises may become self-generating, since they are usually accompanied by a decline in the purchasing power of the working people, brought about by increased unemployment and reduced work time; this decline further complicates the sale of commodities and hinders the restoration of a temporary balance between capital accumulation and consumption.

Economic crises most graphically demonstrate the profoundly contradictory character of capitalist production, which "must, on the one hand, develop productive forces as though it were not production on a limited social basis and must, on the other hand, develop them within this limitation. This paradox is the deepest and innermost cause of crises and of the contradictions that disrupt bourgeois production. Bourgeois production must operate within the framework of these contradictions, which, even when

cursorily and superficially examined, show it to be a historically transitory form" (K. Marx and F. Engels, *Soch.*, 2nd ed., vol. 26, part 3, p. 81).

Although there is a single cause for economic crises, each crisis has its own specific features, stemming from the concrete historical conditions under which it develops. An economic crisis reflects the characteristics of the age, the level of development of capitalism, and an entire complex of economic and political factors operative in a given country at the moment the crisis occurs.

Periodic economic crises began with the crisis of 1825 in Great Britain, where capitalist production relations first developed. The next economic crisis was the crisis of 1836, which gripped Great Britain and the USA—two countries with close economic ties. Next came the crisis of 1847, which affected virtually all European countries and assumed the character of a world crisis.

The first worldwide economic crisis occurred in 1857; for nearly every country this crisis proved to be the deepest it had experienced since embarking on the capitalist road of development. In the USA, pig iron production declined 20 percent, and cotton consumption 27 percent. In Great Britain, the shipbuilding industry was hit hardest, with output dropping 26 percent. In Germany the consumption of pig iron declined 25 percent, and in France pig iron production and cotton consumption both declined 13 percent. In Russia pig iron production declined 17 percent, and the production of cotton textiles 14 percent.

The economic crisis of 1866, although rather severe in Great Britain, did not significantly affect other countries.

The next world economic crisis, which began in Austria and Germany in 1873, was the longest in the history of capitalism, reaching its greatest extent in 1878 when it spread to Great Britain.

The economic crisis of 1882 affected primarily the USA and France; in the crisis of 1890, the greatest economic upheavals occurred in Germany, the USA, and France.

The crisis of 1900–03 represents a turning point between the age of laissez-faire capitalism and the age of imperialism. The principal victims of the crisis were the USA and Germany; Great Britain and France were affected to a lesser extent. The economic situation was serious in Russia, where the crisis coincided with a crop failure.

Bourgeois ideologists hoped that with the advent of capitalist monopolies, which organized production at their enterprises in a planned fashion, economic crises would disappear or at least become less severe, but this was not to be. The first economic crisis of the age of imperialism—the crisis of 1907—proved no less destructive than its predecessors. The US economy was hit hardest. In the article "Marxism and Revisionism," V. I. Lenin wrote that the crisis of 1907 offered striking proof that crises remained an inevitable part of the capitalist system. He also pointed out that in the age of imperialism "the forms, the sequence, the picture of particular crises changed" (*Poln. sobr. soch.*, 5th ed., vol. 17, p. 21).

The economic crisis of 1920–21 affected primarily the USA and Great Britain.

In 1929 the world was plunged into its most serious economic crisis, which lasted until mid-1933 and shook the entire capitalist system to its very foundations. During this crisis, production declined 46 percent in the USA, 24 percent in Great Britain, 41 percent in Germany, and 32 percent in France. The value of the stocks of industrial companies declined 87 percent in the USA, 48 percent in Great Britain, 64 percent in Germany, and 60 percent in France. Unemployment reached colossal proportions. According to official data, in 1933 there were 30 million unemployed in 32 capitalist countries, including 14 million in the USA.

The world economic crisis of 1929–33 showed that the contradiction between the social character of production and the private form of appropriation of the results of production had become so acute that the capitalist economy could no longer function normally. State intervention in the economy was required, and the government found it necessary to influence spontaneous processes in the capitalist economy in order to avert upheavals; this policy accelerated the transformation of monopoly capitalism into state-monopoly capitalism.

The long-term planning of economic growth by the state that took place in many capitalist countries after World War II, as well as the efficient regulation of the economy, which was designed to forestall or mitigate cycles, had a certain stabilizing influence on the development of capitalist countries. The signs of economic crisis were nevertheless clearly apparent in this period in the USA, Great Britain, Canada, the Federal Republic of Germany, and Italy.

In most other capitalist countries, the cumulative contradictions of expanded capitalist reproduction were resolved in slowdowns of economic activity and a sharp decline in economic growth, accompanied primarily by a curtailment in the production of the means of production and a deceleration of capital accumulation. In the three postwar decades economic crises recurred most frequently in the USA, in 1948–49, 1953–54, 1957–58, 1960–61, 1969–71, and 1973–75. Industrial production declined, respectively, 17 percent, 9 percent, 13 percent, 7 percent, 8 percent, and 13 percent.

The first postwar global economic crisis, which began in late 1957 and continued until mid-1958, affected numerous capitalist countries, including the USA, Great Britain, Canada, Belgium, and the Netherlands. Industrial output in the developed capitalist countries declined 4 percent, and the army of the unemployed reached nearly 10 million.

The relatively stable economic development of several capitalist countries in the 1950's and 1960's fostered the development of bourgeois and revisionist theories according to which it is possible for capitalism to develop without crises by improving the techniques used in the state regulation of economic processes. Capitalist reality soon refuted these theories, however. In the capitalist system of the early 1970's an entire series of disturbances of the process of reproduction arose, bringing on the next worldwide economic crisis, which began in late 1973 in the USA and affected virtually the entire capitalist world in 1974 and 1975.

With respect to the number of countries affected and in its duration, depth, and destructive force, the crisis of 1973–75 considerably surpassed the world economic crisis of 1957–58 and in a number of respects resembled the crisis of 1929–33. Industrial production declined 13 percent in the USA, 20 percent in Japan, 22 percent in the Federal Republic of Germany, 10 percent in Great Britain, 13 percent in France, and 14 percent in Italy. In a single year—December 1973 to December 1974—the stock market fell by 33 percent in the USA, 17 percent in Japan, 10 percent in the Federal Republic of Germany, 56 percent in Great Britain, 33 percent in France, and 28 percent in Italy. The number of bankruptcies in 1974 exceeded those in the previous year by 6 percent in the USA, 42 percent in Japan, 40 percent in the Federal Republic of Germany, 47 percent in Great Britain, and 27 percent in France. By mid-1975 there were 15 million unemployed in the developed capitalist countries. Another 10 million were either working a shorter work week or had been laid off. The real income of the working people declined everywhere. In the USA, for example, the total real income of the working people, which had grown by an average of approximately 3 percent a year between 1950 and 1970, declined by 6 percent between 1973 and 1975.

The world economic crisis of 1973–75 was unusually severe and long because it involved high rates of inflation in all capitalist countries, currency and energy crises, and a worsening of ecological and food problems. The economic crisis of 1973–75 demonstrated the limited ability of the bourgeois state to regulate spontaneous economic processes and the cyclical dynamics of the economy. The inability of capitalist governments to avert and resolve crises testifies to the crisis of state anticyclical regulation in the 1970's. Because of the significantly higher level of socialization of production and the greater internationalization of economic life, the forms and methods of anticyclical regulation developed immediately after the war ceased to be effective in the 1970's. The basic contradiction of capitalism was once more manifested in acute form.

Economic crises demonstrate the disparity between the production relations of bourgeois society and its productive forces and reveal the transitory nature of the capitalist mode of production, which can develop only by periodically squandering material and human resources. Economic crises convince the working people of the need to struggle for a new social order free from crises, unemployment, and exploitation—that is, the need to struggle for socialism.

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IU. N. POKATAEV [29–1855–3]

ECONOMIC EFFICIENCY, the ratio between the results of production—output and material services—on the one hand and expenditures of labor and the means of production on the other. Under socialism, economic efficiency is a key index of economic development. For the capitalist entrepreneur, expenditures take the form of fixed capital stock and circulating productive capital advanced by him, and results take the form of profits. Comparisons of expenditures and results based on report and statistical data for the various branches of the economy and for the national economy as a whole are used in the management of capitalist firms, whose primary motive is the desire to maximize profits.

[29–1837–1]

ECONOMIC EFFICIENCY OF CAPITAL INVESTMENTS, an indicator that provides a picture of the planned connections and quantitative relations between the expenditures of socialist society for expansion and simple reproduction of fixed capital stock and the results obtained. The direct result of capital investment is that production capacities and nonproduction facilities are put into operation; the eventual result is a growth in output and material services and, ultimately, a growth in national income.

The theories and techniques devised by Soviet economists for determining the economic efficiency of capital investments provide a basis for selecting the optimal alternatives of capital investments when drawing up long-term and current (annual or quarterly) plans and plans for specific projects; they play a direct role in the management of enterprises (associations), branches of the economy, and integrated programs with particular goals for economic development.

Between 1951 and 1976 the USSR invested 1.46 trillion rubles, and 1.351 trillion rubles' worth of fixed capital stock became operational. In that same period the total fixed assets (production and nonproduction) increased eightfold, and net output (national income) increased sevenfold. Capital investment in production fixed assets accounts for two-thirds of all investment.

The effect (result) of capital investments in production for the national economy, branches of the economy, and subbranches that keep the appropriate records is manifested in the growth of the gross product, final product, and net product (national income), expressed in terms of value and in physical terms. Efficiency is measured, however, by the ratio of the result (output) to the expenditures (investments) needed to produce the result.

In branches, subbranches, and enterprises (associations) that do not calculate net output (national income), profit is used as an index of the effect, and efficiency is taken as the ratio of profit to the value of capital or as the ratio of the growth in profit to the growth in the value of capital (or of capital investment). This index does not give a quantitative description of the overall economic efficiency of capital investments, because it does not include a considerable part of the net product, such as wages or the social consumption funds; it does make possible an evaluation of the dynamics of capital investment.

The effect of capital investments in the nonproduction sphere is expressed in the growth of services that meet nonproduction sociocultural needs, such as housing, consumer services, education, and health care. Efficiency is measured as the ratio of physical results—for example, residential housing space, the number of places in schools, or the number of hospital beds—to expenditures (investments).

Determining the absolute (general) efficiency of capital investments—the ratio of effect to expenditures—is of great importance in planning the reproduction of the social product and subjecting it to analysis, especially in view of the need to increase the efficiency of social production under conditions of full employment of the work force and an increasing use of natural resources (*see* ECONOMIC EFFICIENCY OF SOCIALIST PRODUCTION). In branches of the economy and in enterprises, indexes of the capital-output ratio and capital productivity are used; these are compared with indexes of the prime cost of production. A rise in the capital-output ratio or a decline in capital productivity may be offset by a decline in current expenditures and be recouped within a prescribed period. This is the esential feature of the problem of payoff on capital investment (*see* PAYOFF ON CAPITAL INVESTMENT).

The economic efficiency of capital investments in both the production and nonproduction spheres depends to a considerable extent on several factors: the lowering of actual expenditures for construction, improvements in construction quality, the reduction of construction time, the degree to which production capacities are developed, and the attainment of projected economic indexes.

A distinction is made between the planned and actual efficiency of capital investments. Planned efficiency is set by the plan, which has taken into account potentials for using internal production resources, for increasing the productivity of labor, for lowering the material-output and capital-output ratios, for achieving technological progress, and for increasing the scale of production. A value is assigned to planned efficiency on the basis of the ratio of the planned effect to expenditures. Actual efficiency is determined by comparing report data on expenditures with data on the effect; these data are compared for the national economy, branches of the economy, and enterprises.

The comparative economic efficiency of capital investments is used to make the best choice among possible capital investment alternatives in overall planning and the planning of specific projects, with a view to turning out products that will meet a given demand. Capital investments and current expenditures are compared, variant by variant, and the investments most attractive in terms of payoff time and discounted expenditures are selected. In order to calculate comparative efficiency, it is important to determine correctly the standard, or normative, coefficient of efficiency, which is inversely proportional to the standard payoff time.

A planned standard of comparative efficiency is used to arrive at an annual figure for capital investments and to add them in with current expenditures. The planned standard represents the minimum permissible level of economy on current costs or minimum permissible level of profits, in relation to a given investment, at which that investment becomes acceptable. The Standard Methods for the Determination of the Economic Efficiency of Capital Investment permit branches of the economy to adjust the standard coefficient of comparative efficiency for the national economy that appears in their instructions for determining economic efficiency; such adjustments take into account the particular features of the various branches of the economy or regions of the country, such as differences in wages, in the technological makeup of assets, in indirect economic effects, and in climate.

The Standard Methods call for a method of discounting based on compound interest to relate expenditures made at various times to a particular period. The planned standard for discounting reflects the average accumulation of capital for the national economy in relation to production assets and is therefore in accordance with the rate of growth of social production. Capital investment at the end of the first year, together with its increment, becomes $C(1 + B)$, which, when reinvested, becomes $C(1 + B)(1 + B)$, or $C(1 + B)^2$, by the end of the second year; by the end of the nth year the figure becomes $C(1 + B)^n$.

Investments in the nth year may be converted into those of the

first year by dividing the later figure by $(1 + B)^n$ or multiplying it by $1/(1 + B)^n$. In this method of discounting the optimal investments is that in which the total discounted capital investments and current expenditures are, other things being equal, the lowest; a common measure can then be applied to investments made at different times, and the investments can be compared and added.

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ECONOMIC EFFICIENCY OF NEW TECHNOLOGY, an indicator that characterizes the results for the national economy and the economic suitability of producing and using new technology.

A distinction is made between fundamentally new technology, which has just been introduced, and new technology, which has been introduced to an insufficient extent. Fast reactors, lasers, cryogenic power lines, and ground-effect machines are examples of fundamentally new technology; computers and automatic transfer lines with numerical program control are examples of new technology. Fundamentally new technology requires large capital investments for debugging, for converting to mass production, and for advancing into new areas of application. However, such technology promises a substantial result in the future. New technology requires less investment for debugging and refinement, and expenditures for production depend on the scale of possible introduction. The result of such technology may be obtained in a shorter period of time and depends on the scale of introduction.

The methods used to determine the economic efficiency of new technology are the same as the methods used to determine the economic efficiency of capital investments. The methods are based on a comparison of expenditures for new technology and the result obtained from the technology. A distinction is made between the absolute, or general, efficiency and the relative efficiency of new technology. Absolute efficiency is measured as the ratio of the result obtained from new technology—for example, a growth in output, a reduction in the prime cost of production, or an increase in profits—to the expenditures for the development and introduction of the technology. Relative efficiency is used to select the best available variant of new technology by determining the payoff period for capital investment or by comparing discounted expenditures for different variants.

In order to determine the economic potential of the introduction of new technology—that is, the result obtainable from the maximum number of units of new technology under optimum conditions—and the actual or possible scale of introduction for individual years, the following are calculated: the reduction in expenditures for production of new technology that is equivalent in capacity to old technology; the growth in output that may be obtained as a result of using the new technology; and the increase in the profits of the producer and the user of the new technology due to the increase in output, the reduction in the prime cost of production, or changes in prices.

The conversion to the manufacture of new producer goods entails additional expenditures on the part of the producer, especially when sufficient experimental testing and other preparatory work have not been done. Initially, such additional expenditures may result in lower profits or even in losses. The user may also bear additional expenditures owing to the conversion to new technology. The additional expenditures are compensated by a subsequent increase in profits as production is increased and prime cost is reduced. Moreover, a temporary reduction in profits or temporary losses may be offset by bank credit. The price of new technology is set at a level that would motivate the producer to fabricate the technology and the user to adopt it.

Besides indexes of value, certain other indexes may be used to evaluate the economic efficiency of new technology. These include the release of labor power, the facilitation and sanitization of working conditions, a reduction in the consumption of scarce materials, and improvements in the quality and reliability of products. Such improvements may not always be reflected in the value and prime cost of the products.

A distinction is made between the planned and the actual economic efficiency of new technology. Planned efficiency is determined on the basis of planning data pertaining to the amount of output, the amount of capital investment, prime cost, and the payoff on capital investment. Data pertaining to the planned and actual economic efficiencies of new technology are used to determine desirable trends for the development of the technology and to plan the introduction of the technology. If the price of new technology is not known when the efficiency of the technology is being planned, the expenditures for the technology may be determined on the basis of estimates of production outlays or, in the absence of such estimates, on the basis of consolidated norms and analogs.

The actual economic efficiency of new technology is measured as the ratio of the reduction in the prime cost of production or of the increase in profit due to the introduction of the technology to the capital investments for the introduction of the technology. The expenditures for new equipment include expenditures for the delivery and installation of the equipment, for the construction of working areas, and for the augmentation of the circulating productive capital associated with the introduction of new technology. Savings in capital investments due to the release of working areas and savings in circulating productive capital are deducted from the expenditures for new equipment. The data obtained are compared with the expenditures that would be required for the old technological base and for the same amount of output. In addition to capital investments, the prime costs of production associated with the new and old technologies are also compared. If the introduction of new technology entails an increase in output, the prime cost is scaled to the increased output; the constant portion of the expenditures and changes in the prime cost are taken into account.

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ECONOMIC EFFICIENCY OF SOCIALIST PRODUCTION, one of the most important indicators of socialist economic development; the ratio of the useful result (effect) to the expenditures—determined for the national economy, branches of the economy, and individual factories—required to achieve that result. Several indexes of the economic efficiency of socialist production may be determined by comparing types of expenditures for the production of output or for the provision of material services with the useful effect. Such indexes are helpful in the quantitative and qualitative analysis of the economy as a whole or of its various subdivisions and are used in the planning and day-to-day management of economic activity.

Indexes of economic efficiency are conventionally divided into three groups. The first comprises general indexes of economic efficiency, the most important of which is the growth of the social productivity of labor. This growth may be expressed quantitatively in the growth of output and in absolute savings of living and embodied labor, measured in terms of value and in physical terms. The results of production are most completely represented in the final social product and national income (net output) (*see* TOTAL SOCIAL PRODUCT). Overall profitability is also considered a general index.

The second group of indexes consists of the basic indexes of economic efficiency in the use of such production resources as living labor, fixed production assets, expenditures of materials, and capital investments. These indexes, which are computed on the basis of national income (net output), include the productivity of living labor (labor input), capital-output ratio (capital productivity), consumption of materials (materials-output ratio), and return on capital investments (capital intensity).

The third group of indexes comprises technological-economic indexes of efficiency in the use of resources. These indexes are used in the analysis and planning of several aspects of the production process and in the calculation of factors of production growth at enterprises, branches of industry, and in agriculture, construction, trade, and transportation. The third group of indexes includes individual output; coefficients of the use of the means of labor and of the capacity of machinery units; expenditures of raw materials, supplies, fuel, and energy per unit of output; and payoff period, discounted expenditures, and capital investments per unit of output.

Depending on the method of calculation used, indexes of the productivity of labor play various roles in the system of indexes of the economic efficiency of socialist production. Growth in the productivity of living labor, when measured as the ratio of the final results of production and the total expenditures of living and embodied labor, is a general index of economic efficiency (and therefore belongs in the first group), since it most completely reflects the results of the interactions between material (physical) and subjective (social) elements of the productive forces. Individual output, or the productivity of living labor, measured as the ratio of the results of production and expenditures only of living labor, is an important instrument for analyzing and planning economic efficiency in the use of labor resources (and therefore belongs in the second group). For this reason, both indexes are used simultaneously in national economic planning.

None of the indexes listed above, considered separately, sufficiently takes into account expenditures, effect, or both taken together. As a rule, the rates and directions of change reflected by these indexes fail to coincide, and it is therefore virtually impossible to use them to make clear-cut economic decisions. A steady growth in national income and the productivity of social labor, for example, suggests an increase in economic efficiency of production, but a drop in capital-output ratio and profitability indicates that production is becoming less efficient. The application of such generally accepted indexes of relative economic efficiency, as minimum discounted expenditures is limited by the nature of the indexes being compared.

Although it is necessary to select a criterion of economic efficiency and to develop an appropriate general indicator, many theoretical complexities are involved; Soviet economic science has therefore devised a variety of approaches to solve these problems. One of the most common viewpoints maintains that the criterion of the economic efficiency of socialist production is the amount of work time saved, or saving of the expenditure of aggregate (living and embodied) labor per unit of output (*see* ECONOMY OF TIME, LAW OF).

The level of social productivity of labor (A) coincides with the national economic efficiency of production (E) and is, at the same time, a general index of efficiency: $E = A = R/(L_l + L_e)$, where R represents the final results of production (output volume expressed in physical terms) and $L_l + L_e$ represents expenditures of aggregate (living and embodied) labor, using a single unit of measure. The expression of the final results in terms of, for example, the total gross social product, the final social product, or national income (net output) constitutes a modification of the index.

Of practical interest is the general index of efficiency in the use of resources, calculated as the ratio of national income in fixed prices to production assets and to expenditures not just of labor consumed but of all labor involved in production. Many economists regard a growth in profits, an increase in net profit or profitability, or a rise in the level of the people's well-being as a criterion of efficiency.

In a developed socialist society, the social development of society and increased social efficiency ultimately take precedence over efficiency of production. The most general criterion of social efficiency is the improvement of the living standard of the population and the comprehensive development of the individual. The standard of living can be expressed through a system of indexes that includes growth in real incomes and the per capita consumption of staple foods. It is not always possible, however, to take direct account of or to quantify many social changes, especially in the intellectual life of the individual or in social relations; in such cases, indirect methods must be used. The effect of changes in working and living conditions, for example, can be evaluated by looking at the life expectancy of the population and at reductions in infant mortality, industrial accidents, and occupational diseases.

The CPSU has developed an economic strategy that emphasizes increasing the economic efficiency of socialist production and seeks to develop intensively all branches of the national economy and to intensify all production processes. By the early 1970's, extensive factors—the hiring of additional manpower and the expansion of production capacities through the construction of new enterprises—had essentially been exhausted in the USSR; it consequently became necessary to make more efficient use of the nation's great industrial and technological potential in order to increase the production of national income and the final social product.

"The present and future development of the nation requires all-around intensification of production, acceleration of scientific and technological progress, and growth in the productivity in labor, all of which are crucial factors in increasing the efficiency of production and raising the standard of living of the population. First and foremost, the return on every unit of material, labor, and financial resources must be increased, and production assets must be used efficiently" (*Materialy XXV s"ezda KPSS*, 1977, p. 126).

The party's economic strategy places particular emphasis on accelerating the growth of the social productivity of labor. During the ninth five-year plan alone (1971–75), the productivity of labor in the national economy increased by 23 percent; this figure is roughly equivalent to a saving of 20 million man-years. An increase in the productivity of labor accounted for 84 percent of the growth of production in industry, 78 percent of the increase in construction, and the entire increase in agriculture.

When the role of economic controls in the planning and management of the national economy was increased, enterprises (associations) were more strongly motivated to use production resources more efficiently and to increase profitability. Approximately 500 billion rubles in profits were obtained in the ninth five-year plan, an increase by a factor of 1.5 over the eighth five-year plan. The implementation of the economic policy of the CPSU, which is aimed at intensifying social production, involves improvements in economic management and the scientific elucidation of pressing problems relating to increased economic efficiency of socialist production. (*See also* OPTIMALITY CRITERION, INTENSIFICATION OF PRODUCTION, ECONOMIC EFFICIENCY OF CAPITAL INVESTMENTS, and ECONOMIC EFFICIENCY OF NEW TECHNOLOGY.)

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A. S. TOLKACHEV [29–1841–1]

ECONOMIC GEOGRAPHY (also economic and social geography), the social science that studies regularities, or patterns, in the location of social production and the conditions and particulars of its development and location in various countries and regions. The regional aspect of social reproduction under specific sociohistorical conditions is the subject of research in economic geography.

Economic geography studies problems in the regional distribution of the economy in close relationship with the operation of objective economic laws. Of major importance are the integrated and comprehensive examination of investigated phenomena, the analysis of the sociohistorical conditions of countries and regions, the consideration of natural conditions and resources, and the primarily geographical aspect of all research. Unlike industrial branch economics, which studies the location of the productive forces of a given branch of industry, economic geography also studies the regional structure of the economy as a whole.

Economic geography is part of the system of geographic sciences (*see* GEOGRAPHY) and has particularly close ties with physical geography. Economic geography's ties with the other natural sciences that study natural conditions have been strengthened as the importance of the ecological problem has grown; this development reflects the general reorientation of contemporary geography toward ecology. Economic-geographical research is an important part of the integrated and comprehensive study of the interaction of nature and society, which is of interest to both the natural and the social sciences.

Economic geography is also interconnected with the historical sciences (particularly with historical geography), the history of national economies, demography, ethnography, and economic cartography. It also occupies an important place in area studies and military geography.

One of the most important concepts of economic geography is the geographic (territorial) division of labor (including the international division of labor), which results in the formation of economic regions in a country. In turn, the system of economic regions is the basis of the territorial structure of a country's national economy. Other fundamental concepts of economic geography include location of productive forces, economic-geographical location, and the territorial-production complex.

Economic geography is divided into general economic geography, the economic geography of branches of the economy, the geography of the world economy, population geography, political geography, and regional economic geography. General economic geography studies regularities in the location of production in general and of individual branches of production. The best-developed subdivisions of the economic geography of branches of the economy are industrial geography, agricultural geography, and transportation geography. The geography of social services, recreational geography, and natural resources geography are currently emerging as well-defined subdivisions. Because of the special role of the population as the producer and final consumer of material goods and services, population geography has a synthetic character rather than an orientation toward branches of the economy. Regional economic geography investigates existing countries and regions and incorporates elements of all subdivisions of economic geography. General and regional economic geography are inseparably related: on the one hand, general regularities achieve local manifestation within individual regions; on the other hand, the analysis and synthesis of regional combinations make it possible to elicit regularities in economic location.

Differences in regularities of location of production, caused by differences in the socioeconomic systems of various countries, necessitate the division of economic geography into the economic geography of socialist countries and the economic geography of capitalist countries.

The economic geography of socialist countries not only describes and explains economic-geographical phenomena and processes, it also strives to make recommendations for improving the location of production and the territorial structure of the economy. By contributing to the scientific substantiation of the planning of the national economy, economic geography helps solve the problem of ensuring maximum satisfaction of the growing needs of society while simultaneously maintaining ecological stability. Solution of the problem is facilitated by the public ownership of the means of production and by a planned development of the national economy.

The influence of socialist production relations on the development of the productive forces has a favorable impact on the geographic division of labor and on location of the productive forces, both within each socialist country and in the world socialist system. The economic geography of socialist countries reveals the regularities that determine the rational planned location of production and the formation of territorial-production complexes. Chief among such regularities is the development and location in socialist countries and regions of production facilities in territorial combinations and proportions that will ensure the greatest effectiveness of the economy. Economic geography studies the harmonious combination of specialization and integrated development of economic regions within the framework of a single plan for the development of a country's national economy. The economic geography of socialist countries is characterized by a constructive approach, in which its research findings are used in the practical socialist and communist construction of individual countries and of the whole socialist community (*see* SOCIALIST ECONOMIC INTEGRATION).

In capitalist countries, where the location of production is spontaneous and at cross-purposes, economic geography frequently fails to study concrete socioeconomic conditions and is often used in the interests of capitalist monopolies to justify the location of enterprises in the quest for maximum profits. Some economic-geographical works attempt to offer theoretical substantiation for a geographic division of labor that places industrially developed countries and regions in opposition to backward countries and regions producing agricultural goods and raw materials; the latter countries and regions are exploited by the bourgeoisie of the developed countries. Such a division of labor hinders the development of the productive forces in the less-developed countries.

Marxist-Leninist economic geography scientifically analyzes location of the productive forces and the structural and regional changes in the capitalist countries, and it reveals the contradictions and economic disproportions inherent in the countries' economies.

In the developing countries that are carrying out progressive social reforms, economic geography is afforded the opportunity of helping develop national economic recommendations.

History. References to and descriptions of the economies of individual countries and peoples can be found in works by geographers of antiquity and the Middle Ages. The practical requirements of trade, government, and warfare were important factors in the rise and subsequent development of economic geography. Statistics, as the aggregate of economic and demographic information, later became a data source for the formation of economic geography. In prerevolutionary Russia, elements of economic geography were included in works by statisticians working for *zemstvos* (district and provincial assemblies), in military statistical reports, and elsewhere. The increased geographic division of labor, the strengthening of trade ties, and the formation of a world market created a need to systematize and analyze information on the production of and trade in commodities (the commercial geography of the 19th century). The requirements of the practical administration of government, especially in countries with a vast territory, necessitated scientifically substantiated economic regionalization. In prerevolutionary Russia, economic-geographical research on economic regionalization was conducted by K. I. Arsen'ev, P. P. Ogarev, P. P. Semenov-Tian-Shanskii, D. I. Mendeleev, and V. P. Semenov-Tian-Shanskii.

Owing to the broad development of the geographic division of labor within various countries and in the overall world economy in the era of imperialism, economic-geographical research has

been conducted in most countries, primarily by scholars from the developed capitalist countries. The works produced have been largely descriptive, and in most cases the theoretical substantiations have been apologetic in nature and have contained elements of racism and geopolitics.

As bourgeois economic geography developed, several schools were formed that incorporated various theoretical concepts. The discipline was significantly influenced by the anthropological school, which viewed social (including economic-geographical) phenomena from the standpoint of biological laws (*see* ANTHROPOGEOGRAPHY). The concepts of geographic determinism, environmentalism, and geographic possibilism were widely applied in economic geography. For a long time, bourgeois economic geography developed along the lines of chorological concepts (the German geographer A. Hettner and the American geographer R. Hartshorne), considering as the primary task of geography the study of the unique features and particulars of individual places and thereby actually denying the significance of generalizations and the search for regularities. Great renown was won by the French school of human geography and the cultural landscape school (the German geographer O. Schlüter), whose adherents stressed detailed characterizations of economic-geographical phenomena and the pictorial description of countries. A major contribution to the formation of bourgeois economic geography was made by the works of economists (the German economists J. von Thünen and A. Weber), who promoted the elaboration and introduction of technical and economic methods in economic-geographical research.

The development of the economic sciences was of decisive importance in the formation of economic geography. The laws of social development and geographic division of labor discovered by K. Marx and F. Engels created the basis for formulating a genuinely scientific economic geography. K. Marx' *Das Kapital*, F. Engels' *Anti-Dühring*, and works by V. I. Lenin, such as *The Development of Capitalism in Russia, New Data on the Laws Governing the Development of Capitalism in Agriculture*, and *Imperialism, the Highest Stage of Capitalism*, were of fundamental importance to economic geography.

As a constructive science that actively influenced the territorial structuring of the national economy, economic geography began developing after the Great October Revolution. Socialist construction in the USSR made broad demands on economic-geographical research. A great deal of material was collected in compiling the plan of the State Commission for the Electrification of Russia (GOELRO), in carrying out economic regionalization, and in drafting the first five-year plan. The theoretical principles were based on Lenin's pronouncements in the "Draft Plan of Scientific and Technical Work" and other documents concerning the rational location of production and national policy. Lenin attached much significance to economic geography and included the study of the economic geography of Russia as part of the mandatory minimum for all higher educational institutions (*Poln. sobr. soch.*, 5th ed., vol. 42, p. 427). Especially important in this respect was the research on economic regionalization conducted by the State Planning Commission and the commission of M. I. Kalinin, with the active participation of G. M. Krzhizhanovskii, I. G. Aleksandrov, L. L. Nikitin, and others.

The location of the productive forces of the USSR was discussed at party congresses, during which many concepts of economic geography (such as the basic economic region and the economic nucleus) were introduced into scientific parlance. The resolutions of the Twenty-fifth Congress of the CPSU made provision for a vast program of improvements in the location of productive forces, for development of existing territorial-production complexes and industrial centers and the formation of new ones, for rationalization of transportation and economic ties, and for expansion of scientific research on the location of productive forces (*Materialy 25-go s"ezda KPSS*, Moscow, 1976, pp. 223–24).

A major role was played by N. N. Baranovskii in developing the principles of Marxist-Leninist economic geography in the USSR. In addition to Baranovskii, significant contributions to the consistent development of the methodology and techniques of economic geography were made by N. N. Kolosovskii, V. F. Vasiutin, Ia. G. Feigin, and I. A. Vitver; the concept of economic regionalization was further developed by Kolosovskii, P. M. Alampiev, Iu. G. Saushkin, and V. M. Chetyrkin. In addition to the thorough study of theoretical problems associated with the location of production, important applied studies were made of individual republics, oblasts and raions. Special expeditions were carried out, and economic maps and atlases were prepared and published.

In the development of contemporary economic geography, the postwar period has been characterized by a new upsurge in economic-geographical research. Theoretical problems of economic geography have been elaborated by E. B. Alaev, Baranskii, R. M. Kabo, O. A. Konstantinov, V. V. Pokshishevskii, A. E. Probst, Saushkin, B. N. Semevskii, and others. Applied research in regional geography and the economic geography of branches of the economy has been conducted on a broader front by scholars in the various Union republics.

The formation of a world socialist system has prompted works investigating the economic geography of foreign socialist countries (V. P. Maksakovskii and I. M. Maergoiz). There has been an increase in the proportion of studies devoted to the developed capitalist countries (V. M. Gokhman and S. B. Lavrov) and the developing countries (V. V. Vol'skii and Ia. G. Mashbits), and the geography of the world economy has received more attention (M. B. Vol'f and M. S. Rozin).

New problems have expanded the purview of population geography, determined the rise of natural resources geography (I. V. Komar and A. A. Mints), and intensified interest in general research on the history of economic geography (N. P. Nikitin and Saushkin).

At the same time, ever increasing attention has been devoted to methodology and the search for ways of applying mathematical-economic modeling and other methods in economic-geographical research (M. M. Albegov, M. K. Bandman, N. I. Blazhko, A. G. Grinberg, V. V. Kistanov, and S. A. Nikolaev).

The development of Marxist-Leninist economic geography in socialist countries has been affirmed in the development of a new geography of the national economy that corresponds to the interests of socialist society. Congresses of Communist and workers' parties in socialist countries devote much attention to territorial problems of development of the national economy. Economic geographers have compiled master plans for the future regional location of productive forces.

In the inception and all stages of development of Marxist-Leninist economic geography, a struggle has been waged against the concepts of bourgeois economic geography, which are based on vulgar political economy, philosophical idealism, and geopolitics. Spatial economy, a popular contemporary school in the economic geography of capitalist countries (associated with the German economist A. Lösch and the American economist W. Isard), attempts to resolve the problem of the location of enterprises by using the abstract principle of minimum expenditures of capital, labor, and time without regard for the specific socioeconomic conditions of the regional organization of production. Some economic geographers view economic development processes with respect to regions as the diffusion of innovations, or they may associate the processes solely with poles of growth. Because of its attempts to avoid analysis of the contradictions of capitalism, bourgeois economic geography fails to reveal regularities in economic geography, even though descriptive characterizations contain many concrete data, individual generalizations of some value, and techniques that, if critically applied, can be very useful to the development of economic geography. More and more geographers in the capitalist countries are striving to offer an objective analysis of economic-geographical phenomena.

Methods. Economic geography uses its own methods as well as general scientific research methods. It analyzes statistical data on the location of production, economic relations, and other features of the regions under investigation. It also conducts direct studies of populated areas, enterprises, and microregions (the task force selective study of key specimens) in combination with the complex analysis of statistical data from planning, land management, and other institutions. Research is oriented both toward the individual branches of the economy and toward regional complexes. In the latter case, a special role is played by the economic-geographical synthesis of materials, which makes it possible to reveal the regional unity of elements of a given economic

structure. Important methods include the comparative geographic method, which reveals particulars of the economic development of individual countries and regions, and the cartographic method, which makes it possible to build a unique spatial model, both descriptive and symbolic, of an economic region.

Various types of economic calculations (balance sheets, technical and economic calculations, and the like) and mathematical techniques of quantitative analysis (correlation analysis, mathematical modeling, linear and nonlinear programming techniques, set theory, and the theory of graphs) are used to solve constructive problems involved in justifying the location of production facilities and in comparing proposals for the location of productive forces. They are particularly essential in the study of mass economic-geographical phenomena stemming from an intricate complex of causes and effects. Mathematical economic models are primarily used in the preplanning stage of economic-geographical research and in the solution of problems involving the optimum location of production. The most important mathematical economic models are economic branch models, models of the development of regional complexes, and interbranch and interregional models of the location of the national economy within a country. The optimum location of production is ultimately determined by using a global model, for which local models are only the first stage of development.

Efficiency of production is the criterion used to judge the optimum location of production in a socialist economy. Economic-geographical calculations take into account various economic indexes, in particular, regional differences in the discounted expenditures per unit of output, which depend on the quantity, quality, and location of natural resources, geographic location, transportation conditions, the degree of concentration of production, the technological level of production, specialization, cooperation and combination, the degree of development of a region, and the degree of development of the region's infrastructure. In the formalization of such indexes, it is essential to take into account the specific features of the socioeconomic system of a given country and the regularities characteristic of the given society, that is, whether it is socialist or capitalist.

The qualitative content of economic-geographical phenomena and processes is primarily revealed by conventional methods of analysis, as supported by structural and systems approaches.

The contemporary development of economic geography is characterized by the development of interdisciplinary research on the basic subject. Research may be conducted from various points of view: the ecological aspects of production-related activity, population settlement, and consumption; the sociological and demographic aspects of social reproduction (in their spatial expression); the population's living conditions (this orientation gives economic geography common interests with medical geography and city planning); and evaluation of the resource prerequisites of economic activity. Goal-programming techniques are becoming increasingly important. Such developments expand the framework of economic-geographical research, help make economic geography a self-contained discipline, and integrate the discipline with other geographic and social sciences.

The development of scientific principles for the optimization of the location of socialist production reveals the fruitfulness of the integrated development of countries and regions, which makes it possible to detect "bottlenecks" in individual regions, uneconomical shipment arrangements, and untapped potential in the economy of individual regions.

Scientific research. In the USSR scientific research in economic geography is conducted by the Geographic Institute of the Academy of Sciences of the USSR, the Institute of Geography of Siberia and the Far East, the Institute of Economics and Management of Industrial Production of the Siberian Division of the Academy of Sciences of the USSR, the Geographic Institute of the Pacific Ocean of the Far East Scientific Center of the Academy of Sciences of the USSR, and subdepartments of economic geography of branches of the Academy of Sciences of the USSR; research is also conducted by geographic institutes, departments, and sections of the republic academies of sciences. The location of productive forces is studied by the Council for the Study of the Productive Forces of the State Planning Committee of the USSR, by a number of economic institutes, and by local scientific institutions (for example, by economic institutes attached to the state planning commissions of the Union republics). A great volume of research is conducted at universities—in particular, Moscow University, Leningrad University, the Latvian University, and the universities of Kazan and Tartu—and at other higher educational institutions. The Geographical Society of the Union of Soviet Socialist Republics serves as a public forum for economic geography.

Major centers of economic-geographical research in other socialist countries include economic and geographic institutes of academies of sciences (the Institute of Geography and Spatial Organization of the Polish Academy of Sciences, the Geographical Institute of the Czechoslovak Academy of Sciences, and the universities of Prague and Bratislava), scientific research institutes attached to planning agencies, and subdepartments and departments of economic geography at higher educational institutions.

There has been considerable development in international cooperation in economic geography. Economic geographers of the USSR and other socialist countries participate in various international geographic forums, including international geographic congresses, and in the work of the International Geographical Union and its commissions. At the Twenty-third International Geographic Congress in Moscow (1976), approximately one-half of the papers presented were devoted to economic geography.

Economic geography is primarily a university science in the capitalist countries. Also important are geographic societies and various associations in which there is active interest in the topics of economic geography. Work in economic geography is frequently financed by foundations and capitalist monopolies, and economic geographers work in military, statistical, and other institutions as well as local government agencies and private firms.

The developing countries are faced with the need for economic-geographical research to analyze local natural resources, to ascertain optimum avenues of economic development (especially in the state sector), to effect a rational location of production, and to ensure favorable conditions for participation in the international division of labor. (*See also* GEOGRAPHIC INSTITUTES and GEOGRAPHICAL JOURNALS.)

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P. M. ALAMPIEV and V. V. POKSHISHEVSKII [29–1814–4]

ECONOMIC GROWTH, THEORIES OF, the bourgeois concepts designed to validate the interrelationship and interdependence of the basic categories and rates of expansion of reproduction. Economic growth theories represent the bourgeois alternative to the Marxist theory of reproduction.

Economic growth theories are concerned with (1) the factors that determine potential economic growth, (2) the interdependence of the macroeconomic categories (such as consumption and accumulation) that ensure stable economic growth, and (3) the manner in which stable growth is achieved—that is, whether it is achieved automatically or can only be ensured through state intervention.

The theory of economic growth developed in the 1950's by R. Harrod (Great Britain) and E. Domar (USA) was based on Keynesian premises. In the Keynesian approach to the analysis of economic growth, demand does not automatically equal supply, nor do savings automatically equal investments; demand—especially the demand for capital investment—plays a key role in economic growth; and the basic technological coefficients (for example, the relationship of capital to product, and of labor to capital) remain unchanged because of the rigidity of prices and are determined by the neutral quality of technological progress—that is, by such technological progress as does not influence the effectiveness of production factors.

According to Keynesian models of economic growth, the rate of accumulation is the main strategic factor and the basic parameter of regulation of long-range economic growth. Such growth is stable when savings are a stable proportion of income and capital is in stable relationship to output, creating what is known as a guaranteed rate of growth. Stability, however, is not achieved automatically. Deviations of the actual rates of growth from the guaranteed rate give rise to cyclical fluctuations; deviations of the guaranteed rate of growth from the natural rate (that is, from the rate of growth corresponding to the rate of growth of the population) cause protracted negative trends in the form of economic stagnation or inflation. The maintenance of stable economic growth requires state intervention and the use of tax and budget policies to regulate accumulation and consumption.

Since the late 1950's, the problems of economic growth have engaged the attention of economists of the neoclassical school, including J. Hicks and J. E. Meade in Great Britain and R. Solow and M. Brown in the USA. Their premises were that demand automatically equals supply; that the supply and effective utilization of economic resources play the major role in economic growth; and that the basic technological coefficients are subject to change depending on the prices of production factors and on the nature of technological advances. The chief premise of the neoclassical theory of economic growth was the idea of free competition, with the prices of production factors established at the level of their marginal products, thus supposedly ensuring a stable economic equilibrium.

On the basis of these assumptions, the economists of the neoclassical school proposed their own model of economic growth. The Cobb-Douglas production function was such a model; together with more complex production functions, it was the basis of a system of indicators that showed the dependence between expenditures and production output (coefficients of the elasticity of output based on resources) as well as the interdependence of the expenditures themselves (maximum rate and elasticity of replacement of resources). A system of quantitative characteristics was devised to show the economic influence of technological progress—such progress being either neutral or not (that is, influencing the effectiveness of production factors), and either materialized (that is, embodied in the means of production) or nonmaterialized (that is, not embodied in the means of production).

Empirical evaluations of the parameters of the production function play an important role in the analysis of the quantitative interrelationships that determine maximum potential output. Specifically, these evaluations were a basis for the conclusion that the main strategic factors of long-term economic growth were technological progress and its determinants—namely, improvements in the quality of equipment, in the level of skills of the work force, and in the organization of production. The economists of the neoclassical school, however, did not use the production function simply to arrive at empirical evaluations; they used it instead as a suitable mathematical form for interpreting the problems of dynamic economic equilibrium on the basis of the vulgar apologetic premises of neoclassical theory. The neoclassical theory of economic growth is designed to prove that the capitalist economic system is internally stable and possesses the necessary mechanisms for automatic restoration in the event of disturbance of the equilibrium. According to this school of thought, state intervention in the economy must be reduced to a minimum and be confined primarily to monetary and credit policies.

The neoclassical theory of economic growth also provides an explanation of the mechanics of distribution of national income. According to the theory, each production factor (that is, labor and capital) receives a share of the output corresponding to its own proportion and marginal productivity. Any change in this share is supposedly due solely to the influence of "nonneutral" technological progress. This theory of growth is thus aimed at distorting and concealing the genuine relations of production and distribution under capitalism.

Both Keynesian and neoclassical theories of economic growth are currently in a state of profound crisis, which results from their failure to conform to reality given the increasingly pronounced contradictions of capitalism. The methodological principles of these theories are the object of heated criticism even within the framework of their own bourgeois political economy.

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I. M. OSADCHAIA [29–1873–1]

ECONOMIC INCENTIVE, a system of measures that uses material means to motivate participants in production to work for the creation of the social product. The nature, form, and methods of economic incentive depend on the dominant production relations of a society.

Under capitalism, economic incentive is contradictory in nature. The actions of owners of the means of production—capitalists—are inspired by the possibility of appropriating surplus value through the exploitation of hired labor. Economic necessity is the labor motivation of industrial workers and all the toiling masses who are deprived of the means of production (*see* CAPITALISM).

Under socialism, economic incentive is based on the law of distribution according to labor. It is determined by the dominance of socialist production relations, which exclude the exploitation of one person by another, since all participants in production are simultaneously the owners of the means of production and of their own labor power. Under such conditions, the unity of three types of interests is achieved—societal, collective, and personal. The most important principle of economic incentive states that "what is good for society must be good for each production collective and each worker."

Economic incentive in socialist production is ensured by the existing system of management (*see* PLANNING, NATIONAL ECONOMIC). Profit-and-loss accounting (economic accountability) and the use of such key economic levers as profit, price, and credit play a major role in economic incentive in socialist enterprises.

Incentive funds (including the fund for the expansion of production, the material incentive fund, and the social-cultural and housing fund) are created at enterprises according to the overall quantitative and qualitative results of the economic activity of a given enterprise collective (such as the growth of labor productivity, reduction of the prime cost of production, increased profitability, and improvement of product quality).

Economic incentive for workers in both state enterprises and kolkhoz and cooperative enterprises depends in large measure on the organization of the wages of industrial and nonindustrial workers and on the remuneration of the labor of kolkhoz workers—the basic form of distribution of the necessary product and the most important means of offering personal material incentive under socialism (*see* WAGES).

One of the most important trends affecting economic incentive is the improvement of the economic mechanism and of economic incentive itself. Such improvement is realized in the stage of developed socialism, given the concurrent strengthening of democratic centralism in economic management.

In addition to material incentive and responsibility under socialism, moral incentive also plays an increasingly important part in economic incentive (*see* MATERIAL AND MORAL STIMULATION).

E. L. MANEVICH [29–1883–1]

ECONOMIC INFORMATION, information about economic relations and the processes of social reproduction; the information is used in the system of management of the national economy alongside other types of information, such as technical information that reflects the interrelationships among the physical elements of production. From the standpoint of persons receiving the reports and data, economic information is valuable only to the extent that it is new and useful for solving some problems in the national economy.

Economic information may be classified by content as follows: (1) by phases and processes of reproduction—information on production, distribution, exchange, and consumption; (2) by elements (or factors) of reproduction—information on population and labor resources, natural resources, output and services, monetary capital, and the like; and (3) by the structural units represented—sectors of the national economy, economic regions, enterprises and organizations, and so forth. From another point of view, it is important to classify economic information by its affiliation with a particular management function: planning economic information, which is developed during the planning process; accounting and statistical data, which arise from the functions of accounting and analysis; normative economic information; parity-check data; forecast data; and other types.

Economic information may be classified as background or management information depending on its effect on the user. Background information contains facts used in substantiating decisions. Management information contains the results of decisions that have been made and are being conveyed to others to be carried out. Management information may be presented in the form of direct assignments or as economic and other types of incentive that affect the behavior or functioning of the objects of management.

Directed and undirected economic information are distinguished by the method of delivery to users. Directed information is presented to one or several specific addressees, usually in standardized document form on a uniform time schedule. Undirected economic information has general application, and users will usually search it out themselves when the need arises.

Economic information is transmitted and processed in the form of symbols recorded on various carriers. The symbol systems used to represent economic information constitute economic information languages. Natural language is their common basis, but in economic management a vocabulary and standardized forms of expression have been developed that are specific to the economic information languages; this has occurred mainly in connection with the widespread use of standard tabular documents in flows of economic information. The use of computer technology to process economic information promotes the spread of various types of artificial languages: classifier-type languages, descriptor-type information languages, and others. The USSR is developing and introducing the Uniform System of Classification and Coding of Technical and Economic Information (ESKK TEI). Its purpose is to ensure uniform (within the country), unambiguous, and formalized representation of the elements of economic information. By 1977, 20 all-Union classifiers and systems of designations had been formulated and ratified as part of the ESKK. They included classifiers for branches of the national economy; industrial, agricultural, and construction output; minerals; work and services in various sectors; enterprises and organizations; and units of measure. Work began in the mid-1970's on an all-Union classifier of technical and economic indicators (OKTEP), which will have a central place in the ESKK. It will create the prerequisites for the ESKK to develop in the direction of formulating compatible information languages to describe economic information with the wide use of computers. In addition to the ESKK, a set of standardized document systems is being devised, to include accounting, report, planning, design, production-engineering, and other documents.

The indicator (index) is the typical form of expression of quantitative data for economic information. It may be a variable that characterizes one of the properties of the economic object depicted or a quantitative value for the variable. Qualitatively, an indicator is defined by a set of significant features; quantitatively, it is determined by measurement or calculation. Indicators of economic information may be consolidated into a system by es-

tablishing various relationships among them. The system forms the methodological foundation of the overall system of collecting and processing economic information and ensures that all quantitative data can be combined and compared.

The functions performed by different management bodies within the system of national economic management are joined by flows of economic information. In turn, such flows reflect the entire functional and organizational structure of management. Flows of economic information may be described in terms of direction, composition, intensity, and time. With respect to direction, there are horizontal flows (connecting management bodies at the same level) and vertical flows (ascending and descending, connecting management bodies at different levels). The composition of information flows is determined by the content of the messages transmitted. The intensity is defined by the volume of data transmitted per unit of time. With respect to time, economic information may be periodic (daily, monthly, annual, and the like) or nonperiodic (occasional or when deviations occur).

The bulk of economic information in circulation is made up of primary and bookkeeping data (within enterprises), transportation and payment-charge documents (in circulation between enterprises), bookkeeping and statistical reports, planning and normative documents, and operational management information. According to the findings of various studies, the annual internal circulation of recorded economic data within an industrial enterprise is from 50,000 to 2 million documents (from 3.5 million to 100 million indicators). The external circulation (volume of input and output data) of an industrial enterprise is approximately 100,000 documents and 1 million indicators per year. Of this, transportation and payment-charge documents account for 80–90 percent of the documents and 40–50 percent of the indicators. An industrial enterprise submits an average of 60,000–80,000 indicators per year in statistical and bookkeeping reports. The largest processing center for economic information is the network of institutions of the State Bank of the USSR (Gosbank), which manages more than 1 million accounts for 570,000 enterprises and organizations, concentrating information on all primary processes of production, distribution, and circulation of the social product. The principal methodological and organizational center for accounting and statistical economic information is the Central Statistical Board under the Council of Ministers of the USSR.

The chief lines of development of the current system of economic information stem from the challenge of improving the management of the national economy and putting it on a new technical basis. The growing complexity of management functions demands greater thoroughness, timeliness, and reliability of economic information; the introduction of modern computers, communications equipment, and the like creates the necessary preconditions for meeting such demands. Qualitative changes in the system of economic information are linked with the sequential development (following the decisions of the Twenty-fourth and Twenty-fifth congresses of the CPSU) of the all-Union system for the collection and processing of information for accounting, planning, and management. The system of economic information is being integrated by stages on a new technical basis. It will provide comprehensive use of an essential minimum of collected data and the maximum possible extraction of information from such data to solve the multifaceted problems of management.

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E. G. IASIN [29–1823–1]

ECONOMIC LAWS, the necessary, stable, and recurrent causal relationships and interdependences of economic phenomena in the course of the production, distribution, and exchange of goods and services at various stages of development of human society. Economic laws reflect the most essential and typical features of the operation and development of a given system of production relations. Every economic law expresses the unity of the qualitative as well as quantitative aspects of economic phenomena and processes and serves as an internal measure of these processes.

Economic laws, like natural laws, are objective. Unlike natural laws, however, they operate and manifest themselves only through the concrete labor and productive activity of society's members. "Men make their own history, but they do not make it just as they please; they do not make it under circumstances chosen by themselves, but under circumstances directly encountered, given, and transmitted from the past" (K. Marx, in K. Marx and F. Engels, *Soch.*, 2nd ed., vol. 8, p. 119). People are not free in their choice of productive forces and material living conditions. Preceding generations develop the productive forces in the process of their labor activity and leave them to succeeding generations. This bond in human history ensures the objective nature of economic development, which is ultimately independent of the will and consciousness both of individuals and of society as a whole.

Economic laws are historical in nature. Their content, mode of action, and forms of manifestation depend on the level of development of the productive forces. People enter into historically determined mutual economic relationships, and their activity is found to be subject to various economic laws. History knows five modes of production, based respectively on the primitive communal system, slavery, feudalism, capitalism, and communism (with socialism as its initial phase). Each mode of production has its own inherent system of economic laws.

The nature of economic laws and the manner in which they are manifested are directly dependent on the type of ownership of the means of production, on the level of actual socialization of production, and on the nature of the economic bonds between the parties in production relationships. In all antagonistic socioeconomic formations, economic laws operate spontaneously and are manifested as an external blind force that compels people to act in a given way.

Under capitalism, given the anarchy of social production arising from the contradiction between the social character of production and private capitalist appropriation, the internal laws of social reproduction manifest themselves in the objective form of economic crises of overproduction; these crises periodically shake the economy of bourgeois society, thereby ensuring "a *constantly disturbed* proportion" in the economy's development (V. I. Lenin, *Poln. sobr. soch.*, vol. 3, p. 621).

In socialist society, competition is replaced by relations of comradely cooperation and mutual aid. The supremacy of public ownership and the planned organization of the entire national economy make it possible to take into account all aspects of the economic laws and to consciously implement them at all levels of socialist management.

Economic laws differ in content and in effective duration. *General* economic laws are characteristic of all socioeconomic formations. This category includes the law of the correspondence of production relations to the nature and level of development of productive forces, the law of the increasing productivity of social labor, and the law of economy of time. At each stage of historical development these laws assume different forms and produce different economic effects. Thus, at the time when the mode of production of the primitive communal system shifted to the mode of production based on slavery, the law of the correspondence of production relations to the nature and level of development of productive forces had the effect of eliminating primitive communal ownership and of establishing and consolidating private slaveholders' ownership of slaves and of the material means of production.

In the transition from capitalism to socialism, the same law operates to eliminate private capitalist ownership of the means of production (and ultimately to eliminate all forms of private ownership of the means of production) and to consolidate public ownership of the means of production in its two forms: (1) public, or state, ownership of the decisive means of production and (2) cooperative ownership of the major portion of the means of agricultural production.

Other types of economic laws are operative only in some, rather than in all, socioeconomic formations—namely, where there is commodity production. This category includes the law of value, the law of money circulation, and the law of supply and de-

mand. The law of value was already functioning at the time when the primitive communal system began to disintegrate—that is, after the first major divisions of labor in society (the separation of cattle raising from farming, and of handicrafts from agriculture). The law of value was limited in its range of operation under the mode of production of the slaveholding system and subsequently under the feudal mode of production; it operated most extensively under the capitalist mode of production, and it is still in effect, expressing a different social content of economic relations in the period of transition from capitalism to socialism and under socialism. The law of value will ultimately die out in the second phase of the communist socioeconomic formation—namely, when full communism has been achieved.

Specific economic laws, which make up a distinct category, operate only under a specific mode of production. They reflect the significant features in the operation and development of historically determined production relations. Specific economic laws are precisely the laws that make principled distinctions between different systems of economic laws. Certain specific economic laws operate only in certain phases or stages of a given mode of production. Thus the system of economic laws of monopoly capitalism has certain new features that distinguish it from the system of economic laws of premonopoly capitalism (for example, the law of monopoly profit under imperialism). The system of economic laws of the socialist phase is gradually transformed into the system of economic laws of full communism, which is communism's second and highest phase. For example, the law of distribution according to labor will be gradually transformed into the law of distribution according to needs.

The primary objects of study of political economy are the specific economic laws that most fully express the socioeconomic nature and historically determined place of one or another system of production relations. Political economy "must first investigate the special laws of each individual stage in the evolution of production and exchange, and only when it has completed this investigation will it be able to establish the few quite general laws which hold good for production and exchange in general" (F. Engels, in K. Marx and F. Engels, *Soch.*, 2nd ed., vol. 20, p. 151).

The emergence and increasingly greater effect of specific economic laws go hand in hand with the establishment and development of historically determined production relations in unity with productive forces. The system of economic laws of a given mode of production represents the integral system of necessary and substantive internal relationships and dependences of that mode of production that characterizes as fully as possible its essence and direction of development. This system includes the basic economic law of a given mode of production, determining the specific goal of social production and the appropriate means to attain that goal; the economic law of the appropriation of the necessary and surplus product by various classes and social groups; the economic law that reflects the specific distribution of social labor and means of production among various branches of production and types of activity; the economic laws of reproduction, which demonstrate the correlation between production of the means of production and production of consumer goods, or between the first and second subdivisions of social production, as well as within each of these subdivisions; the economic laws that characterize the distribution of consumer goods among direct producers; the economic laws that express the essence of secondary, or transferred, production relations, such as international economic relations; the economic laws of individual spheres of social production; and the general economic laws operating under the conditions of a given mode of production.

The knowledge and utilization of economic laws are two reciprocally determined aspects of society's mastery of the laws governing the functioning and development of the economic system. People are able to master economic laws—that is, to comprehend them, to use them in a certain way, and to direct the law's effect toward the satisfaction of their economic interests. The knowledge and utilization of economic laws in an antagonistic society are class-oriented, serving the interests of the classes that own the means of production. The exploitative essence of capitalism and the spontaneous nature of capitalist economic development exclude the possibility of well-planned organized actions on the part of the masses with the aim of deliberate utilization of economic laws. Under socialism, economic laws are comprehended and utilized by the working class in the interests of society, and under advanced socialism, by all the people under the leadership of the working class.

Some elements of objective analysis of the economic laws of capitalism can be found in the works of such classical bourgeois political economists as W. Petty, F. Quesnay, A. Smith, and D. Ricardo.

K. Marx and F. Engels, the founders of the theory of scientific communism, examined the capitalist system of economic laws and revealed the objective inevitability of the downfall of capitalism, showing that the proletariat is destined to dig its grave. V. I. Lenin brought to light the distinctive effects of the economic laws of capitalism under the rule of the monopolies, defining imperialism as the highest and last stage of capitalism. He proved that uneven economic and political development is an unconditional law of capitalism. In the age of imperialism, the victory of the proletarian revolution may initially come in a few countries only, or even in a single country. Socialist revolution expresses the conscious utilization by the masses, under the leadership of the proletariat, of the law of the correspondence of production relations to the nature and level of development of productive forces, thereby ushering in the age of socialism and communism in which the spontaneous action of economic laws is replaced by their purposeful utilization in the interests of society.

Knowledge of economic laws includes discovery of the internal content, general direction, quantitative determinability, and immanent forms of manifestation of each law and consequent discovery of the significance of a given law in the context of economic development; study of the material prerequisites and economic conditions that are the basis of the laws' operation and interaction in the system of economic laws; identification of the specific forms in which a law manifests itself under specific socioeconomic conditions and depending on the scale of the object under study (a single enterprise, an economic region, branch, or sphere, the national economy as a whole, or the world economy); elucidation of the requirements of a given economic law both in general terms and with respect to specific historical conditions; and finally identification of those objective trends in economic development that lead to the extinction or modification of a given economic law.

It is only under socialism and communism that the use (preceded by knowledge) of economic laws in the interests of society is both possible and necessary, this being the main form of implementation of such laws; it is only under socialism and communism that the direct producers are united by the social nature of production and public ownership of the means of production.

The scientific principles underlying the utilization of economic laws under socialism were set down in the works of K. Marx, F. Engels, and V. I. Lenin; they are elaborated and developed in the documents of the CPSU and other communist and workers' parties and in the works of Marxist scholars. The utilization of economic laws is effected by means of the economic policies of communist and workers' parties and socialist states. Economic policies are concretely implemented in the various types of economic and organizational activities of the state. Such activities include the planned management of the socialist economy (economic forecasting, planning, organization, and management, the provision of performance incentives, and accounting and monitoring of production and distribution), as well as the broad dissemination of economic knowledge among all working people and the training of personnel for the national economy.

The effective utilization of economic laws presupposes in-depth and comprehensive analysis of the state of the economy and of the objective trends of its development at a given stage; elaboration of a scientifically valid notion of the desired results of economic development, commensurate to society's resources and potential as well as to its developing needs; and determination of the specific effect of various social forces and possible ways of combining them toward the attainment of contemplated results in accordance with the requirements of the system of economic laws. All this constitutes the economic strategy of the communist and workers' parties and socialist states. The elaboration and implementation of economic policies also include such economic

tactics as the continuation and concretization of economic strategy. Economic tactics are the actual techniques and means by which economic policies are applied to individual branches of the national economy, to individual economic regions, and to workers' individual social groups over a relatively short time.

The manner and extent of the economic laws' utilization serve at the same time to test the truth of the theoretical knowledge that has been obtained on the system of economic laws, and they are a most important condition for thorough knowledge of such laws.

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ECONOMIC MANAGEMENT, a concrete historical method of influencing the process of social labor in accordance with the objective laws of social development; one of the principal forms of social control. Economic management involves both the production and the nonproduction sphere (*see* ADMINISTRATION AND MANAGEMENT). [29–1884–1]

ECONOMIC MAPS, topical maps that illustrate various economic phenomena and activities.

A distinction is made between general economic maps, which describe the economy as a whole (including maps of economic regions, territorial-production complexes, economic centers, economic ties, levels of economic development, and specialization of production), and maps of various branches of production and spheres of circulation (including industry maps, agricultural maps, transportation and communications maps, and maps of the construction industry and trade and finances). Maps depicting labor resources and natural resources as components of economic activity are also classified as economic maps. Resource evaluation maps (depicting agroclimatological resources, conditions of economic development of regions, conservation, and the like) are classified midway between economic maps and maps of the natural world.

The first hand-drawn economic maps in Russia appeared in the late 17th century; printed maps were first published in the 1840's. The most important economic maps compiled before the October Revolution were made after the reforms of the 1860's, for example, the *Statistical Atlas of the Principal Sectors of Factory Industry in European Russia* (1869–73) and *Trade and Industry Map of European Russia* (1900), compiled by V. P. Semenov-Tian-Shanskii.

Economic maps are used to facilitate planning and forecasting the development and location of productive forces as well as for management of the national economy. The first widely known Soviet economic map was the *Schematic Map of the Electrification of Russia* (1921), compiled at the initiative of V. I. Lenin. Compilation of the *Great Soviet Atlas of the World* (1937) and of the economic and comprehensive atlases of the USSR and individual regions of the country represented a significant contribution to domestic and world economic cartography. Further achievements in the postwar years have included a series of economic atlases of the USSR and other countries, comprehensive atlases of the Union republics, krais, and oblasts, and economic maps for reference, education, and agitation and propaganda.

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ECONOMIC MATERIALISM (also economic determinism), the dogmatic simplification of the materialist interpretation of history. In essence, economic materialism reduces the wealth of the dialectics of social development to the operation of a predominant age-old "economic factor." While recognizing economics as the subject of history, economic materialism views people as the passive "element" of the productive forces or as the products of production relations. From the productive forces and production relations, economic materialism schematically deduces all other phenomena of social life that have no active role of their own. Economic materialism views people solely as personifiers of economic categories, or economic personae.

The ultimate expression of economic materialism can be found in the vulgar sociologism of V. M. Shuliatikov. Economic materialism as a whole is characteristic of the opportunist "tradition" (of E. Bernstein, for example). It is also manifested in the works of certain Marxists, such as A. Labriola, P. Lafargue, and F. Mehring. As V. I. Lenin pointed out, what led to the emergence of economic materialism was the assimilation of Marxism "in an extremely one-sided and mutilated fashion [by those who] had learnt by rote certain 'slogans,' certain answers . . . *without having understood* the Marxist criteria for these answers" (*Poln. sobr. soch.*, 5th ed., vol. 20, p. 88). Criticism of economic materialism is a necessary condition of the creative development of Marxism.

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ECONOMIC MODEL, MATHEMATICAL, a model of an economic entity or process the description of which involves the use of mathematics.

Mathematical economic models may be constructed to analyze various premises and principles of an economic theory, to provide logical substantiation of observed economic patterns, or to process and systematize empirical data. Their applications include the practical forecasting, planning, and management of the national economy and the improvement of planning and management of the economic mechanism as a whole and of other aspects of society's economic activity.

According to their purpose, models may be classified as descriptive and constructive. Descriptive models are used to help explain various existing economic phenomena and processes.

Classic examples are models of economic growth and models of competitive economic equilibrium. The latter may be regarded as the first mathematical economic models in history. Their origins can be traced back to the famous *Economic Table* of the Physiocrat F. Quesnay. In this work Quesnay attempted to explain the creation and redistribution of income.

Modern equilibrium models involve aggregates of producers and consumers, the producers being described by means of a set of production capabilities and the consumers being described by means of certain functions or procedures that specify a preference or a choice of consumer goods. Producers try to select a mode of production that will produce maximum profit, and consumers seek to obtain the market basket of goods that will bring them the maximum degree of satisfaction for the money they have to spend. The consumers' funds (budget) are formed from producers' profits through some specified profit redistribution mechanism. A state of equilibrium is attained when no producer or consumer is interested in altering his activity. Equilibrium models are used for the description of both capitalist and socialist economies. In essence, the coordination of various, including opposing, interests is investigated in such models.

Descriptive models include economic growth models designed to forecast the basic aggregate indicators of development of the national economy and forecasting models for various parts of the economy. The latter models, which are based on mathematical statistics, particularly on correlation analysis, are used to study and forecast the behavior of multifactor economic processes, such as the dynamics of prices on the world market or of stock exchange indexes. Also classed as descriptive models are models that merely simulate the behavior of various parts of the economy, for example, models that simulate the development of an enterprise or firm.

The development of constructive models represents a new stage in the modeling of economic phenomena. The principal distinctive feature of such models is that they model the economy that society creates; in particular, they model desirable changes in the existing economy. Constructive models have had a considerable influence on the development of economic theory as a whole. The first models of this type were the reproduction schemata of K. Marx, the analysis of which led Marx and subsequently V. I. Lenin to conclude that the production of means of production—especially the production of means of production for the production of means of production—necessarily develops more rapidly than does the production of consumer goods (*see* REPRODUCTION).

The constructive approach to the modeling of economic phenomena is inherent in the socialist economy, in which economic construction can be carried out on a scientific foundation. The discovery of linear programming, a mathematical discipline for analyzing and solving extremum problems with constraints, in the late 1930's stimulated the rapid development of constructive models. The optimal planning model of a socialist economy was developed on the basis of linear programming. Within the framework of this model precise definitions were obtained of such concepts as optimum, optimal plan (*see* OPTIMUM, NATIONAL ECONOMIC), social utility, and socially necessary expenditures of labor. This model, like the model of an ideal gas in physics, was an ideal model; it generated an entire spectrum of optimal planning models that take into more complete account various aspects of the actual planning process. To be sure, the model incorporated such assumptions as the linear dependence of output on expenditures, the infinite divisibility of products, the existence of an exact mathematical formulation of the global objective of society, the absolute admissibility and validity of the information used, and the presence of infinite computational capacity. Nevertheless, it provided the foundation for the theory underlying the System for the Optimal Functioning of a Socialist Economy (SOFE), which is being developed in the USSR.

In terms of their basic premises, optimal economic growth models may be classed as optimal planning models. They are used to investigate the potential development of an economic system over time and to define the optimum of economic growth and the factors that influence the maximum growth rate.

The further development of planning models necessitates the creation of systems of planning models where each model in a system is developed and used by an appropriate planning or administrative agency. Mathematical means are being developed for the purpose of resolving problems relating to the coordination of the solutions of individual models. As economic factors are incorporated into models with increasing precision, the models become more complicated, and their subsequent analysis and, in some measure, use become more difficult. For this reason, computers have been increasingly used in the construction, analysis, and practical application of models.

The division of mathematical economic models into descriptive and constructive types is somewhat arbitrary. For example, the report intersector balance is a purely descriptive model, but the planning intersector balance has both descriptive and constructive properties. The construction of integrated models of the functioning of economic systems is one of the basic trends in the development of mathematical economic models. The models of functioning reflect not some isolated economic process, such as the planning process, but the aggregate of all basic processes, including planning, production activity proper, material and technical supply, management of plan fulfillment, coordination of the interests of different agencies, and pricing. For this reason, the model of the functioning of an economic entity consists of building blocks that use diverse mathematical apparatus. The analysis of such an integrated model involves primarily numerical experiments using computers and appropriate statistical processing.

The variables that are to be defined as a result of the "solution of the model" may be not only numerical characteristics, such as output volume or the use or nonuse of various technological methods, but also the algorithm of activity or the structure of the interaction of parts. For example, algorithms pertaining to the compilation of the plan vary, as do algorithms relating to the interaction of enterprises and of material and technical supply agencies; in addition, the production structure of enterprises varies.

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V. L. MAKAROV [29–1812–1]

ECONOMIC PATTERN, a type of social pattern (*see* CONFORMITY TO LAWS OF SOCIETY). Economic patterns are usually the aggregate result, or resultant, of several economic laws acting simultaneously. The relations and dependencies reflected in economic patterns are therefore more complex and multivariate than the relations and dependences reflected in economic laws.

[29–1849–1]

ECONOMIC POLICY, the system of economic measures implemented by the state in the interests of the dominant class in presocialist formations or, under socialism, in the interests of all society; a branch of economic science.

The social content and objectives of economic policy and the means chosen to achieve its goals are determined by the character of the social system and ownership of the means of production. Like all policies, economic policies are the concentrated expression of economics, or of historically determined modes of production. The economic policy of the political party in power is influenced by numerous factors, such as the relationship between class forces, the stage of development of the class struggle in a given country and in the international arena, and the state of peace or war.

Economic policy dates back to the inception of classes and the formation of the state. In a society with antagonistic classes, it reflects the interests of the exploiting classes and is the means by which such interests are protected and realized. Under slavery and feudalism, economic policy was generally confined to the imposition of taxes and the regulation of monetary circulation. In the formative period of the capitalist mode of production, the bourgeois state took measures to establish and develop manufacturing enterprises and adopted laws that consolidated the supremacy of capital over hired labor; mercantilism and protectionism became widespread.

The growth of the industrial bourgeoisie gave rise to the policies of free enterprise and free trade. The economic policy of the bourgeois state during this period reflected the historical conditions of free-competition capitalism. In the age of imperialism, the bourgeois state has increasingly intervened in the process of capitalist reproduction. State monopoly regulation is a complex mechanism of socioeconomic and political maneuvering that is used to preserve the capitalist economy. It includes such measures as economic programming, development of the state sector, subsidies, anti-inflationary measures, and credit and financial activities directed toward foreign economic expansion (for example, tax advantages for export monopolies, government-guaranteed exports, and customs policies).

To a considerable degree, the capitalist countries' monopolies use the machinery of the state for their international operations. The period that followed World War II saw the emergence and growing range of activities of international monopoly organizations—some encompassing a particular branch in its entirety, such as the European Coal and Steel Community, and some designed for a more general type of economic integration, such as the European Economic Community.

In the age of imperialism, the economic policies of the bourgeois states and parties reflect capitalism's adaptation to new historical conditions. Such policies, however, cannot ensure the planned development of the economy on the scale of the entire society or the stabilization of capitalism as a system. The general crisis of capitalism continues to mount. The economic policy of the bourgeois states as a whole, being diametrically opposed to the fundamental interests of the working people, leads to even sharper class contradictions.

In the developing countries that pursue an independent course, economic policy is aimed at limiting the omnipotence of the foreign monopolies, establishing a state sector in the economy, developing industrial production, and implementing agricultural reforms. These countries favor the establishment of a new international economic order with just and equitable international division of labor and foreign economic exchange.

Economic policy plays a fundamentally different role under socialism—a system that is based on the public ownership of the means of production and that develops according to plan through the conscious use of economic laws. Through its economic policies, the socialist state regulates material production—the basis of society's development—and in so doing determines the future prospects and tempo of social progress, directly influences changes in the social structure and the people's greater well-being, and ensures the solution of the basic socioeconomic problems of communist construction. Through their successful efforts to build communism, the socialist countries exert a decisive influence on world development.

Fundamental economic policy, economic strategy, and current economic targets are determined by the communist and workers' parties of the socialist countries—primarily at the party congresses and at the plenary sessions of the leading central party organs. The economic policy of the communist parties, which is based on Marxist-Leninist theory, expresses the fundamental interests of the toiling masses headed by the working class and of all strata and social groups in socialist society; it is distinguished by its scientific character, realism, goal-directedness, and consistency.

V. I. Lenin formulated the most important principles of the economic policy of the socialist state. The basic tenets of economic policy are concretized and implemented in the activity of the socialist state through the national economic system of management and planning. The state's long-term, or five-year, and one-year plans reflect the conditions and specific characteristics of a given period of the country's development. Under the specific conditions that evolved in the first few years after the victory of the Great October Socialist Revolution in Russia, the Communist Party and the Soviet state implemented the policy of "war communism" and the New Economic Policy. Industrialization, the collectivization of agriculture, and the cultural revolution created a mighty industry and overcame the country's age-old backwardness, thus ensuring the victory of socialism.

Starting with the late 1930's, the economic policy of the CPSU and of the Soviet state was aimed at strengthening victorious socialism, building an advanced socialist society, expanding and consolidating the material and technical basis for socialism, developing socialist production relations, and raising the living standard and cultural level of the working people. Until the mid-1950's, the major portion of the country's accumulation fund was used to accelerate the rate of development of heavy industry—an effort dictated by the need to restore the national economy, which had been destroyed during the Great Patriotic War of the Soviet Union of 1941–45, and to strengthen the economic and defensive power of the Soviet nation and of the entire world socialist system. After the mid-1950's, the Soviet state was able to allocate a greater part of its resources to the development of light industry, housing construction, and agriculture. By the late 1950's, the material and technical basis for socialism had been strengthened and the USSR was a mighty and invincible power. Socialism was finally and totally triumphant.

The building of an advanced socialist society in the USSR was contingent on the development of long-range economic policies and economic strategy under new conditions. With the general upsurge of the economy, it was found that the existing planning techniques and economic production incentives were not appropriate to the higher level reached by the productive forces and were indeed hindering the latter's development. Therefore in the 1960's and 1970's the party and the state concentrated on basic improvements in production relations, in the management of the national economy, and in the planning and stimulation of production. These objectives were reflected in the documents of the March (1965) and July (1970) plenums of the Central Committee of the CPSU (CC CPSU) on the development of agricultural production; in the decree of the CC CPSU and Council of Ministers of the USSR (1966) introducing a guaranteed monthly wage for kolkhozniks; in the decisions of the September (1965) plenum of the CC CPSU on improved planning and stronger economic incentives for industrial production; and in the decree of the CC CPSU and the Council of Ministers of the USSR (1973) on the further improvement of industrial management.

An economic strategy corresponding to the conditions and tasks of advanced, or mature, socialism was devised by the Twenty-fourth and Twenty-fifth Congresses of the CPSU. "Like any other strategy, the party's economic strategy begins with the formulation of tasks, with the articulation of fundamental, long-term goals. . . . Economic strategy also includes a precise determination of the ways and means to attain these goals" (*Materialy XXV s"ezda KPSS*, pp. 39, 40). The October (1976) plenum of the CC CPSU, which approved the tenth five-year plan, defined the key issues of economic development and devised a set of effective tactics for the solution of economic and political problems.

The supreme goal of the economic policy of the socialist state and of the party is the steady rise of the living standard and cultural level of the population. The system of advanced socialism offers greater opportunities to realize this goal, making it possible to more fully satisfy the people's growing material and nonmaterial needs, to improve the socioeconomic and production conditions of labor, to raise the level of the socialist mode of life, to perfect the structure of Soviet society, and to reduce the differences in affluence, cultural level, and working and living conditions of the different social groups in the cities and rural areas. The long-range goals of economic policy are set forth in concrete terms in the social program of the five-year plans (for example, the program for social development and for raising the people's standard of living in the tenth five-year plan, established by the Twenty-fifth Congress of the CPSU).

The principal means employed to achieve the stated goals are (1) increasing the effectiveness of social production through its intensification, (2) accelerating the rate of scientific and technological progress, (3) raising labor productivity and improving the quality of all types of work throughout the national economy, and (4) coupling the attainments of the scientific and technological revolution with the advantages of socialism. The policy of increasing the effectiveness of social production is occasioned both by the long-term task of establishing the material and technical basis for communism and achieving victory in the economic competition with the capitalist system and by the specific conditions of the national economy at the present stage of development—in

particular, by the limited possibility of expanding production at the expense of nonintensive factors.

The party's economic strategy determines the basic directions in the development and improvement of production at any given stage. Thus the tenth five-year plan (1976–80) posed the task of promoting further growth in the country's economic capacity, expanding and radically renewing the social funds, and securing the stable and balanced growth of heavy industry, which is the economy's foundation. These tasks can be successfully accomplished by implementing the uniform scientific and technological policy that is a basic component of the party's and the socialist state's economic policy.

Economic policy includes capital investment policy and the rational allocation of productive forces, income, prices, and wages, as well as agricultural policy, financial and credit policy, and demographic policy. The policy of rational utilization of natural resources and environmental protection is increasingly assuming a separate identity. Foreign economic policy is an important part of economic policy; it contributes to socialist economic integration, the strengthening of stable and mutually advantageous cooperation with the developing countries, and the expansion of economic, scientific, and technological relations with the industrially developed capitalist countries based on the consistent observance of the principles of peaceful coexistence.

The successful implementation of the economic policy devised by the Marxist-Leninist parties of member nations of the Council for Mutual Economic Assistance enabled the majority of these countries to complete the transition from capitalism to socialism and to build a socialist society. The economic policy of these countries is now aimed at securing the further growth of social production, increasing its effectiveness, and raising the people's material and cultural standard of living. Current efforts are devoted to building the advanced socialist society.

Socialist economic policy is distinguished by its humanistic objectives and its genuinely popular character. The constantly expanding participation of the working people in the formulation and implementation of economic policy is an important ruling principle of socialist and communist construction. Such participation takes various forms—namely, the nationwide discussion of key documents pertaining to economic policy, the workers' participation in the solution of problems related to production and in the work of various social organizations, and the wide-ranging extent of socialist competition.

Economic policy is taking shape as an increasingly important and independent scientific school that investigates the scientific foundations and principles of political direction of the economy and explores the practical implementation of economic policies at various stages of development of socialist society. Economic policy is based on Marxist-Leninist philosophy and political economy and on the theory of scientific communism; it also takes into account the achievements of allied sciences—for example, theories of planning and management, sociology, and law. In the course of formulation of economic strategy and tactics, recommendations are made for improved management of the national economy, and ways and means are determined to mobilize the working masses for resolution of the problems confronting society. Many of the questions that fall within the scope of economic policy as a branch of science are open to debate—for example, the question of defining the subject matter and distinctive methods of economic policy that differentiate it from allied scientific disciplines. In the USSR the program of the political and economic education system includes the study of the economic policy of the CPSU.

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L. I. ABALKIN [29–1828–3]

ECONOMIC POTENTIAL, the aggregate capacity of branches of the national economy at a given point in history to produce industrial and agricultural output, undertake capital construction, transport freight, and provide services to the population.

Economic potential is determined by the quantity of labor resources and the quality of their vocational training, by the volume of production capacities of industrial and construction organizations, by the production capacities of agriculture, by the extent of transportation arteries and the means of transport, by the development of sectors in the nonproduction sphere, by advances in science and technology, and by the resources of explored mineral deposits—in other words, by the elements that in their aggregate make up the productive forces of society. Economic potential depends on the extent of a country's national wealth.

Economic potential is a social category. Under the conditions of capitalism, economic potential is a factor in the economic and military pressure exerted on countries in the socialist community, in the economic and political subordination of countries with poorly developed economies, in the struggle for markets, and in the realization of superprofits. It is also a means of increasing the influence of monopoly capital on state administrative bodies and increasing the exploitation of the working masses. Economic potential depends on the absolute production capacity of economic branches and on the degree to which the capacities are used. Labor resources and production capacities in capitalist countries are not fully used because of certain patterns of reproduction. (It is estimated that in 1976 the USA had more than 8 million unemployed and industrial production facilities were operating at approximately 77 percent of capacity.) Economic potential is therefore calculated on the basis of the actual output and total use of production capacities.

Under socialism, economic potential is used to ensure the economic independence and defensive capability of socialist countries and the better satisfaction of the needs of the working masses by raising the living standard and cultural level of the people. Since economic potential is defined with respect to absolute production volume, a high economic potential may be enjoyed by large countries with developed productive forces and great national wealth. In 1977 the USSR produced one-fifth of the world's total industrial output and occupied second place in the volume of industrial production.

Labor resources and the level of vocational training are a key element in economic potential. In 1977, 92 percent of the able-bodied population was employed in the national economy of the USSR. Industrial and nonindustrial workers numbered 106.4 million, of whom 10.0 million had higher education and 14.0 million had specialized secondary education. Nearly 34.2 million industrial and nonindustrial workers upgrade their qualification each year.

Economic potential is in large measure determined by the level of industrial development, in particular, the development of the machine-building industry, which supplies all branches of the national economy with the means of production (*see* ECONOMIC DEVELOPMENT, LEVEL OF). Soviet industry comprises 44,000 associations and enterprises that in 1977 manufactured products valued at 554 billion rubles. Industry employs 35.4 million industrial and nonindustrial workers. The growth rates of industrial production are more rapid than those of other branches and promote the growth of economic potential as a whole. Between 1940 and 1977 the gross social product of the USSR increased by a factor greater than 12; during the same period industrial output increased by a factor of 18.

In 1977, USSR agriculture had 27,000 kolkhozes and 20,000 sovkhozes; 217.7 million hectares were under cultivation, and the

number of livestock held totaled approximately 329 million head. Agriculture had at its disposal 2.4 million tractors, 692,000 grain-harvesting combines, 1.5 million trucks, and a large quantity of other equipment. Gross agricultural output in 1977 was valued at 123.5 billion rubles.

Capital construction promotes the growth of economic potential. The USSR has 24,400 construction organizations, which put 407.8 billion rubles' worth of fixed capital stock into operation between 1971 and 1975, 95.4 billion rubles' worth in 1976, and 98.2 billion rubles' worth in 1977. This capital included 250 new, large-scale state industrial enterprises, a large number of new shops and production facilities at existing enterprises, new livestock complexes and farms, roads, housing, schools, hospitals, and other projects. Construction organizations employ 8 million persons. They have 151,400 excavators, 44,000 scrapers, 165,300 bulldozers, and 200,500 mobile cranes.

The USSR has at its disposal a high-capacity transportation system that incorporates 270,000 km of railroad track (belonging to the Ministry of Railroads) and sidings (belonging to industrial enterprises and organizations); 689,000 km of surfaced roads; 162,100 km of oil and gas pipelines; and well-developed oceangoing, river, and air fleets equipped with modern means of transport. In 1977, the total freight turnover for all types of general-service transportation amounted to 5.6 trillion ton-kilometers; more than 26 billion tons of freight and 42 billion passengers were transported.

Scientific institutions (including higher educational institutions) make up the scientific and technical potential of the USSR. They employ approximately 1.3 million scientific workers (one-fourth of all scientific workers in the world), including 35,400 doctors of sciences and 353,400 candidates of sciences. In 1976 and 1977, 7,800 new models of machines, equipment, and instruments were developed and production technology was improved, thereby effecting a significant increase in the nation's economic potential.

The growth of the economic potential of the USSR is promoted by the country's vast reserves of explored mineral deposits, many of which, including iron ore, coal, and potassium salts, are the largest in the world.

Economic potential also depends on the degree of development of sectors in the nonproduction sphere—education, public health, and housing and municipal services—that ensure the reproduction and functioning of labor power. The USSR has 154,000 general education schools, 861 higher educational institutions, 4,300 specialized secondary educational institutions, 24,300 hospitals and health care facilities, extensive housing facilities, and other social and cultural facilities.

In the stage of developed socialism, economic potential is characterized by a high level of development of the productive forces, by a dynamic and proportional economic growth, by the increasing efficiency of production, by the integrated mechanization and automation of production, and by the improvement of qualification levels. The economic potential reached by the USSR has made it possible for the country to create a material and technical basis for socialism and to use the scientific and technological revolution to construct the material and technical basis for communism. The economic potential of the USSR is supplemented by the economic potential of other socialist countries; together they constitute the economic potential of the world socialist economic system. In 1977 all socialist countries combined accounted for more than 40 percent of the world industrial output. Their growth rates significantly surpass those of the capitalist countries, which results in an increase in the share of the socialist economy in world production.

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M. N. GORSHKOV [29–1868–1]

ECONOMIC REFORM IN THE USSR, the transition that took place in the mid-1960's—after the March and September 1965 plenums of the Central Committee of the CPSU—to a new system of management based on improved centralized planning, broader use of economic management techniques, greater autonomy in the economic operation of enterprises and economic organizations, and workers' increased responsibilities, as well as great material incentives, in raising the efficiency of production.

The factors that led to the economic reform were the higher level of development and scale of production and the greater complexity of economic relations caused by the scientific and technological revolution; these circumstances demanded, on the one hand, greater concentration on the long-range problems of improving production and, on the other, a high degree of operational efficiency in day-to-day economic activity. The system of economic management that had evolved was now hindering the effort to increase the productivity of labor and the efficiency of production, thereby reducing the possibility of achieving rapid growth in the material and cultural level of the population and high scores in the economic competition with capitalism.

Fuller utilization of the advantages of socialist production required that improvements in centralized state planning of the economy be combined with a higher degree of economic autonomy, increased operational efficiency, and greater initiative on the part of enterprises, bringing the system of economic management in line with the modern material base established for large-scale mechanized production during the period of socialist construction. The economic reform represented a new stage in the improvement of socialist production relations—particularly the relations between society as a single economic organism and the enterprises as components of that organism—through consistent implementation of the principle of democratic centralism; the principle requires that centrally planned state management of the economy be combined with the development of local initiatives by the broad masses of working people.

The economic reform was marked by the transition to full profit-and-loss accounting and extensive use of such cost factors as price, profit, credit, and bonuses. Profit became a more important indicator in evaluating the performance of enterprises. The new procedure for allocating profit ensured a better match of the social, collective, and personal interests in the socialist economy. Profits were yielding more funds to enterprises for the improvement of production, higher material incentives, and better working and living conditions. The amount of funds left at the disposal of a given enterprise depends on its efficient utilization of the productive assets assigned to it and on the increased volume, better quality, and greater profitability of its products. Enterprises have been assigned greater responsibility in fulfilling their contractual obligations under the profit-and-loss accounting system. The principles of profit-and-loss accounting are also applied to the activity of the higher-level administrative agencies and in some instances even to the ministries.

In the realm of administration, the economic reform relieved the state agencies of responsibility over the detailed operations of enterprises and allowed the centralized leadership to focus on the major long-range questions—namely, the development of production and, in addition, the broader application of economic management techniques that would ensure greater production efficiency by directly affecting the producers' economic interests. An important part of the economic reform was the restoration and strengthening of branch management and reduction in the number of management units through the establishment of production associations, production research associations, and all-Union (republic) industrial associations. The increased funds placed at the disposal of enterprises have enhanced the economic significance of the trade unions and other workers' organizations operating within the enterprises. The economic reform served to promote socialist competition.

Centralized planning assumed greater importance in the course of the economic reform. The improvement in the centrally ratified plan indicators of enterprise activity, as well as the reduction in the number of such indicators, enabled the state planning agencies to devote their concentrated efforts to the proportions and rates of development of the national economy, the basic direction of scientific and technological advances, and the rational siting of production. The planning functions of the enterprises (associations) and ministries were expanded, and production units were given greater operational economic autonomy and initiative. The introduction of new indicators and norms—such as the capital charge, fixed (rent) payments, and norms governing

the establishment of incentive funds—ensured that planning would be closely linked to economic incentives.

The reform of wholesale prices was an important component of the economic reform. Effective profit-and-loss accounting demanded that prices more fully reflect the socially necessary labor expenditures on production, that unprofitable operations in various branches of the national economy be eliminated, and that prices be more effectively used to improve the quality of products and modify the product mix. The reform of wholesale prices (1967) made it possible to plan prices in terms of the capital-output ratio of production.

With the economic reform, the use of commodity-money relations and cost categories in the national economy was substantially expanded. Bourgeois economists tried to use this circumstance to distort the content of the reform; they interpreted the reform as the abandonment of the foundations of socialism, as a denial of the Marxist-Leninist principles of economic construction of the new society, as an evolutionary step toward capitalism, as a kind of "liberalization" of socialism, or as evidence of the "convergence" of the two systems. Events have shown, however, that the economic reform represents the further development of the specific forms of organization of socialist production and is directed toward the improvement and consistent implementation of the management principles developed by V. I. Lenin and enriched by the practice of economic construction in the USSR and in the other socialist countries.

The economic reform was a factor in the greater efficiency of social production and in the growth of the country's economic potential in the stage of advanced socialism. On the other hand, improvements in economic relations are not limited to those achieved within the framework of the economic reform. The course of communist construction is marked by continuing efforts to further improve the mechanism and techniques of economic management.

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A. S. DIESPEROV [29–1833–1]

ECONOMIC REGION, a territorial component of a country's national economy. It is characterized by a specific economic-geographical status, by an economic unity, by distinctive natural and economic conditions, and by a production specialization that is based on the territorial social division of labor and has developed over time.

Under capitalism, economic regions form and develop spontaneously in the heat of competition. When certain industries develop in one region, they frequently decline in another.

Under socialism, the territorial division of labor develops, and economic regions form in a planned fashion based on the economic laws of socialism. Economic regions are developed in a systematic and integrated manner; their specialization is combined with the rational location of productive forces and with the development of regional complexes of industries and production facilities that increase economic efficiency and ensure both that the natural, human, and technological resources of the regions will be used fully and that the economic potential of the nation will show an overall increase.

Marxist methodology was first applied to the study of economic regionalization by V. I. Lenin, who in *The Development of Capitalism in Russia* analyzed in depth the formation of economic regions in Russia, a process he regarded as an integral part of the development of capitalist production relations. In *New Data on the Laws of Capitalist Development in Agriculture*, Lenin provided a scientific basis for the division of the USA into three large economic regions: the industrial North; the South, formerly a slaveholding region; and the West, which was being colonized.

The scientific principles of socialist economic regionalization were first developed in the USSR. After the October Revolution of 1917 economic planning required that the country be scientifically divided into economic regions—parts of the national economy that would undergo systematic development. In 1920 the plan of the State Commission for the Electrification of Russia (GOELRO) established eight large regions.

With the organization of Gosplan (State Planning Commission) in 1921, the division of the country into economic regions was carried out by a special subcommission under the direction of G. M. Krzhizhanovskii and I. G. Aleksandrov; many directives on this question were issued by Lenin. In 1921, Gosplan drafted a plan that divided the country into 21 economic regions. The draft was revised by a commission (chairman, M. I. Kalinin) of the All-Russian Central Executive Committee. "Regionalization," the commission noted, "must be based on the economic principle. A region must be a distinctive and, as far as possible, economically complete, territory of the nation; it must have a specific combination of the requisite natural features, cultural heritage, and a population trained for production to become a link in the overall chain of the national economy" (*Ekonomicheskoe raionirovanie Rossii*, 1922, p. 55).

Specialization within the social territorial division of labor plays the principal role in the formation of economic regions. The general boundaries of a region are determined primarily by the range of action of specialized branches of the economy and major auxiliary facilities—the associated cooperative suppliers of raw materials, assemblies, and parts. In addition the formation of economic regions is influenced by natural conditions, such as the presence of large deposits of minerals, the hydroelectric potential, the natural fertility of the soil, and the climate. Also important is the nature of the work force, major considerations being population density, cumulative work experience, the ethnic composition of the population, and the extent to which the population is concentrated in large cities. Other factors influencing the formation of economic regions are technical and economic conditions, including the level of development of productive forces, the state of the production-related and social infrastructure, and the existence of such advanced forms of the social organization of production as concentration, specialization, and combination. The division of the country into administrative and political units also plays a part in the formation of economic regions, because of the important role of the socialist state in organizing economic construction. Territorial-production complexes constitute the material and technical basis for the formation of economic regions.

Given the vast expanses, varied natural conditions, and rich resources of the USSR and in view of the increased scale and complexity of the socialist economy, the country must be divided into both large and small economic regions in order to rationally organize the economy on a territorial basis. In practice, three levels of economic regions are distinguished: large (macroregions), administrative (mesoregions), and lowest-level (microregions).

Large economic regions comprise three types: Union republics, groups of Union republics, and groups of autonomous republics, krais, or oblasts of the RSFSR and the Ukrainian SSR. The large economic regions provide the framework for establishing national economic territorial proportions and for determining basic trends in the location of productive forces throughout the national economy.

Administrative economic regions, which form the basis of the country's territorial makeup, include autonomous republics, krais, and oblasts, as well as Union republics that are not divided into oblasts. Such regions constitute the basic elements in the territorial planning and management of the national economy.

Lowest-level economic regions are low-level administrative regions that constitute the primary territorial elements in the classification of economic regions.

The rapid development of the country's productive forces, the growth of the economic potential of the eastern and northern regions, the formation and development of new territorial-production complexes, and the implementation of large-scale integrated territorial programs make it necessary to revise periodically the network of economic regions in the USSR. These factors also require that the network be coordinated with efforts to improve the management and planning of the national economy for the purpose of accelerating the rate and increasing the efficiency of social production.

The network of economic regions has been revised several times, the number of large economic regions has changed, and the composition of some large regions has been altered. The first five-year plan (1929–32) was drawn up for 24 regions and the second five-year plan (1933–37) for 32 regions and the Northern Zone. The third five-year plan (1938–42) was compiled for nine regions and ten Union republics; at the same time, oblasts and krais were grouped into 13 primary economic units that formed the basis for planning the development of the national economy by region.

The system of classification approved in 1963 and updated in 1966 comprises, in addition to the Moldavian SSR, 18 large economic regions. Ten of these regions are in the RSFSR: Northwestern, Central, Volga-Viatka, Central Chernozem, Volga, Northern Caucasus, Ural, Western Siberian, Eastern Siberian, and Far East. Three regions are in the Ukrainian SSR: Donets-Dnieper, Southwestern, and Southern. The five remaining regions are formed from the other Union republics: Baltic (Lithuanian, Latvian, and Estonian SSR's), Transcaucasian (Georgian, Azerbaijan, and Armenian SSR's), Middle Asian (Uzbek, Kirghiz, Tadzhik, and Turkmen SSR's), Kazakhstan (Kazakhstan SSR), and Byelorussian (Byelorussian SSR).

Economic-geographical zoning—the establishment of economic-geographical zones, or consolidated regions—is used for the long-range forecasting of the placement of productive forces. Seven such zones were created during the drafting of *Basic Trends in the Development of the National Economy of the USSR Between 1976 and 1990*: Central and Northern European (Northwestern, Central, Volga-Viatka, Byelorussian, and Baltic large economic regions), Southern European (Central Chernozem, Northern Caucasus, Donets-Dnieper, Southwestern, Southern, and Transcaucasian large economic regions and the Moldavian SSR), Ural-Volga, Siberian, Far East, Kazakhstan, and Middle Asian.

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G. I. GRANIK [29–1870–2]

ECONOMIC REGIONALIZATION, the demarcation on a national scale of economic regions that have formed or are forming in accordance with the territorial social division of labor (*see* DIVISION OF LABOR). Under socialism, a scientifically grounded economic regionalization is a necessary instrument of national economic planning by territory and is an important condition for improving the territorial organization of productive forces and economic management.

Economic regionalization is an effective method of management and an important factor in correctly combining territorial planning with the sectoral principle of management, in ensuring the rational location of productive forces, and in regulating the specialization and integrated economic development of economic regions in order to bring about every possible increase in the efficiency of social production (*see* ECONOMIC REGION, LOCATION OF PRODUCTIVE FORCES, and TERRITORIAL-PRODUCTION COMPLEX).

[29–1877–1]

ECONOMICS, a branch of science that studies production relations or the specific aspects of production relations in a given sphere of social production and exchange.

As a field of human knowledge, economics entails (1) the study of the objective laws governing the economic structure of society within the framework of the socioeconomic formations that regularly follow and replace one another, (2) the theoretical analysis of the processes and phenomena in the various spheres and branches of the national economy, and (3) the elaboration of practical recommendations with respect to the production and distribution of the necessities of life. Economics is one of the social sciences. The economic sciences are the product of long-term historical development. The establishment of a system of economic knowledge was directly tied to the advent of political economy as a science.

Works by classical bourgeois political economists laid the scientific foundation for the development of the economic sciences; such works investigated many important socioeconomic processes in the capitalist economies. The consolidation of the capitalist mode of production, the increasingly antagonistic opposition between hired labor and capital, and the transformation of the bourgeoisie from a progressive into a reactionary class contributed to the emergence of vulgar bourgeois political economy, which supplanted the analysis of the internal laws of the capitalist economic system with the description and systematization of externally perceived economic processes and phenomena.

The possibility of creating a genuinely scientific system of economic knowledge arose with the advent of Marxist economic doctrine, which incorporated the highest achievements of previous economic thought and creatively reworked them in accordance with materialist historical principles. F. Engels and V. I. Lenin made enormous contributions to K. Marx' economic theory. Marxist-Leninist economic theory was subsequently developed and concretized in the theoretical activity of the CPSU and of the fraternal Marxist-Leninist parties as well as in scholarly works by Soviet and foreign Marxist economists.

The Marxist system of classification differentiates between basic and applied economic sciences. The task of the basic sciences is to study objective economic laws and theoretically justify their effective application. The basic sciences include political economy, history of the national economy, history of economic thought, national economic planning, theory of economic management, statistics, accounting, and the analysis of economic activity. The applied sciences utilize the results of basic studies to solve specific practical problems. The various types of applied economic sciences are differentiated by function (finances and credit, money circulation, pricing, demography, labor economics, and material and technical supply), region or geographic area (economics of individual countries), and branch (for example, industrial, agricultural, construction, transport, or communications economics).

Political economy plays the principal role in the system of economic sciences, serving as the theoretical and methodological foundation of the entire complex formed by these sciences. Increased emphasis on the role of mathematics in economic research distinguishes the present stage of development of the economic sciences. In particular, the modeling of economic processes is being intensively developed. The socialist countries

make practical use of the theses, conclusions, and recommendations of the economic sciences in the drafting and implementation of economic policy.

For greater details on the development of economic science, see the relevant sections in articles on individual countries and Union republics and the section on economics in Volume 31.

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Marx, K. *K kritike politicheskoi ekonomii: Predislovie*. K. Marx and F. Engels, *Soch.*, 2nd ed., vol. 13.
Lenin, V. I. "Tri istochnika i tri sostavnykh chasti marksizma." *Poln. sobr. soch.*, 5th ed., vol. 23.
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Lenin, V. I. "Ekonomika i politika v epokhu diktatury proletariata." *Ibid.*, vol. 39.
Materialy XXV s"ezda KPSS. Moscow, 1977.
Sistema ekonomicheskikh nauk. Editor in chief, K. V. Ostrovitianov. Moscow, 1968.
Eremin, A. M. *O sisteme ekonomicheskikh nauk*. Moscow, 1968.
Abalkin, L. I. *Politicheskaia ekonomiia i ekonomicheskaia politika*. Moscow, 1970.
Khachaturov, T. S. *Sovetskaia ekonomika na sovremennom etape*. Moscow, 1975.

L. I. ABALKIN and A. A. KHANDRUEV [29–1794–1]

ECONOMICS, CONSTRUCTION, in the USSR, the branch of economics that studies patterns of development and the effectiveness of capital construction. Before the Great Patriotic War of 1941–45, construction economics was regarded as part of the science of organization of construction production; only in the postwar years did it develop as an independent branch.

Construction economics deals with questions of the organizational forms of management (specialization, cooperation, concentration, combination, and the creation of production associations) and the planning of capital investment and construction production (forecasting and long-range, five-year, one-year, and routine operational planning of structure, location, and economic regionalization). An important task of the discipline is to substantiate the transition to the planning and evaluation of the performance of construction organizations on the basis of projects that are finished, turned over to the customer, and ready to operate.

Construction economics conducts research in the economic efficiency of capital investments and of scientific and technological progress in construction (factors, criteria, indicators, and planned standards) as the decisive prerequisite for increasing labor and capital productivity, improving the utilization of material resources, accelerating the growth of production capacities (primarily as a result of the reconstruction, technical reequipping, and modernization of enterprises), achieving the earliest possible use of new production capacities, and attaining projected technological and economic indicators.

Construction economics works out the economic principles underlying construction planning, the standardization of construction work, the industrialization of construction (with due regard to time, ecology, urban planning, and the social and economic impact), and the lowering of estimated costs and capital investments per unit of output. An important function of the discipline is to develop a system of interrelated cost and physical standards (planning, production, estimated, accounting, and statistical standards) for the technological and economic regulation and management of construction production in all phases of the investment process.

Construction economics studies the resources of capital construction and the effectiveness of their utilization, including questions relating to the development of the material and technical basis, fixed capital stock and its reproduction, the creation of normative circulating capital in the construction industry, the training and utilization of personnel, the organization and improvement of labor productivity, the improvement of the wage system, and the organization of the system of material and technical supply.

Construction economics substantiates economic methods of management and incentive in capital construction: profit-and-loss accounting (economic accountability), financing and crediting of construction, and the system of mutual settlements of accounts between participants in the construction process, stemming from efforts to bolster the role of economic incentive in the acceleration of scientific and technological progress.

Construction economics is associated with national economic planning, with a number of special economic disciplines (finance and credit, statistics, accounting, and analysis of economic performance), and with sciences that study the production technology of construction. It serves as a necessary methodological basis for determining the effectiveness of technical solutions to problems in the designing of construction projects and in the performance of construction work.

Construction economics is studied at a number of specialized scientific research institutes, such as the Scientific Research Institute of Construction Economics, the Central Scientific Research and Experimental Planning Institute of Automated Systems in Construction, and the All-Union Scientific Research and Planning Institute of Construction Labor. Economics sections (laboratories and departments) are found in virtually all planning and scientific research institutes working in the various areas of capital construction. Publications in the field include the journal *Ekonomika stroitel'stva* (Construction Economics) and the newspaper *Stroitel'naia gazeta* (Construction Newspaper); the publishing house Stroiizdat also publishes works on construction economics. Questions in construction economics are widely discussed in the Soviet press.

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Khachaturov, T. S. *Ekonomicheskaia effektivnost' kapital'nykh vlozhenii*. Moscow, 1964.
Vainshtein, B. S. *Nauchno-tekhnicheskii progress i povyshenie ekonomicheskoi effektivnosti v stroitel'stve*. Moscow, 1964.
Reinin, S. N. *Problemy tsenoobrazovaniia i smetnogo dela v stroitel'stve*. Moscow, 1965.
Krasovskii, V. P. *Problemy ekonomiki kapital'nykh vlozhenii*. Moscow, 1967.
Ekonomika stroitel'stva. Edited by B. Ia. Ionas and S. N. Reinin. Moscow, 1977.

B. IA. IONAS [29–1805–2]

ECONOMICS, ENCYCLOPEDIAS AND DICTIONARIES OF, reference works that contain in a systematized form summaries of information on the economic sciences and on individual branches of economics. The following types of encyclopedias and dictionaries of economics are distinguished: general encyclopedias of economics, special encyclopedias that deal with individual branches of economic science, dictionaries that define terminology, and multilingual dictionaries of equivalent economic terms. The subject matter in encyclopedias of economics may be arranged either in alphabetical order or by topic; with rare exceptions, the organization of dictionaries of economics is alphabetical.

The first works that resembled dictionaries of economics appeared in the late 17th and early 18th centuries in Great Britain, Germany, France, and other European states. At first, such works were glossaries contained in monographs. For example, in Great Britain, E. Hatton included a "Merchant's Glossary" in *The Merchant's Magazine, or Trades-man's Treasury* (London, 1695; 9th ed., London, 1734). In the 18th century, encyclopedias and dictionaries of economics were first compiled as independent works. The immense 242-volume *Oeconomische Enzyklopädie, oder Allgemeines System der Staats-, Stadt-, Haus-, und Landwirtschaft, in alphabetischer Ordnung* (Berlin, 1773–1858) deserves special mention. It was initiated by the German economist J. G. Krünitz, who edited 72 of the volumes. The Scotsman J. R. McCulloch, who wrote works on economics, compiled *A Dictionary, Practical, Theoretical, and Historical, of Commerce and Commercial Navigation* (London, 1832). By 1890, McCulloch's dictionary had been published in 30 editions in Great Britain and the USA.

Russia. In the 18th century, M. V. Lomonosov attempted to compile a lexicon of merchandising terminology. The results were published much later as *Kratkoe raspolozhenie sochiniaemogo ekonomicheskogo leksikona rossiiskikh produktov* (A Con-

cise Plan for a Compiled Economic Lexicon of Russian Commodities; St. Petersburg, 1865) and *Reestr rossiiskim produktam* (A Register of Russian Commodities; St. Petersburg, 1869). Various encyclopedias and dictionaries of economics were compiled in the fields of merchandising, commerce, finance, and accounting. They included I. S. Vavilov's *Spravochnyi kommercheskii slovar'* (Reference Dictionary of Commerce; St. Petersburg, 1856), A. I. Ipatov's *Kommercheskii slovar'* (Dictionary of Commerce; St. Petersburg, 1898), and I. P. Babenko's *Torgovo-promyshlennyi slovar'* (Dictionary of Commerce and Industry; St. Petersburg, 1900).

USSR. The publication of the first Marxist general encyclopedia of economics, *Ekonomicheskaia entsiklopediia: Politicheskaia ekonomiia* (Encyclopedia of Economics: Political Economy; vols. 1–2, Moscow, 1972–75), was begun in 1972. The editor in chief of the first two volumes was A. M. Rumiantsev. The encyclopedia deals with a wide range of theoretical problems in Marxist-Leninist political economy, as well as with problems of current interest pertaining to the planning and control of the national economy, economic analysis, finance, and statistics. It presents a critique of bourgeois economic theories and, for the first time, attempts to show the development of economic thought in various countries and by various peoples. The encyclopedia also deals with problems equally within the purview of the economic, sociological, and juridical sciences.

A list of some other important Soviet encyclopedias and dictionaries of economics follows.

Ekonomicheskaia entsiklopediia: Promyshlennost' i stroitel'stvo (Encyclopedia of Economics: Industry and Construction). A. N. Efimov, editor in chief. Vols. 1–3. Moscow, 1962–65. Intended mainly for personnel in industry and construction.

Ekonomicheskaia zhizn' SSSR: Khronika sobytii i faktov, 1917–1965 (Economic Life of the USSR: Chronicle of Events and Facts, 1917–1965). Vols. 1–2, 2nd ed. Moscow, 1967.

Politekonomicheskii slovar' (Dictionary of Political Economy). Moscow, 1964; 2nd ed., Moscow, 1972.

Finansovo-kreditnyi slovar' (Dictionary of Finance and Credit). Vols. 1–2. Moscow, 1961–64.

Statisticheskii slovar' (Dictionary of Statistics). Moscow, 1965. The first reference work in the USSR on all branches of statistical science and practice.

Entsyklopediia narodnoho hospodarstva Ukrains'koi RSR (Encyclopedia of the National Economy of the Ukrainian SSR), vols. 1–4. S. M. Iampol'skii, editor in chief. Kiev, 1969–72.

Ekonomichnyi slovnyk (Dictionary of Economics). Edited by P. Baqrii and S. Doroguntsov. Kiev, 1973.

Vorob'eva, S. A., and T. K. Molodid. *Russko-ukrainskii slovar' sotsial'no-ekonomicheskoi terminologii* (Russian-Ukrainian Dictionary of Socioeconomic Terminology), 2nd ed. Kiev, 1976.

Nasyrova, M. *Kratkii russko-kazakhskii tolkovyi slovar' sotsial'no-ekonomicheskikh terminov* (Concise Russian-Kazakh Defining Dictionary of Socioeconomic Terms). Alma-Ata, 1968.

Russko-moldavskii ekonomicheskii slovar' (Russian-Moldavian Dictionary of Economics). Kishinev, 1973.

Russko-litovskii slovar' ekonomicheskikh terminov (Russian-Lithuanian Dictionary of Economic Terms). Vilnius, 1966.

Other countries. A list of the leading encyclopedias and dictionaries of economics from the 18th to the 20th centuries follows.

18th century (chronological)

Chomel, N. *Dictionnaire oeconomique, contenant divers moyens d'augmenter et conserver son bien*, vols. 1–2. Lyon, 1709; 4th ed., Commercy, 1741.

Allgemeines oeconomisches Lexikon. Leipzig, 1731; 4th ed., vols. 1–2, Leipzig, 1764.

Rolt, R. *A New Dictionary of Trade and Commerce*. London, 1756.

Dizionario del cittadino, o sia, Ristretto storico, teorico e pratico del commercio, vols. 1–2. Nice, 1763.

19th century (chronological)

Leuchs, J. M. *Ausführliches Handelslexikon*, vols. 1–2. Nuremberg, 1824–26.

Schiebe, A. *Universallexikon der Handelswissenschaften*, vols. 1–3. Leipzig, 1837–39.

Renandière, B. *Dictionnaire des principaux termes du commerce, de la banque et de l'industrie*. Brussels, 1840.

Dictionnaire de l'économie politique. Edited by Coquelin and Guillaumin. Vols. 1–2. Brussels, 1853–54; Paris, 1873.

Boccardo, G. *Dizionario della economia politica e del commercio cosi teoretico come pratico*, vols. 1–4. Turin, 1857–61; 2nd ed., vols. 1–2, Milan, 1885–87.

Rentzsch, H. *Handwörterbuch der Volkswirtschaftslehre*. Leipzig, 1865–66; 2nd ed., Leipzig, 1869–70.

Scarpa, V. G. *Vocabolario della lingua italiana mercantile*. Turin, 1874.

Spamer, O. *Illustriertes Handelslexikon*, vols. 1–4. Leipzig, 1874–79.

Furrer, A. *Volkswirtschaftliches Lexikon der Schweiz*, vols. 1–4. Bern, 1885–92.

Say, L., and J. Chailley. *Nouveau Dictionnaire d'économie politique*, vols. 1–2. Paris, 1891–97; 2nd ed., vols. 1–2, Paris, 1900.

Palgrave, R. H. I. *Dictionary of Political Economy*. Edited by H. Higgs. Vols. 1–3. London–New York, 1894–99; London, 1923–26; New York, 1963.

Wörterbuch der Volkswirtschaft. Edited by L. Elster. Vols. 1–2. Jena, 1898; 4th ed., vols. 1–3, Jena, 1931–33.

20th century (by country)

Bulgaria

Ikonomicheska entsiklopediia. I. Stefanov, managing editor. Vols. 1–2. Sofia, 1971–72.

Shopov, D. *Kratuk ikonomicheski rechnik za rabotnika*, 2nd ed. Sofia, 1974.

Czechoslovakia

Průša, J. *Příruční slovník ekonomiky práce*. Prague, 1960.

Mervart, J., et al. *Slovník světové ekonomiky*. Prague, 1967.

Stručný slovník plánovania národného hospodárstva, Bratislava, 1969.

Ekonomická encyklopedie, vols. 1–2. Prague, 1972.

France

Guyot, J., and A. Raffalovich. *Dictionnaire de commerce*, vols. 1–2. Paris, 1899–1901.

Peuchet, J. *Dictionnaire universel d'économie politique*, vols. 1–4. Paris, 1910.

Romeuf, J., and G. Pasqualaggi. *Dictionnaire de sciences économiques*, vols. 1–2. Paris, 1956–58.

Suavet, T. *Dictionnaire économique et social*. Paris, 1963; 6th ed., Paris, 1970.

Glossaire des termes relatifs aux pratiques commerciales restrictives. Paris, 1965.

Dictionnaire de science économique. Edited by A. Cotta. Tours, 1968; 3rd ed., Tours, 1972.

Mathieu, G. *Vocabulaire de l'économie*. Paris, 1970.

Bouvier-Ajam, M., J. Ibarrola, and N. Pasquarelli. *Dictionnaire économique et social*. Paris, 1975.

German Democratic Republic

Rhodin, R. *Fachausdrücke des Aussenhandels*. Berlin, 1958.

Ökonomisches Lexikon, vols. 1–2. Berlin, 1966–67; 2nd ed., Berlin, 1970–71.

Wörterbuch der Ökonomie Sozialismus, 2nd ed. Edited by W. Ehlert et al. Berlin, 1969; 3rd ed., Berlin, 1973.

Germany (before 1945)

Schirmer, A. *Wörterbuch der deutschen Kaufmannssprache auf geschichtlichen Grundlagen*. Strassburg, 1911; 2nd ed., Stuttgart, 1954.

Bülow, F. *Wörterbuch der Wirtschaft*. Leipzig, 1936.

Germany, Federal Republic of

Dr. Gablers Wirtschaftslexikon. Edited by R. Sellien and H. Sellien. Vols. 1–2. Wiesbaden, 1956; 8th ed., Wiesbaden, 1971.

Lexikon der modernen Wirtschaftspraxis. Edited by H. Eckardt. Munich, 1968.

Hungary
Közgazdasági kislexikon. Edited by O. Gadó. Budapest, 1972.
India
Dictionary of Economics. Edited by Vira Raghu et al. Nagpur, 1951.
Iran
Rast, N. *Farkhang-e bazargani* (Dictionary of Commerce). Tehran, 1944.
Italy
Papi, G. U. *Dizionario di economia*. Turin, 1967.
Japan
Shio Kiyoshi and Kimata Hizo. *Shogyo keizai yogo jiten* (Dictionary of Economic and Commercial Terms). Tokyo, 1958.
Hisatake Masao, Konzumi Akira, and Nagasawa Koreyuki. *Kindai keizaigaku yogo jiten* (Dictionary of Economic Science). Tokyo, 1967.
Korea, People's Democratic Republic of
Kyongjehak sajon (Dictionary of Economics), vols. 1–2. Pyongyang, 1970.
Netherlands
Bedrijfseconomische encyclopedie. Edited by J. G. Stridiron. Vols. 1–5. Utrecht, 1947–52.
Encyclopedie van de bedrijfseconomie. A. Mey, editor in chief. Vols. 1–6. Bussum, 1969–71.
Poland
Mały słownik ekonomiczny. Edited by M. Librowski. Warsaw, 1958.
Mała encyklopedia ekonomiczna. M. Pohorille, editor in chief. Warsaw, 1962. Second ed., edited by K. Secomski, Warsaw, 1974.
Sweden
Eldem, R., H. Mabon, and H. Uggla. *Bonniers ekonomiska lexikon*. Stockholm, 1971.
USA and Great Britain (published or reprinted simultaneously in both countries)
Horton, B. J., J. Ripley, and M. B. Schnapper. *Dictionary of Modern Economics*. Washington, D.C., 1948.
Sloan, H., and A. Zurcher. *Dictionary of Economics*. New York, 1949; 5th ed., New York, 1971.
Nemmers, E. E., and C. C. Janzen. *Dictionary of Economics and Business*. New York, 1959; 3rd ed., Totowa, N.J., 1974.
Hanson, J. L. *A Dictionary of Economics and Commerce*. London, 1965; 4th ed., London, 1974.
The McGraw-Hill Dictionary of Modern Economics. New York, 1965; 2nd ed., New York, 1973.
Gilpin, A. *Dictionary of Economic Terms*. London, 1966; 3rd ed., London, 1973.
Bannock, G., R. E. Baxter, and R. Rees. *The Penguin Dictionary of Economics*. Harmondsworth, England, 1972.
Greener, M., ed. *The Penguin Dictionary of Commerce*. Harmondsworth, England, 1974.
Yugoslavia
Andolšek, D., and F. Ažman. *Mali gospodarski slovar*. Ljubljana, 1958.

Multilingual dictionaries. Multilingual dictionaries of equivalent economic terms are of great practical value, especially in foreign trade, since mistranslations of foreign economic terminology often give rise to legal claims. A list of the leading multilingual dictionaries of equivalent economic terms follows.

Kleines Aussenhandels Wörterbuch in acht Sprachen: Deutsch, Russisch, Polnisch, Tschechisch, Englisch, Französisch, Spanisch, Portugiesisch. Berlin, 1960.
Glossary of Economics, Including Soviet Terminology, in English/American–French–German–Russian. Compiled and arranged by F. Clifford-Vaughan and M. Clifford-Vaughan. Amsterdam, 1966; French ed., Paris, 1966.
Kohls, S. *Ökonomisches Wörterbuch, Aussenwirtschaft: Deutsch, Russisch, Englisch, Französisch, Spanisch*. Berlin, 1972.
Munniksma, F. *International Business Dictionary in Nine Languages: English, Esperanto, Deutsch, Español, Français, Italiano, Nederlands, Portugués, Svensk*. Deventer, Netherlands, 1974.
Izrailevich, E. E. *Kratkii russko-angliiskii kommercheskii slovar'* (Concise Russian-English Dictionary of Commerce). Moscow, 1946.
Izrailevich, E. E. *Anglo-russkii obshcheekonomicheskii i vneshnetorgovyi slovar'* (English-Russian Dictionary of General Economics and Foreign Trade). Moscow, 1955; 3rd ed., Moscow, 1972.
Senin, V. P. *Kitaisko-russkii i russko-kitaiskii slovar' eksportno-importnykh tovarov* (Chinese-Russian and Russian-Chinese Dictionary of Imports and Exports). Edited by E. D. Oksiukevich. Moscow, 1963.
Schaarschuh, F. J. *Wörterbuch des Handels*. Vol. 1: *Russisch-Deutsch*, vol. 2: *Deutsch-Russisch*. Leipzig, 1967.
Al'bertova, E. L. *Kratkii russko-frantsuzskii i frantsuzsko-russkii kommercheskii slovar'* (Concise Russian-French and French-Russian Dictionary of Commerce). Moscow, 1951.
Zozulenko, L. M. *Kratkii pol'sko-russkii i russko-pol'skii vneshnetorgovyi slovar'* (Concise Polish-Russian and Russian-Polish Dictionary of Foreign Trade). Moscow, 1955.
Ul'tsiferov, O. G., and B. I. Shurshalin. *Khindi-russkii i russko-khindi obshcheekonomicheskii i vneshnetorgovyi slovar'* (Hindi-Russian and Russian-Hindi Dictionary of General Economics and Foreign Trade). Edited by A. I. Medovyi. Moscow, 1974.
Aliskevičová, A. *Krátký česko-ruský a rusko-český ekonomický slovník*. Prague, 1965.
Nelskylä, G., and P. Priklonsky. *Svensk-rusk teknisk och kommersiell ordbok*. Stockholm, 1958.
Tulukov, M. A. *Russko-iaponskii obshcheekonomicheskii i vneshnetorgovyi slovar'* (Russian-Japanese Dictionary of General Economics and Foreign Trade). Moscow, 1964.

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Malclès, L. N. *Les Sources du travail bibliographique*, vol. 2: *Bibliographies spécialisées (sciences humaines)*. Geneva-Lille, 1952. Pages 628–30.
Zischka, G. A. *Index lexicorum*. Vienna, 1959. Pages 183–92.
Guide to Reference Material, 3rd ed. Edited by A. J. Walford. Vol. 2. London, 1975. Pages 132–37. T. S. LAVROVA [29–1861–1]

ECONOMICS, INDUSTRIAL, in the USSR, the branch of economic science that studies industry as an integrated system of interrelated branches, sectors, and enterprises, or associations. Industrial economics took shape with the advent of large-scale socialist industry, which constitutes its field of inquiry.

Industrial economics studies the various manifestations of the objective economic laws of socialism in industry and devises economic management systems and techniques designed to increase efficiency and improve the quality of performance in all the branches and units of industrial production. Industrial economics includes the economics of individual branches (including the coal, oil refining, natural gas, chemical, and food sectors, light industry, power generation, metallurgy, and machine building); each of these subdivisions of economics examines the economic designation of products, material and technical base, and personnel makeup of the particular branch, as well as interbranch relations and branch differences with respect to fixed capital stock, circulating productive capital, makeup of production costs, and types of enterprises (including differences in size, level of specialization, location, and organization of labor and production).

The complexity of production activities of modern industrial enterprises has given rise to a separate scientific discipline known as enterprise economics ("the organization, planning, and management of the enterprise"). Enterprise economics explores the problems pertaining to the economic operations of the enterprise, or association, and to the state's guidance of its activity, and it studies rational methods of combining all elements of the production process toward their optimum utilization.

Industrial economics is related to several allied fields of knowledge—namely, national economic planning, statistics, labor economics, economic geography, finance and credit, and pricing—as well as to the technical and mathematical sciences.

Research studies of industrial economics are undertaken in the academic institutions, in the scientific institutions of the various branches, in the institutions of higher education throughout the country, and in various subdivisions of the institutes of the Academy of Sciences of the USSR and of the Union republics. Each of the branch research institutes is engaged in research on the economics of a given branch of industry. Various technical institutions of higher education have departments of industrial economics and departments of economics of individual branches of industry; these departments investigate problems related to the economics, planning, organization, and management of industrial production. Research studies are chiefly concerned with economic efficiency of production, the rational use of natural resources as industry's raw-material base, and the optimization of planning and operational decisions and techniques for improving the management of industrial production and of its branches, associations, and enterprises.

The major press organs that publish industrial economics research studies are the journals *Voprosy ekonomiki, Planovoe khoziaistvo, Ekonomika i organizatsiia promyshlennogo proizvodstva, Ekonomicheskie nauki*, and the collection of abstracts *Ekonomika promyshlennosti*. All the central scientific and technical journals of the various branches of industry have special sections devoted to the industrial economics of the given branch.

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Efimov, A. N. *Ekonomika i planirovanie sovetskoi promyshlennosti*. Moscow, 1970.

Ekonomika sotsialisticheskoi promyshlennosti, 5th ed. Edited by L. I. Itin. Moscow, 1974.

L. I. ITIN [29–1802–1]

ECONOMICS, INSTITUTE OF (full name, Institute of Economics of the Academy of Sciences of the USSR), a scientific institution that deals with fundamental problems of the political economy of socialism. The institute was organized in Moscow in 1930 from the economics section of the Communist Academy. Since 1936, it has been subordinate to the Academy of Sciences of the USSR.

As of 1978, the Institute of Economics had six departments, specializing in the following: general problems of the political economy of socialism; theoretical problems of the material and technical basis for communism and of scientific and technological progress; socialist reproduction; agrarian problems of socialism; the generalization of experience in Soviet economics and the history of the development of Soviet economic thought; and planning, coordination, and information. The institute also had a laboratory for the theoretical study of the planned management of the national economy, a general Academic Council, five academic councils for special problems, and three specialized councils for awarding the academic degrees of doctor of sciences and candidate of sciences.

The Institute of Economics helps draft five-year plans and long-range plans for the development of the national economy. It investigates theoretical problems pertaining to the improvement of planning techniques, planned pricing, and the management of the national economy, as well as problems of increasing the economic efficiency of social production, accelerating technological progress, and raising the efficiency of agricultural production. The institute generalizes the experience of economic policy and the development of economic thought in the USSR and in other socialist countries; it also prepares critiques of bourgeois and revisionist concepts of socialism.

The institute has a library. Graduate degrees are awarded for full-time study at the institute or for correspondence study. Since 1950, the institute has been a center for the coordination of economic research.

The Institute of Economics has its own press organ, the monthly journal *Voprosy ekonomiki* (Problems of Economics). The institute maintains broad scholarly relations with economic institutions in other countries.

V. V. ORESHKIN [29–1809–1]

ECONOMICS, JOURNALS OF, periodicals devoted to various aspects of economic theory and practice.

Prerevolutionary Russia. Before the advent of specialized economic journals in Russia, articles on economics were printed in general political and literary journals. Scholarly publications resembling journals of economics were issued under such titles as *Trudy* (Transactions) and *Vedomosti* (Bulletin) by various scholarly societies and economic institutions, for example, the Ministry of Finance, the State Bank, and the Ministry of State Domains. The first such publication was *Trudy Vol'nogo ekonomicheskogo obshchestva* (Transactions of the Free Economic Society; 1765).

In 1857, *Ekonomicheskii ukazatel'* (The Economic Index) first appeared. It dealt with both practical problems of agriculture and commerce and theoretical problems of political economy, statistics, and finance. The journal devoted special attention to theoretical and practical problems pertaining to the economic development of Russia, for example, raising the technical level of production and increasing the level of consumption.

A list of some Russian journals of economies that were published in the second half of the 19th century and the early 20th century follows.

Torgovyi sbornik (The Commercial Collection; 1864–73)
Vestnik finansov, promyshlennosti i torgovli (Journal of Finance, Industry, and Commerce; 1884–1917)
Russkoe ekonomicheskoe obozrenie (Russian Economic Review; 1897–1905)
Narodnoe khoziaistvo (The National Economy; 1900–05)
Kommercheskii mir (The Commercial World; 1906–09)
Promyshlennost' i torgovlia (Industry and Commerce; 1908–17)
Torgovo-promyshlennoe obozrenie (Commercial and Industrial Review; 1908–12)
Vestnik kooperatsii (Journal of Cooperation; 1909–18)
Ekonomist Rossii (The Russian Economist; 1909–12)
Novyi ekonomist (The New Economist; 1913–17)
Promyshlennaia Rossiia (Industrial Russia; 1915–16)

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Since the October Revolution. The first central Soviet journal of economics was *Narodnoe khoziaistvo* (The National Economy; 1918–22), an organ of the Supreme Council on the National Economy (VSNKh). It contained theoretical articles that summarized the experiment in socialist administration and the processes involved in the socialist reorganization of the economic system. The journal also printed surveys of the current state of the economic system as a whole and of its individual sectors, discussions and debates in the VSNKh and in its departments and commissions, decrees of the Council of People's Commissars and of the VSNKh on economic matters, and the minutes and resolutions of congresses of the councils of the national economy. From 1920 to 1928, *Vestnik truda* (Journal of Labor) was published. An organ of the All-Union Central Council of Trade Unions, the journal dealt with the productivity of labor, the accounting of labor input and production output, labor conditions, wages, supply, the prices of consumer goods, and the everyday life of workers. *Vestnik statistiki* (Journal of Statistics), an organ of the Central Statistical Board, first appeared in 1919.

Problems of political economy, the methodology of economic science, and the most important problems of current economic policy received prominent coverage in the party press, especially in *Bol'shevik* (The Bolshevik; since 1924), *Vestnik sotsialisticheskoi akademii* (Journal of the Socialist Academy; founded in 1922, issued from 1924 to 1935 under the title *Vestnik kommunisticheskoi akademii* [Journal of the Communist Academy]), *Pod znamenem marksizma* (Under the Banner of Marxism; 1922–44), and *Sotsialisticheskoe khoziaistvo* (The Socialist Economy; 1923–30). *Planovoe khoziaistvo* (The Planned Economy; since 1924, publication suspended from 1941 to 1944) and *Vestnik promyshlennosti, torgovli i transporta* (Journal of Industry, Trade, and Transport; 1922–26) were devoted to theoretical and practical problems of, for example, national economic planning, regulation, and price formation. Theoretical and practical problems of state finances, credit, and money circulation were considered

in such journals as *Vestnik finansov* (Journal of Finance; 1922–30), *Finansovye problemy planovogo khoziaistva* (Financial Problems of the Planned Economy; 1922–30), and *Finansy i narodnoe khoziaistvo* (Finances and the National Economy; 1926–30). *Ekonomicheskoe obozrenie* (Economic Review; 1923–30), which was issued by the newspaper *Ekonomicheskaia zhizn'* (Economic Life), dealt mainly with current economic policy and observations of market conditions.

In 1922, *Ekonomist* (The Economist) and *Ekonomicheskoe vozrozhdenie Rossii* (Economic Rebirth of Russia) were published for a short time. Economists maintaining essentially bourgeois-restorationist positions grouped around the two journals; as a result, the publications were shut down. In the 1920's and 1930's, several dozen economic journals were issued at various times in the Union republics other than the RSFSR. However, in most cases, such journals were short-lived, appearing for only one to two years.

In the 1920's, together with central and republic journals of economics, a large number of local journals appeared. Such local journals were the organs of provincial executive committees, councils of the national economy, cooperatives, and trade unions. They included *Ekonomicheskoe stroitel'stvo* (Economic Construction; Moscow, 1922–30), *Promyshlennost' i torgovlia* (Industry and Trade; Leningrad, 1922–26), *Khoziaistvo Severo-Zapadnogo kraia* (The Economy of the Northwestern Krai; Leningrad, 1924–27), *Viatsko-Vetluzhskii krai* (Viatka-Vetluga Krai; Viatka, 1925–28), *Severnoe khoziaistvo* (The Northern Economy; Arkhangel'sk, 1923–29), and *Azovo-Chernomorskii krai* (Azov–Black Sea Krai; Rostov-on-Don, 1922–35). Such journals printed information relating to local economic life and articles on the economics of agriculture, industry, and trade. They also published surveys of local market conditions and featured discussions of timely problems pertaining to labor payment, financing and crediting, management in local industry and trade, and the location of production.

In the late 1920's and early 1930's, the number of economic journals was reduced. The leading theoretical journal of economics in the period was *Problemy ekonomiki* (Problems of Economics, 1929–41); it was published by the Institute of Economics of the Communist Academy, and from 1936 by the Academy of Sciences of the USSR. Problems of economic construction in industry, trade, and credit and monetary relations during the industrialization of the national economy were discussed in such journals as *Puti industrializatsii* (Paths to Industrialization; 1928–31), *Kredit i khozraschet* (Credit and Profit-and-Loss Accounting; 1932–38), *Khozraschet* (Profit-and-Loss Accounting; 1931–32), *Plan* (The Plan; 1933–37), and *SSSR na stroike* (The USSR Under Construction; 1930–41). Theoretical and practical problems of the transformation in agriculture were discussed in such journals as *Na agrarnom fronte* (On the Agrarian Front; 1925–35), *Agrarnye problemy* (Agrarian Problems; 1927–35), and *Ekonomika sel'skogo khoziaistva* (Agriculture Economics, since 1921).

During the Great Patriotic War of 1941–45, the publication of economic journals was virtually discontinued. After the war, the periodical literature on economics was quickly restored and enlarged.

In the mid-1970's, various journals of economics were published in the USSR. *Voprosy ekonomiki* (Problems of Economics; since 1948) deals with problems of economic theory, primarily with the political economy of socialism. It contains theoretical articles and provides broad coverage of management problems of current interest. The political economy of socialism and of modern capitalism, the history of the national economy, and the history of economic thought are discussed in *Ekonomicheskie nauki* (Economic Sciences; since 1958), *Izvestiia Akademii nauk SSSR: Seriia ekonomicheskaia* (Proceedings of the Academy of Sciences of the USSR: Economics Series, since 1970), *Vestnik Moskovskogo universiteta: Seriia 6—Ekonomika* (Journal of Moscow University: Series 6—Economics; since 1946), and *Vestnik Leningradskogo universiteta: Ekonomika, Filosofiia, Pravo* (Journal of Leningrad University: Economics, Philosophy, Law; since 1946). *Mirovaia ekonomika i mezhdunarodnye otnosheniia* (World Economics and International Relations; since 1957) and *SShA—Ekonomika, Politika, Ideologiia* (The USA: Economics, Politics, Ideology; since 1970) deal with problems in the theory of monopoly capitalism.

Problems of current interest in national economic planning and economic problems pertaining to individual sectors or to all sectors of the national economy are considered in the following journals: *Planovoe khoziaistvo* (The Planned Economy; since 1924), *Material'no-tekhnicheskoe snabzhenie* (Material and Technical Supply; since 1966), *Sotsialisticheskii trud* (Socialist Labor; since 1956), *Ekonomika i matematicheskie metody* (Economics and Mathematical Methods; since 1965), *Ekonomika i organizatsiia promyshlennogo proizvodstva* (The Economics and Organization of Industrial Production; since 1970), *Ekonomika stroitel'stva* (Construction Economics; since 1959), *Bukhgalterskii uchet* (Accounting; since 1937), *Vestnik statistiki* (Journal of Statistics; since 1919), *Den'gi i kredit* (Money and Credit; since 1927), *Finansy SSSR* (Finances of the USSR; since 1926), *Vneshniaia torgovlia* (Foreign Trade; since 1921), *Sovetskaia potrebitel'skaia kooperatsiia* (Soviet Consumers' Cooperative; since 1957), and *Sovetskaia torgovlia* (Soviet Trade; since 1927).

The following journals of economics are published in the Union republics: *Ekonomika Sovetskoi Ukrainy* (Economy of the Soviet Ukraine; Kiev, since 1958; in Russian and Ukrainian), *Narodnoe khoziaistvo Kazakhstana* (National Economy of Kazakhstan; Alma-Ata, since 1926), *Liaudies ūkis* (National Economy; Vilnius, since 1958), *Izvestiia Akademii nauk Azerbaidzhanskoi SSR: Seriia ekonomicheskikh nauk* (Proceedings of the Academy of Sciences of the Azerbaijan SSR: Economic Sciences Series; Baku, since 1966; in Russian and Azerbaijani), *Hayastani zhokhovrdakan tntesutyun* (National Economy of Armenia; Yerevan; since 1957, in Armenian), and *Ekonomika i zhizn'* (Economics and Life; Tashkent, since 1959).

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Other socialist countries. A list of the leading journals of economics published in other socialist countries follows.

Bulgaria, People's Republic of
- *Novo vreme* (Sofia, since 1897)
- *Planovo stopanstvo* (Sofia, since 1946)
- *Ikonomicheska misul* (Sofia, since 1956)

Cuba
- *Bohemia* (Havana, since 1911)
- *Cuba socialista* (Havana, since 1961)
- *Nuestra industria* (Havana, since 1963)
- *Cuba noticias económicas* (Havana, since 1965); English edition: *Cuba Economic News*
- *Economía y desarrollo* (Havana, since 1970)

Czechoslovak Socialist Republic
- *Politická ekonomie* (Prague, since 1953)
- *Plánované hospodářstvi* (Prague, since 1948)
- *Ekonomický časopis* (Bratislava, since 1953)

German Democratic Republic
- *Einheit* (Berlin, since 1946)
- *Die Wirtschaft* (Berlin, since 1946)
- *Wirtschaftswissenschaft* (Berlin, since 1953)
- *Sozialistische Arbeitswissenschaft* (Berlin, since 1957)
- *Sozialistische Finanzwirtschaft* (Berlin, since 1947)
- *Statistische Praxis* (Berlin, since 1946)
- *Fertigungstechnik und Betrieb* (Berlin, since 1951)

Hungarian People's Republic
- *Magyar statisztikai szemle: A központi statisztikai hivatal folyóirata* (Budapest, since 1923)
- *Közgazdasági szemle* (Budapest, since 1954)
- *Acta oeconomica* (Budapest, since 1966)
- *Hungarian Economy* (Budapest, since 1972)

Mongolian People's Republic
- *Namyn am'dral* (Ulan Bator, since 1923)
- *Ediin zasgiin asuudal* (Ulan Bator, since 1959)

Polish People's Republic
- *Ekonomista* (Warsaw, since 1900)
- *Ruch prawniczy, ekonomiczny i socjologiczny* (Poznań, since 1921)
- *Gospodarka planowa* (Warsaw, since 1946)
- *Nove drogi* (Warsaw, since 1947)

Rumania, Socialist Republic of
- *Revista de statistică* (Bucharest, since 1952)

Revista economică (Bucharest, since 1974)
Finanţe şi credit (Bucharest, since 1955)
Vietnam, Socialist Republic of
Nghien Cuu Kinh-Te (Economic Research; Hanoi, since 1961)
Yugoslavia, Socialist Federal Republic of
Ekonomist (Belgrade, since 1948)
Ekonomska misao (Belgrade, since 1968)
Ekonomska revija (Ljubljana, since 1950)
Socijalizam (Belgrade, since 1958)
Naše teme (Zagreb, since 1957)

Capitalist countries. A list of the leading journals of economics published in capitalist countries follows.

Australia
The Economic Record (Melbourne, since 1925)
Austria
Zeitschrift für Nationalökonomie (Vienna, since 1929)
Arbeit und Wirtschaft (Vienna, since 1923)
Wirtschaftspolitische Blätter (Vienna, since 1954)
Austrian Economic News (Vienna, since 1969)
Austrian Economy in Brief (Vienna, since 1974)
Belgium
Comptes rendus des travaux de la société Royale d'Economie Politique de Belgique (Brussels, 1855–1964); since 1964 called *Séances de la Société Royale d'Economie Politique de Belgique*
Economische en sociaal tijdschrift (Antwerp, since 1947)
Etudes économiques (Mons, since 1925)
Mercure (Brussels, since 1944)
Canada
L'Actualité économique (Montreal, since 1925)
The Canadian Journal of Economics (Toronto, since 1968); supersedes *The Canadian Journal of Economics and Political Science*
Denmark
Nationaløkonomisk tidsskrift (Copenhagen, since 1873)
Økonomi og politik (Copenhagen, since 1927)
Økonomisk kronik (Copenhagen, since 1950)
Finland
Kansantaloudellinen aikakauskirja (Helsinki, since 1905)
Ekonomiska samfundets tidskrift (Helsinki, since 1913)
Kansallis-osake-pankki (Helsinki, since 1948)
France
Cahiers du communisme (Paris, since 1924)
Cote Desfossés (Paris, since 1825)
Revue économique française (Paris, since 1878)
Revue d'économie politique (Paris, since 1887)
Economie (Paris, since 1946)
Problèmes économiques (Paris, since 1948)
Germany, Federal Republic of
Zeitschrift für die gesamte Staatswissenschaft (Tübingen, since 1844)
Jahrbücher für Nationalökonomie und Statistik (Stuttgart, since 1863)
Wirtschaftsdienst (Hamburg, since 1917)
Vierteljahrshefte zur Wirtschaftsforschung (Berlin [Steglitz], since 1925)
Europa-Archiv (Frankfurt am Main, since 1946)
Great Britain
Labour Monthly (London, since 1921)
Marxism Today (London, since 1957)
The Spectator (London, since 1828)
The Economist (London, since 1843)
The Economic Journal (London, since 1891)
Italy
Critica marxista (Rome, since 1963)
Politica ed economia (Rome, since 1970)
Giornale degli economisti e annali di economia (Milan, since 1875)
Industria (Milan, since 1886)
Rivista di politica economica (Rome, since 1911)
Japan
Economic Review (Kyoto, since 1915)
Quarterly Survey of Japanese Finance and Industry (Tokyo, founded 1949); now called *Japanese Finance and Industry: Quarterly Survey*
Osaka Economic Papers (Osaka, since 1952)
Hitotsubashi Journal of Economics (Tokyo, since 1960)
Japan Economic Journal (Tokyo, since 1963)
Netherlands
De Economist (Leiden, since 1852)
Economie (Tilburg, since 1935)
New Zealand
Economic News Bulletin (Wellington, since 1955)
Monthly Abstract of Statistics (Wellington, since 1914)
Norway
Statsøkonomisk tidsskrift (Oslo, since 1887)
Bedriftsøkonomen (Oslo, since 1938)
Sosialøkonomen (Oslo, since 1947)
Economics of Planning (Oslo, 1961–77)
Spain
Moneda y crédito (Madrid, since 1942)
Revista de economía política (Madrid, founded 1945); now called *Revista de política economía*
Boletín de estudios económicos (Bilbao, since 1942)
Sweden
Swedish Journal of Economics (Stockholm, founded 1899); now called *Scandinavian Journal of Economics.*
Företagsekonomi bokförarenrevisorn (Göteborg, since 1921)
Ekonomen (Stockholm, since 1924)
Ekonomisk revy (Stockholm, since 1944)
Konjunkturläget (Stockholm, since 1960)
Ekonomiska läget (Stockholm, since 1949)
United States
Political Affairs (New York, since 1922)
Quarterly Journal of Economics (Cambridge, Mass., since 1886)
The Journal of Political Economy (Chicago, since 1892)
The American Economic Review (Nashville, Tenn., since 1911)
Monthly Labor Review (Washington, D.C., since 1915)
The American Journal of Economics and Sociology (New York, since 1941)

Developing countries. A list of the leading journals of economics published in developing countries follows.

Angola
Actividade econômica de Angola (Luanda, since 1935)
Argentina
Económica (La Plata, since 1954)
Clarín económico (Buenos Aires, since 1960)
Brazil
Pesquisa e planejamento econômico (Rio de Janeiro, since 1971)
Chile
Economía (Santiago, since 1940)
Cuadernos de economía (Santiago, since 1963)
Ecuador
Difusión económica (Guayaquil, since 1954)
Egypt, Arab Republic of
Economiste égyptien (Alexandria, since 1901)
Ghana
The Economic Bulletin of Ghana (Accra, since 1957)
India
Indian Journal of Economics (Allahabad, since 1916)
The Indian Economic Review (Delhi, since 1952)
Economic Affairs (Calcutta, since 1956)
Lebanon
Arab Economist (Beirut, since 1969)
Mexico
Investigación económica (Mexico City, since 1941)
Actividad económica (Mexico City, since 1974)
Morocco
Bulletin économique et social du Maroc (Rabat, since 1933)
Nigeria
The Nigerian Journal of Economics and Social Studies (Ibadan, since 1959)
Tunisia
Tunisie économique (Tunis, since 1961)

Uganda
Uganda Journal of Political Economy (Kampala, since 1977); from 1971 to 1977 called *Uganda Economic Journal*
Venezuela
Orientación económica (Caracas, since 1961).

L. I. SAVINSKAIA [29–1844–2]

ECONOMICS AND POLITICS IN THE ERA OF THE DICTATORSHIP OF THE PROLETARIAT, an article by V. I. Lenin containing scientific substantiation of the chief economic and political principles of the proletarian state in the transitional period between capitalism and socialism. Written on Oct. 30, 1919, the article was first published in *Pravda* (no. 250, Nov. 7, 1919). The article appears in Lenin's *Collected Works* (V. I. Lenin, *Poln. sobr. soch.*, 5th ed., vol. 39).

In the first part of the article, Lenin cites the Marxist tenet that an entire historical era lies between capitalism and communism, combining various features of these two social formations, and he describes the general and particular traits marking the development of various countries in the period of transition. Russia's basic forms of social economy—capitalism, petty commodity production, and communism—and corresponding social classes—the bourgeoisie, the petite bourgeoisie (the peasantry in particular), and the proletariat—were the same as those of any other country taking the road to socialism. But the dictatorship of the proletariat in Russia differed in certain particulars, which reflected the country's level of economic development and its petit bourgeois character. As Lenin pointed out, however, "the peculiarities can apply only to what is of lesser importance" (*Poln. sobr. soch.*, 5th ed., vol. 39, p. 272).

Lenin emphasized that the peasant economy's petty commodity production represented a very broad, sound, and deep-rooted basis for the revival of capitalism in its fierce struggle against communism—a struggle that took the form of private speculation and profiteering versus state distribution of products. Lenin's theoretical propositions are illustrated by factual data. He formulates and explains the thesis that "socialism means the abolition of classes" (*ibid.*, p. 276). In order to abolish classes it is necessary, first, to overthrow the landowners and capitalists. But this is only a part, and not even the most difficult part, of what needs to be done. It is necessary, second, to abolish the difference between workers and peasants. This task is incomparably more difficult and necessarily of long duration. It can be accomplished only by shifting from individual and isolated petty commodity production to large-scale social production. This transition will be accelerated by affording the peasant such assistance as will radically change all farming techniques. Hasty and incautious administrative and legislative measures can only delay and complicate the conversion of small peasant farms to a collective base.

At the same time that he advanced these most important principles, Lenin emphasized that the proletariat must separate and demarcate the working peasant from the peasant owner, the peasant worker from the peasant huckster, the peasant who labors from the peasant who profiteers. "In this demarcation lies the *whole essence* of socialism" (*ibid.*, p. 277).

The last section of the article describes changes in the status and interrelations of classes in the era of the dictatorship of the proletariat. Having overthrown the bourgeoisie and having won political power, the proletariat is transformed from an oppressed class into the ruling class. It wields state power, exercises control over the socialized means of production, guides the wavering and intermediary elements and classes, and crushes the resistance of the exploiters. The landowners and capitalists are defeated but not yet destroyed. They retain some of the means of production, and they still have vast social connections and the support of international capital. Because they have been defeated, the energy of their resistance has increased a hundred- and a thousand-fold.

On the basis of these circumstances, Lenin drew the conclusion that the bitter class struggle between the overthrown exploiters and the workers was at the time inevitable. The peasantry, "in view of the incredibly severe breakup of all social relations" (*ibid.*, p. 280), inevitably wavers and experiences uncertainty. The proletariat must strive to lead those who are vacillating and unstable and to influence and guide the peasantry. Lenin reveals the theoretical insolvency of the petit bourgeois views of R. MacDonald, J. Longuet, K. Kautsky, and F. Adler with respect to the transition to socialism "through democracy" in general; he demonstrates the basic difference between the bourgeois-democratic and socialist interpretations of equality, and he clarifies the Marxist position that equality becomes a prejudice if it is not understood as the abolition of classes.

The practice of socialist construction in the USSR and in the other socialist countries has confirmed the correctness of Lenin's theoretical statements regarding the main patterns of formation of socialist society, as presented in this article, and the need to consider the national peculiarities of any given country.

[29–1801–2]

ECONOMICS EDUCATION, in the USSR, the training of specialists in planning, accounting, finance, and other fields of economics to work in the national economy, research, and education.

Educational institutions offering instruction in economics arose in connection with the development of industry and trade. The first commercial schools were established in Russia in the second half of the 18th century. Economics courses were first taught in the country's universities in the 19th century. In the early 20th century, commercial institutes established in Moscow and Kiev were the first specialized higher educational institutions to train specialists for trade and industry.

Economics education began its true development after the October Revolution in 1917. During the years of Soviet power, a vast network of higher educational institutions specializing in economics, university departments of economics, technical and agricultural institutes, branches of economics institutes in industrial centers, and economics technicums has been established. Economics education is offered by day, evening, and correspondence study. The aggregate of academic courses of study required for each specialization is determined by the nature of the graduate's future job. Marxist-Leninist political economy is the methodological and general theoretical foundation of the training of economists. It fosters the formation of a communist world view in future specialists. The general courses of study common to all specializations in economics are the history of the CPSU, Marxist-Leninist philosophy and scientific communism, the history of the national economy, and the economic geography of the USSR and foreign countries, as well as courses in the technology of individual sectors of production and a foreign language. Students take a general course in higher mathematics and special courses in probability, statistics, and mathematical programming. Other mandatory studies include computers and computer programming, mechanized processing of economic information, and bookkeeping.

Specialization is available for the further training of economists. For example, students studying national economic planning may specialize in the planning of prices and prime cost, and those studying the economics of trade may specialize in the economics of food services or another area.

Economists are trained on the basis of a combination of theoretical learning and practical acquisition of work methods and procedures in a given specialization. Attention is focused on independent work by students and student participation in departmental research, student scientific societies, and the like. At the end of their final year of study, students at higher educational institutions of economics receive the qualification of economist and are assigned, according to the makeup of their training, to jobs in planning offices, offices of labor and wages, and supply offices at enterprises, ministries, and government departments, as well as to the systems of the Ministry of Finance, State Bank (Gosbank) and Central Statistical Board. Researchers and teachers in economics are trained in graduate study programs, which have been established at most higher educational institutions of economics and departments of economics. Technicums graduate specialists in planning, accounting, and merchandising with a secondary economics education. The training offered by technicums is narrower than that at higher educational institutions. Technicum graduates receive the qualification of planning technician, merchandising specialist, bookkeeper, and others.

Specialists working in economics, industry, agriculture, construction, and transportation may increase their knowledge in courses for advanced qualification offered at higher and secondary educational institutions, at institutes for improving the skills of managerial personnel and specialists, and through the network of universities of Marxism-Leninism and people's universities. The decree of the Central Committee of the CPSU of Aug. 31, 1971, On Improving the Economics Education of the Toiling Masses, played an important role in improving economics education, and a vast system of economics study at the higher, secondary, and elementary levels was set up in the country. Party organizations direct the work of all levels of economics study through councils on economics education. Methodological councils on the work of the schools of communist labor, which have become one of the large-scale forms of economics education, have been established at all trade union committees. The objective of mass economics education is to develop the labor activism of the toiling masses by every means possible.

Economists are trained in the USSR for many countries in Asia, Africa, and Latin America. Special attention is devoted to the economies of the particular countries. The Patrice Lumumba Peoples' Friendship University of Moscow is very helpful in this work.

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Zinov'ev, S. I., and B. M. Remennikov. *Vysshie uchebnye zavedeniia SSSR*. Edited by P. I. Polukhin. Moscow, 1962. [29–1875–1]

ECONOMICS INSTITUTE OF THE STATE PLANNING COMMITTEE OF THE USSR (full name, Scientific Research Economics Institute of the State Planning Committee of the USSR; NIEI), a research institute that deals with methodological problems of long-range national economic planning and investigates the economic and social problems of development of the national economy of the USSR. The institute was established in Moscow in 1955. It has eight research departments and 32 sections (1976).

The institute's chief research activities are as follows: development of the methodology and techniques of compiling long-range national economic plans, including the methodology of economic forecasting and research on complex national economic problems with due regard for the creation and use of automated systems for planning calculations; refining of techniques of analytic research in economics; study of the problems of determining optimum long-term rates and proportions of socialist expanded reproduction, raising the efficiency of social production, and improving the standard of living; and elaboration of socioeconomic questions and proposals relevant to forming the economic and political design of long-range plans for the development of the national economy of the USSR.

The institute has a library and a mathematics laboratory. It trains graduate students in residence and by extension study. There are institute-wide scholarly councils that consider the most pressing problems and review candidate's and doctoral dissertations. In addition to basic monographs on fundamental problems, the institute regularly publishes collections of scientific articles on specific topics. L. M. RUMIANTSEVA [29–1867–1]

ECONOMICS INSTITUTES, in the USSR, higher educational institutions that train highly qualified economists and engineer-economists for various sectors of the national economy. Instruction is offered in many fields, such as the economics and planning of the national economy or of branches of industry, construction, transport, agriculture, or trade; the economics of labor and the planning of material and technical supply; computer processing of economic data; automatic control systems; economic cybernetics; merchandising and the organization of trade; the technology and organization of the food service industry; finances and credit; and accounting. The course of studies lasts from four to five years.

As of 1977–78, there were 36 economics institutes in the USSR with a four- or five-year course of instruction. They included 13 institutes of the national economy, 12 institutes of the economics of trade, four financial and economic institutes, two institutes of engineering economics (one in Leningrad and one in Kharkov), the Kuibyshev Planning Institute, the Moscow Finance Institute, the Moscow Institute of Economics and Statistics, the Saratov Institute of Economics, and the Sergo Ordzhonikidze Moscow Institute of Management, which was established in 1975 on the basis of the Sergo Ordzhonikidze Moscow Institute of Engineering Economics.

Most of the economics institutes have evening and correspondence divisions. Economists are also trained in the economics departments of universities and other higher educational institutions. (*See* ECONOMICS EDUCATION; MOSCOW INSTITUTE OF THE NATIONAL ECONOMY; LENINGRAD INSTITUTE OF ENGINEERING ECONOMICS; and LENINGRAD FINANCIAL AND ECONOMIC INSTITUTE.) [29–1853–1]

ECONOMICS INSTITUTES, RESEARCH, in the USSR, scientific institutions that conduct research in economics.

In Russia, the first specialized scientific institution that dealt with economic problems was the Commission for the Study of Natural Productive Forces, which was founded in 1915. After the Great October Socialist Revolution, economic problems of building socialism and of the world capitalist economy were studied at the Socialist Academy of Social Sciences, which was established in 1918 and renamed the Communist Academy in 1924. The Communist Academy included the Institute of World Economy and World Politics (founded 1925), the Agrarian Institute (1928), and the Institute of Economics (1930). Another institute of economics operated under the auspices of the Russian Association of Social Science Research Institutes (1924–30). In 1936, the economics institutes of the Communist Academy were placed under the jurisdiction of the Academy of Sciences of the USSR (AN SSSR).

As a scientific-organizational center, the economics division of the AN SSSR, which was established in 1962, coordinates the study of the economic regularities of building socialism and communism and the investigation of problems pertaining to optimum national economic planning and management, the economic efficiency of social production, the construction of the material and technical basis for communism, the scientific and technological revolution, the location of productive forces, the economics of contemporary capitalism, the world socialist system and the developing countries, and economic competition between the two world systems.

The following economics institutes are attached to the economics division of the AN SSSR: the Institute of Economics, the Institute of World Economics and International Relations, the Institute of the Economics and Organization of Industrial Production (Novosibirsk, 1958), the Institute of Africa, the Institute of Economics of the World Socialist System, the Institute of Latin America, the Central Economic Mathematical Institute, the Institute of the Far East, the Institute of the USA and Canada (1968), the Institute of Social Economic Problems (Leningrad, 1974), and the Institute of Economics of the Urals Scientific Center of the AN SSSR (Sverdlovsk, 1974).

The economics division of the AN SSSR supervises the work of the economics departments of the Yakut and Buriat branches of the Siberian Division of the AN SSSR and the economics departments of the Dagestan, Komi, S. M. Kirov Kola, Bashkir, and Karelian branches of the AN SSSR. The Association of Soviet Economic Scientific Institutions, which was founded in 1957, operates under the auspices of the AN SSSR.

The following economics institutes are attached to the State Planning Committee of the USSR: the Scientific Research Economics Institute of the State Planning Committee of the USSR, the Scientific Research Institute of Planning and Standards (1961), the All-Union Scientific Research Institute of Cybernetics (1969), and the Council for the Study of Productive Forces (1930).

In the Union republics, scientific research economics institutes have been established by the state planning commissions, branch economics institutes have been organized by major ministries, and institutes of economics are attached to the academies of sciences of the republics. Such institutes have operated in Byelorussia since 1931, the Ukraine since 1936, Lithuania since 1941, Uz-

bekistan since 1943, Georgia since 1944, Tadzhikistan since 1946, Latvia since 1946, Estonia since 1946, Kazakhstan since 1952, Armenia since 1955, Kirghizia since 1956, Turkmenistan since 1957, Azerbaijan since 1958, and Moldavia since 1960. The International Institute of Economic Problems of the World Socialist System has been located in Moscow since 1971.

Economic problems are studied in special laboratories and in departments or subdepartments at higher educational institutions —that is, at institutes of the national economy, planning institutes, financial and economic institutes, and institutes of engineering economics—and at universities, higher schools, and academies. The most important departments and subdepartments that deal with economic problems are the subdepartments of political economy at the M. V. Lomonosov Moscow State University, the A. A. Zhdanov Leningrad State University, and the University of Kiev, as well as the departments of political economy at the Higher Party School and the Academy of Social Sciences of the Central Committee of the CPSU.

V. V. ORESHKIN [29–1854–1]

ECONOMICS OF COMMUNICATIONS, in the USSR, the branch of economics that studies the patterns of the development and functioning of communications. It studies the forms and methods of economic management in order to improve the efficiency and qualitative performance of the branch as a whole and of the various subbranches, including postal, telegraph, and telephone communications.

As a discipline, the economics of communications proposes ways of improving the management of communications enterprises, makes recommendations on the methodology and organization of economic planning, and develops forms and methods for the organization of labor and production with due consideration given to the uneven work load of communications enterprises and networks. It also suggests methods for planning and analyzing the economic performance indicators of the communications branch and for evaluating their impact on production efficiency, and it makes recommendations for improving the system of tariffs for communications services and prices for the products of various communications enterprises (*see* TARIFFS, COMMUNICATIONS). Research in the economics of communications takes into account the fundamental economic characteristics of the sector (the nonmaterial nature of the product—communication services—and the participation of more than one communications enterprise in the transmission of messages).

The economics of communications is closely associated with national economic planning and with a number of allied economic sciences: communications statistics, the finances of communications, and so forth. The discipline also has important ties with specialized technical sciences. Research on problems of the economics of communications is carried out at research institutes and higher educational institutions of communications that have departments of the economics of communications and departments of the organization of planning and management. The scientific methodology of the discipline is widely used by economic planning agencies, ministries, enterprises, and research institutions in the field of communications to evaluate the effectiveness of capital investments and new communications technology and to plan and manage communications production. Research in the economics of communications is published in the journal *Vestnik sviazi* (Communications Journal).

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See also references under ECONOMICS.

O. S. SRAPIONOV [29–1803–1]

ECONOMICS OF THE WORLD SOCIALIST SYSTEM, INSTITUTE OF (full name, Institute of Economics of the World Socialist System of the Academy of Sciences of the USSR), a scientific institution dedicated to research on economic, political, and ideological issues in the development of world socialism and on the laws that govern the construction of a socialist society, the strengthening of the world socialist system, and the enhancement of the revolutionary influence of the world socialist system on world history. The institute, which was established in Moscow in 1960, had seven departments and 32 sections in 1977.

Research at the institute is devoted to (1) analyzing the general laws and stages in the construction of a new society in the other socialist countries; (2) providing a theoretical generalization of the experience obtained in the development of the world socialist system and a new type of international relations; (3) elucidating theoretical and practical questions pertaining to the development of a world socialist economy and socialist integration; (4) studying the international division of labor; (5) comprehensively analyzing the general and specific features of economic, political, and ideological life in the various socialist countries, conducting a comparative study of the theory and practice of economic construction in the other socialist countries, and assessing prospects for further strengthening the economic ties of such countries with the USSR; (6) analyzing the development in the socialist countries of theoretical thought on the construction of socialism and socialist economic integration; (7) and criticizing bourgeois, reformist, and revisionist ideas on issues relating to the development and mutual relations of the socialist countries.

The institute has a library. Graduate degrees are awarded for study at the institute and for correspondence study. An institute-wide academic council directs organizational and scholarly work. Specialized councils for awarding academic degrees confer the degrees of doctor of sciences and candidate of sciences. There is also a scholarly council for coordinating research on different aspects of the world socialist system.

The institute publishes basic monographs, pamphlets, and collections of scholarly works on problems in the development of the world socialist system as whole and on current problems in the development of individual socialist countries.

G. A. VLASKIN [29–1810–1]

ECONOMICS OF TRADE, in the USSR, the branch of economic science that studies patterns of development of consumer trade as a form of commodity circulation. The economics of trade studies the influence of trade on production and on supply and demand, investigates the correlation between increased volume of commodity turnover and the development of a material and technical basis for trade, and analyzes the interrelations between the size of the commodity supply, the rate and volume of commodity turnover, and the range of goods involved in commodity turnover.

With a view to increasing the efficiency of social production, introducing scientific methods of management, and providing improved service to the people, the economics of trade investigates problems in management and planning and in providing economic incentives in trade. In a developed socialist society, the economics of trade studies problems in such areas as the improvement—for all levels of the trade apparatus—of current planning, long-range planning, and the system of economic incentives. It seeks to determine the volume and structure of public consumption and investigates methods, based on the study of the incomes of individual population groups, for evaluating the effective monetary demand of the population. The economics of trade develops a scientific methodology for the planning of commodity turnover and for the formation and location of commodity supplies. It explores ways to economize actual and embodied labor in the circulation sphere, seeks out reserves of fixed capital stock and of circulating productive capital, and develops methods for making more efficient use of this stock and capital in trade.

The leading institution of the economics of trade—a discipline that is associated with such fields as national economic planning, economic geography, statistics, industrial economics, agricultural economics, transportation economics, the organization of trade, and trade management—is the All-Union Scientific Research Institute of the Economics of Trade and Management Systems. Problems of the economics of trade are also studied at the All-Union Scientific Research Institute for the Study of Demand and Market Conditions, the Scientific Research Institute of Food Services, the Central Scientific Research Institute of Scientific and Technical Information Pertaining to Trade, and the Ukrainian Scientific Research Institute of Trade and Food Service. Is-

sues in the economics of trade are studied at subdepartments of the economics of trade in the country's higher educational trade institutions and institutes of the national economy.

Theoretical and practical problems of trade are discussed regularly in the newspaper *Sovetskaia torgovlia* and in the journals *Sovetskaia torgovlia, Sovetskaia potrebitel'skaia kooperatsiia, Kommercheskii vestnik, Torgovlia za rubezhom*, and *Novye tovary*.

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I. M. FEL'DMAN [29–1806–2]

ECONOMIC STATISTICS, the branch of statistical science that studies the quantitative aspect of economic processes and phenomena in the national economy in conjunction with their qualitative aspect. Unlike more specialized forms of statistics, which study economic processes in particular branches of the national economy, economic statistics studies the national economy as an integrated whole (*see* STATISTICS, INDUSTRIAL; STATISTICS, AGRICULTURAL; and STATISTICS, LABOR).

Marxist-Leninist political economy constitutes the theoretical foundation of economic statistics. Political economy investigates and identifies the most important features of social-production relations and reveals the laws governing the production and distribution of material goods; economic statistics makes use of these principles to provide a quantitative description of phenomena and processes in the national economy and shows, with the help of economic-statistical indicators, how social production is developing in a particular place and time. In V. I. Lenin's definition, the purpose of economic statistics is to give "statistical expression" to the phenomena and laws of socioeconomic development of society (see *Poln. sobr. soch.*, 5th ed., vol. 27, p. 206). A preliminary and comprehensive socioeconomic analysis of the phenomena under study is a major precondition for the scientific organization of economic statistics.

Economic statistics is both an integral part of statistical science and an important branch of practical activity. Although it emerged as an independent scientific discipline and a subject taught in educational institutions before the Great Patriotic War of 1941–45, economic statistics underwent its greatest development after the war. In the investigation of economic processes and in the collection, processing, and analysis of statistical data, it makes extensive use of such techniques as mass statistical observation, grouping, indexing, the analysis of time series, and the balance method. Mathematicoeconomic research methods involving computers are coming to be used more widely.

In a socialist society, economic statistics is an important tool in the management and planning of the national economy. It describes the condition and development of a socialist economy, progress toward the fulfillment of national economic plans, and the way the branches of the economy are developing in relation to one another. In addition, it provides a picture of the introduction of new technology, the location of productive forces in the country, and improvements in public welfare. The most important tasks of economic statistics include the economic-statistical description of the efficiency of social production and the improvement of performance at all levels of the national economy.

In bourgeois statistics, economic statistics does not exist as an independent scientific discipline for the integrated investigation of processes and phenomena of social reproduction. The statistical literature of capitalist countries treats economic statistics as the application of general methods of statistics and mathematical statistics to the measurement of economic phenomena.

The system of indexes in economic statistics comprehensively describes economic processes and phenomena. The crucial indexes—the comprehensive, general indexes of economic development and of the growth of the people's material prosperity—include the total social product, national income, real incomes of the population, nonproductive consumption, accumulation, national wealth and its constituent elements, and the social productivity of labor.

Statisticians dealing with particular branches of the economy apply the general principles that have been developed by economic statistics in order to construct a system of economic indexes and a methodology for calculating them. A major division of economic statistics is the balance of the national economy of the USSR, which makes it possible to ascertain whether the economy is developing in a balanced manner.

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M. R. EIDEL'MAN [29–1835–1]

ECONOMIC TABLE (*Tableau économique*), the principal work by F. Quesnay, the founder of the Physiocrats; the first attempt to analyze social reproduction by establishing definite balanced proportions between the natural (material) and value elements of social production. *Economic Table* was written in 1758.

Economic Table sets forth the erroneous theory of the net product (*produit net*), which according to Quesnay is created only in agriculture, and divides society into three classes: the productive class (farmers and hired agricultural laborers), the proprietary class (landowners and the king), and the sterile class (industrialists, merchants, artisans, and hired industrial workers). Quesnay then describes the circulation of a year's product, a process that begins after the farmers have paid the landowners rent, which is considered the only form of net product, in the amount of 2 billion livres.

The process of circulation comprises the following five acts: (1) The landowners purchase 1 billion livres' worth of food from the farmers; as a result, 1 billion livres return to the farmers, and one-fifth of the year's product goes out of circulation. (2) The landowners use the remaining 1 billion of their 2 billion livres received in rent to buy industrial articles from the sterile class. (3) With the 1 billion livres received for its industrial articles, the sterile class buys food products from the farmers. A second billion livres is thus returned to the farmers, and two-fifths of the year's product goes out of circulation. (4) The farmers buy 1 billion livres' worth of industrial articles from the sterile class, which go toward the replacement of tools and materials whose value was included in the value of the year's product. (5) The sterile class uses its 1 billion livres to purchase raw materials from the farmers. The circulation of the year's product thus ensures the replacement of the capital (*avances*) used in agriculture and industry, and production can begin again.

K. Marx criticized the flaws and contradictions in *Economic Table*. Since it was based on the erroneous theory of the net product and an incorrect class division of society, the work did not reflect the mechanism of capitalist reproduction and its contradictions. The practical recommendations that came out of *Economic Table*, however, were progressive and antifeudal.

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ECONOMISM, an opportunist trend in the formative period of Russian Social Democracy (late 19th and early 20th centuries) that sought to adapt the tactics and organization of Social Democracy to the spontaneous course of the working-class movement. "Its political essence was summed up in the programme: 'for the workers—the economic struggle; for the liberals—the political struggle'" (V. I. Lenin, *Poln. sobr. soch.*, 5th ed., vol. 26, pp. 343–44).

Among the leading Economists were K. M. Takhtaroev, S. N. Prokopovich, E. A. Kuskova, V. N. Krichevskii, A. S. Pikker (A. Martynov), and V. P. Makhnovets (Akimov). The major centers of economism were the newspaper *Rabochaia mysl'* and the journal *Rabochee delo* (the organ of the Union of Russian Social Democrats Abroad). Economism was the first manifestation of opportunism in Russian Social Democracy; it was a variety of

international opportunism—that is, of Bernsteinism. The spread and development of economism were promoted by (1) the absence of ideological and organizational unity among the Russian Social Democrats, (2) the insufficient degree of class consciousness on the part of the proletariat—a class that had just taken the first step on the path of independent struggle and was drawing recruits among the peasants, for whom the purely economic side of the struggle was the most comprehensible one, (3) the massive influx of petit bourgeois elements in the Social Democratic organizations, (4) the successful economic strikes during the period of the industrial upsurge, and (5) the arrests that eliminated the most experienced and theoretically well-trained revolutionaries.

The ideas of economism were first formulated in the first issue of the newspaper *Rabochaia mysl'*: "The struggle for economic status, the struggle against capital on the grounds of vital daily interests, and the strike as the instrument of this struggle—such is the motto of the workers' movement." The Economists, distorting the Marxist tenet that all class struggle is political struggle, maintained that any spontaneous action by the workers constitutes political action. According to the Economists, what was meant by political struggle was not the independent class struggle of the proletariat (destined to lead the bourgeois-democratic revolution) but legal opposition within the framework of the autocratic system and in alliance with other "oppositionist social strata" (for example, worker participation in the bureaus that had jurisdiction over the factories and in urban self-government and the submission of demands to the tsarist government for "protective labor legislation").

By denying the proletariat's need to voice its own political demands and to struggle for such demands, the "new school in Social Democracy" (as the Economists called themselves) subordinated the workers' movement to the liberal bourgeoisie. The economists exalted the spontaneity of the workers' movement and maintained that the proletariat would develop its own socialist awareness in the process of spontaneous struggle. They denied the necessity of a political party of the working class.

The Economists' basic ideas were most consistently and fully set forth in the *Credo*—a document written by Kuskova in the early part of 1899. The spread of economism in the Social Democratic movement led to the increasing organizational and ideological fragmentation of the local groups and committees of the RSDLP. As an expression of the ideas of bourgeois liberalism in the workers' movement, economism met with the decisive criticism of revolutionary Marxists on the one hand and with the approval of Russian liberals on the other.

Lenin struck the first blow against the newly formed trend of economism in February 1897, at a meeting between the "old men" and the "youths" of the St. Petersburg League of Struggle for the Emancipation of the Working Class; the "youths," who were influenced by "legal Marxism" and Bernsteinism, had assumed the leading positions in the league. In August 1899, from his exile in Shushenskoe, Lenin wrote "A Protest by Russian Social Democrats" (against the Economists' *Credo*). The "Protest," which was signed by 17 exiled Social Democrats, declared economism to be a manifestation of bourgeois influence on the proletariat and pointed out the close ties between economism and Western revisionism. In 1901 the newspaper *Iskra* took up the struggle against the Economists; the decisive role in the ideological defeat of economism was played by Lenin's book *What Is to Be Done?* (1902).

The influence of economism waned with the development of the workers' movement and the growing role of the *Iskra* supporters in the Social Democratic organizations. By 1903 only a few of the Social Democratic organizations continued to espouse economism. At the Second Congress of the RSDLP (1903) the delegates representing the Economists (members of the League of Russian Social Democracy Abroad and of the St. Petersburg Workers' Organization) opposed the inclusion in the party program of the point on the dictatorship of the proletariat and the introduction of socialist consciousness in the workers' movement. After the congress, most of the Economists became Mensheviks.

The struggle of the revolutionary Marxists against economism —a struggle headed by Lenin—was a necessary condition for the establishment of that new type of proletarian party which was the Bolshevik Party.

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ECONOMIST, THE, a weekly British journal of politics and economics. *The Economist* has been published in London since 1843. As a rule it supports the Conservative Party. It is intended mainly for businessmen. Circulation, more than 100,000 (1977).
[29–1814–1]

ECONOMIZER, a component of a boiler unit. An economizer is a heat exchanger in which feed water is heated by flue gases before the water is supplied to the boiler. For a pressure of up to 22 kilograms-force per cm^2 (2.2 megapascals) and a feed-water temperature below the dew point of the flue gases or for water that has not been deaerated, an economizer consisting of plain cast-iron tubes or of finned cast-iron tubes is used. For higher temperatures and pressures, an economizer consisting of steel tubes is used; most economizers of this type consist of plain steel tubes. An economizer increases the efficiency of a boiler unit.
[29–1787–1]

ECONOMO, CONSTANTIN ALEXANDER VON (Baron von San Serff). Born Aug. 21, 1876, in Braila; died Oct. 21, 1931, in Vienna. Austrian neurologist of Greek descent.

Economo graduated from the University of Vienna medical school in 1901 and became a professor of neurology and psychiatry there in 1921. During World War I he served first as a pilot and then as an army medical officer.

In 1902, Economo discovered the swallowing and chewing centers of the brain. In 1917 he described epidemic encephalitis lethargica (Economo's disease), and on the basis of clinical and anatomical studies on the disease he determined the significance of the hypothalamus and thalamus in insomnia and advanced a theory of sleep.

In 1925, Economo published a book (with G. N. Koskinas) and an atlas on the cytoarchitectonics of the cerebral cortex. He compiled a precise cytoarchitectonic map of the cerebral cortex (109 areas) and measured the size of cells in the various cortical layers. Based on cytoarchitectonic research and the study of human fossil skulls, he put forth the theory of progressive cerebration, according to which the brain develops continuously, advancing to a higher stage of development. In 1931 he opened a special department for the study of the brain, mainly its cytoarchitectonics and myeloarchitectonics.

Economo became president of the Vienna Psychoanalytical Society in 1928. A pioneer in Austrian aviation, he became president of an aviation club in 1910.

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ECONOMY. (1) The aggregate of production relations, or the economic basis of society. The scientific definition of the economy and of its place in the development of society was first given by K. Marx: "The aggregate . . . of production relations constitutes the economic structure of society, the actual base upon which the legal and political superstructure is erected and which has its particular corresponding forms of social consciousness" (K. Marx and F. Engels, *Soch.*, 2nd ed., vol. 13, pp. 6–7). The economy forms the basis of all other social relations and plays the decisive role in the development of society.

The economy is the system of production relations in any mode of production. The determining relations in this system are those

pertaining to the ownership of the means of production and the character and social means of linkage between the direct producers and the means of production. The aggregate of production relations of a given mode of production is expressed in the corresponding system of economic laws and categories of political economy. Each mode of production has its own characteristic economy with its own distinct type of ownership, objectives, and forms and methods of management—as in the case of the primitive communal system, slavery, feudalism, capitalism, and communism. Economics directly interacts with politics, a component of which is economic policy.

(2) The national economy of a given country or a given part of the economy including the corresponding branches and types of production. The national economy reflects not only the characteristic features of a given mode of production but also the distinguishing features of a given country stemming from such specific historical conditions as its geographic location, the part it plays in the international division of labor, its historical traditions, and the level of development of its productive forces.

The economy includes the branches of material production (such as industry, agriculture, construction, transport, and trade) and the nonproduction sphere (including education, health care, and culture). Social production is subdivided into (1) production of the means of production and (2) production of consumer goods. The relationship between the two subdivisions is influenced by various factors, with the first subdivision playing the decisive role as the basis of technological progress.

The economy of the USSR is a single national economic aggregate that encompasses all the elements of social production, distribution, and exchange throughout the country. It is based on large-scale mechanized production in all branches of the national economy and is developed on a planned basis for the benefit of the people's increasing well-being. The USSR has built an advanced socialist society. In its present stage, socialism is already developing on its own basis, and the full creative powers of the new system are increasingly revealed. The greater division of labor and more proportional development of the various branches and regions are creating the necessary conditions for consistent growth in the efficiency of all social production and for fuller utilization of natural and labor resources.

The entry of socialism into the world arena led to the emergence of the economy of the world socialist system. The chief trends in the development of this system are the growing extent of socialist economic integration, the increasing convergence of the national economies of the various socialist countries, and the establishment of far-reaching and stable bonds linking together the main branches of the economy and of science and technology.

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See references under ECONOMICS. [29–1794–1]

ECONOMY OF TIME, LAW OF, a universal economic law that expresses the source of economically efficient social reproduction and the means by which such efficiency can be increased.

The law of economy of time was formulated by K. Marx in connection with the disclosure of the historically transitory significance of money—the latter being the manifestation of the social character of production in terms of value. Under communism, value will no longer be needed to ascertain and measure increasing efficiency, since this will be feasible by direct means. As Marx pointed out, "Comprehensive social as well as individual development, consumption, and activity depend on the saving of time. All economy is ultimately an economy of time. . . . Economy of time, like the planned distribution of work time among various branches of production, is still the first economic law based on collective production" (K. Marx and F. Engels, *Soch.*, 2nd ed., vol. 46, part 1, p. 117).

The law of economy of time is a scientific abstraction. Marxist science never projects this law directly onto specific economic phenomena; rather, it reveals the specific historical conditions and forms in which the law is operative for the various modes of production.

Economy of time includes economy of work time expended in a given period, as well as economy in the results of previous expenditures of work time, or work time expended on raw materials, supplies, machinery, equipment, and other means of production. Accordingly, some of the concrete effects of the law of economy of time are higher labor and capital productivity, lower material-intensiveness, and optimal proportionality in the national economy as well as within individual economic units.

As interpreted by Marx, the law of economy of time can be applied not only to work time but also to some nonworking time (that is, time spent on the performance of duties beyond the range of production proper). Under this interpretation, the law of economy of time is manifested in such concrete forms as the mechanization of housework, improvement of consumer services, and reduction in the amount of time expended on transportation, shopping, sewing clothes, and private housing repairs.

The law of economy of time may operate in spontaneous as well as in planned form. In the first instance the trend toward increased efficiency results from the interaction of resource losses and savings; in the second, the law of economy of time operates in the form of a policy of economies.

The mode of production is the decisive factor determining the law's nature and its socioeconomic effects, which are radically different under capitalism and under socialism. Under capitalism, economies of time are realized by private owners by means of increased exploitation. The law of economy of time assumes the particular form whereby scientific and technological advances and increasing economic efficiency tend to serve the interests of private capitalist appropriation. Surplus value and capitalist profit are the supreme criteria of economy.

In *Das Kapital*, Marx examined the historical actualization and antagonistic contradictions of the law of economy of time under capitalism. The unavoidable vices of capitalism—parasitic consumption on the part of the exploiting classes, unemployment, the anarchic formation of the proportions of the national economy, and the crises consequent thereto—preclude the attainment of maximum economic efficiency, and hence maximum economy of time. At the same time, subject to these general objective limitations, the economic efficiency of production under capitalism does increase. Capitalist management in practice, in addition to plundering resources, leads to the development of new techniques and methods of saving work time, raw materials, and supplies, reducing production costs, and improving the quality of products and services. These innovations, disassociated from socioeconomic forms unacceptable to socialism, are studied and assimilated by socialist enterprises, institutions, and organizations.

The socialist mode of production provides greater opportunity for the economical use of time and of all types of resources. Parasitic consumption by exploiters is eliminated, and reproduction is freed of the narrow criteria of efficiency foisted upon it by private ownership; the economical use of resources and the implementation of the law of economy of time are effected in the general form of planned reduction in the relative expenditures of live and embodied labor—that is, a policy of economies. The decisive factor in the law of economy of time is the development of reproduction on the basis of a single national economic plan, which permits the deliberate and constant maintenance of optimum proportions in the overall economy and in its branches. The system of branch and regional production plans ensures optimum reproduction at all levels.

Socialism is characterized by a set of uniform state policies with respect to technology—policies that also yield considerable savings of resources to society. Under the conditions of advanced socialism, when the advantages of the socialist system of management are combined with the gains of the scientific and technological revolution, the progress of reproduction is accelerated and acquires a complex character. Improvements in efficiency and quality take place at a faster rate; the socially necessary level of such improvements rises continuously and becomes mandatory for all producers. Obsolescence takes place at a more rapid pace, affecting technology, production techniques, the organization of production, and the finished product; every phase of social reproduction must be intensified. Consequently the time factor becomes increasingly important, thus in fact reflecting the specific effect of the law of economy of time under the conditions of mature socialism.

Under socialism, the socioeconomic effects of the law of economy of time are expressed in the reduction of time required to

produce the necessary product, this being the material prerequisite for the fuller and more comprehensive development and demonstration of man's creative endowments.

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B. V. RAKITSKII [29–1792–1]

ÉCOSSAISE, a folk dance of Scottish origin performed to bagpipe music. The écossaise is a variety of contredanse, a dance common in Great Britain. It was performed as a ballroom dance in France beginning in the late 18th century. The musical time was first 3/4 and later 2/4. The main movements include a sliding step and hop. The écossaise was used as a musical form by Beethoven, Schubert, and Chopin. [29–1884–4]

ECOSYSTEM, a natural complex (biologically integral system) formed by living organisms (biocenosis) and their environment (abiotic, such as the atmosphere, or biotic, such as the soil and bodies of water), which are interrelated by the exchange of matter and energy. One of the basic concepts of ecology, it is applicable to objects of varying complexity and size.

One example of an ecosystem is a pond, with its plants, fish, invertebrates, microorganisms and bottom deposits and with the characteristic temperature fluctuations, quantity of oxygen dissolved in the water, the substances present in the water, and other factors with a specific biological productivity. Another example is a forest, with its litter, soil, microorganisms, birds, and herbivorous and predatory mammals and with the characteristic range of temperature, atmospheric humidity, light conditions, groundwaters, and other environmental factors and the characteristic exchange of matter and energy. A decaying stump in a forest, with the organisms living on and in it, together with their living conditions, may also be considered an ecosystem.

Ideally, an ecosystem in which the vital activities of autotrophic and heterotrophic organisms is in balance can approach the conditions of a closed system, which only exchanges energy with its surroundings. Under natural conditions, however, the continued existence of an ecosystem is possible only when there is a flow of both energy and a certain amount of matter from its surroundings. All existing ecosystems, which together make up the earth's biosphere, are of the open type, exchanging both matter and energy with their surroundings.

The term "ecosystem" is applicable to both natural and man-made ecosystems, such as agricultural land, gardens, and parks.

In the comprehensive study of natural complexes of interacting plants, animals, and microorganisms, scientists have assigned many different names to these supraorganismic units. Many of the terms have not gained wide usage, and some are used only in particular circumstances; for example, the term "biome" is used in the USA to designate such major ecosystems as the coniferous forest zone and the steppe zone.

The term "ecosystem," which has displaced many other terms of similar meaning, was proposed in 1935 by the British botanist A. Tansley. In 1944, V. N. Sukachev introduced the term biogeocenosis for terrestrial living systems, but he did not consider it to be synonymous with the term "ecosystem." Indeed, even aquariums and beehives are certainly examples of ecosystems, but they cannot be called biogeocenoses. Moreover, a general feature of a biogeocenosis is a smaller total animal biomass in comparison with the plant biomass, while in an aquatic ecosystem the opposite is true.

An ecosystem is distinguished by its species composition, the number of individuals of the various species, and the biomass, distribution, and seasonal dynamics of the species. Beginning in the 1940's and 1950's, research has been carried out that makes it possible to characterize quantitatively the functional features of an ecosystem (especially the food chains) by way of which the biological transformation of matter and energy proceed. The quantitative expression of the rate and efficiency of these processes by means of modern methods, and particularly by means of mathematical modeling of ecosystems, is an essential starting point for dealing with the urgent questions of the rational use of natural resources and the preservation of man's environment.

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Odum, E. *Osnovy ekologii*. Moscow, 1975. (Translated from English.)
G. G. VINBERG [29–1884–5]

ECOSYSTEM, CLOSED, a functionally unified assemblage of organisms (plants, animals, and microorganisms) inhabiting a common territory and capable of prolonged existence under conditions of a closed cycle of matter (that is, in the absence of matter exchange across the boundaries).

The ecosystem principle is used in the development of life-support systems to maintain human life in places other than the earth's biosphere, for example, in spacecraft or underwater craft. Such an artificially created ecosystem is based on plants, which in the process of photosynthesis use light energy to absorb carbon dioxide and release oxygen, that is, regenerate the atmosphere. The plant biomass can be used as food by man and by other heterotrophic organisms, which themselves, in turn, can serve as food for man. The unused plant biomass and the metabolic wastes of man and other components of the artificial biocenosis are decomposed by microorganisms to form water, carbon dioxide, and mineral substances, which are reused by the plants.

Experimental closed ecosystems have been created in the USSR consisting of man, unicellular algae, higher plants (cabbages, carrots, beets, tomatoes, wheat), and microorganisms, which act as mineralizers. Regeneration in such ecosystems fully satisfies man's requirements for oxygen and water and provides 20 percent of his food. Natural ecolosystems usually are referred to simply as ecosystems.

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E. IA. SHEPELEV [29–1772–2]

ECOTYPE, a group of similar populations within one and the same plant species that are adapted to certain climatic, edaphic, or cenotic conditions and that have developed, under these conditions, hereditary morphological, physiological, biochemical, and other features. Thus, an ecotype is isolated with respect to distribution; genotypically it is an intraspecific subdivision, which distinguishes it from a biotype.

The term "ecotype" was introduced in the 1920's by the Swedish scientist G. Turesson. Different plants have different numbers of ecotypes. The ecotypic composition of a species becomes more varied as its geographic range and ecological amplitude increase. For example, 36 ecotypes have been distinguished in the pine *Pinus silvestris* and 27 in the spruce *Picea abies*. Ecotypic polymorphism is most clearly manifested at the center of speciation and morphogenesis. In the medic *Medicago falcata*, for example, there are many ecotypes in the Caucasus and only a few in the northern USSR. Parallel ecotypic differentiation is observed in many species. Thus, the wormwood *Artemisia campestris*, sheep sorrel (*Rumex acetosella*), and *Silene uniflora*, which grow in

bright, dry habitats where there are strong winds, develop ecotypes with procumbent stems.

Three main groups of ecotypes are distinguished: climatic, edaphic, and biotypic. Climatic, or geographic, ecotypes occupy a separate part of the area of distribution of a species and originated under the influence of specific climatic conditions; for example, in the awnless brome (*Bromus inermis*), the southern ecotype differs from the northern one by its nanism, narrow rough leaves, and wax coating. Edaphic ecotypes develop under the influence of soil and ground conditions, such as the pine ecotype on the chalky outcrops of the Don River, which has even been described as the independent species *Pinus cretacea*. Biotypic, or cenotic, ecotypes appear and develop mainly under the influence of plants together with which the given species form plant communities, for example, the field and forest ecotypes of the cocksfoot (*Dactylis glomerata*) and the forest and dune ecotypes of the narrow-leaved hawkweed (*Hieracium umbellatum*).

The development of an ecotype is a lengthy process. If an ecotype has progressive characteristics, which permit it to extend the range of the species, it may give rise to a new species, and consequently an ecotype is one of the stages in the process of speciation.

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KH. KH. TRASS [29–1886–1]

ECZEMA, an acute or chronic noncontagious inflammatory disease of the skin, neuroallergic in nature and characterized by various eruptions, a burning sensation, itching, and a tendency to recur. A variety of factors, both external (mechanical, chemical, thermal) and internal (diseases of the liver, kidneys, gastrointestinal tract, endocrine and nervous systems), are conducive to the development of eczema.

Several forms of eczema are distinguished, depending on the cause, site, and nature of the inflammation. True eczema is marked by a sudden onset; multiple sites of inflammation, including the nails; symmetrical location of the foci, which have indistinct contours; and reddening of the skin in the affected area. Other symptoms are the formation of minute blisters, some of which change into pustules or moist spots (hence the obsolete name "weeping lichen"), and later the formation of scales and crusts.

In microbial eczema (perivulnus), the foci are usually arranged asymmetrically, mainly on the upper and lower limbs, and have sharp, irregular contours. The skin near the lesions is bluish red and thickened and has pustular and other eruptions and purulent and bloody crusts. Reddening of the skin, edema, numerous blisters, nodules, pustules, and weeping spots occur, mainly on the palms, soles, and fingers.

Seborrheic eczema, or dermatitis seborrheica, is localized mainly on the scalp, forehead, and chest, behind the ears, around the nose and lips, in the armpits, in the groin, and around the umbilicus. The scalp is red and dry, with many grayish scales and seropurulent crusts on a moist surface. Reddening, edema, and weeping are quite pronounced, and there may be painful cracks. The trunk has clearly yellowish pink desquamative spots, some with tiny nodules in the center.

Treatment, depending on the cause and form of the eczema, includes the use of sedatives (valerian, tranquilizers), vitamins (B_1, B_6, C), and desensitizing and other agents. Also advisable are special diets, treatment in health resorts, and the local application of lotions, pastes, ointments, and antipruritic agents.

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I. IA. SHAKHTMEISTER [29–1754–2]

EDAPHON, a term introduced by the German biologist R. France to refer to the entire group of organisms that live in the soil in their active stage of development and that represent a closed community. Later the term came to mean the entire group of organisms living in the soil.

REFERENCE

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EDDINGTON, ARTHUR STANLEY. Born Dec. 28, 1882, in Kendal, Westmorland; died Nov. 22, 1944, in Cambridge. British astronomer. Fellow of the Royal Society of London (1914).

From 1906 to 1913, Eddington was on the staff of the Royal Observatory at Greenwich. He was appointed a professor at Cambridge University in 1913 and became the director of the astronomical observatory at Cambridge in 1914. From 1921 to 1923 he was the president of the Royal Astronomical Society in London.

Eddington's works dealt mainly with stellar motions, the internal structure of stars, the theory of relativity, and relativistic cosmology. Eddington was the first to apply the theory of radiative equilibrium to stellar interiors; he developed the theory of a gaseous star in radiative equilibrium. He discovered the relationship between the luminosity and the mass of a star and was the first to calculate models of stars in radiative equilibrium.

Eddington was a member of several foreign academies and scientific societies.

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[29–1678–6]

EDE, a city in Nigeria, in the state of Oyo; situated on the upper Oshun River. Population, 182,000 (1975). Ede is the center of a region producing cacao beans. Cacao beans, tobacco, and cotton are traded and agricultural raw materials are processed in the city. [29–1679–2]

EDE, a city in the Netherlands, in the province of Gelderland. Population, 79,900 (1975). Ede is a railroad junction. Industrial enterprises include a branch of the AKZO chemical-fiber concern and plants for the manufacture of textiles, tobacco and food products, metal articles, and pianos. [29–1679–3]

EDÉA, a city in Cameroon, on the left bank of the Sanaga River, in Coastal Province. Population, 23,000 (1970). A trade and transportation center, Edéa is connected by railroad and highway with the city of Yaoundé and the port of Douala. It has a hydroelectric power plant with a capacity of 264 megawatts (1976) on the Sanaga River. An aluminum plant in the city uses electricity from the hydroelectric plant and alumina imported from the Republic of Guinea. Other industries in Edéa include palm oil production and woodworking. [29–1679–4]

EDELFELT, ALBERT. Born July 21, 1854, near Borgå; died Aug. 18, 1905, in Borgå. Finnish painter.

Edelfelt studied at the School of Drawing of the Society for the Encouragement of Artists in Helsingfors under B. Lindholm and B. Reinhold (1868–71), at the Antwerp Academy of Sciences (1873–74), and in Paris under J. L. Gérôme (1874).

Edelfelt, a representative of the realist school, was also influenced by impressionism. His works include historical scenes (*The Swedish King Charles Mutilates the Corpse of His Enemy Stadtholder Flemming in 1537*, 1878) and scenes from the life of the people (*Peasant Women From Ruokolahti*, 1887; *Fishermen From Distant Islands*, 1898), as well as landscapes and portraits (*Mother*, 1883; *Louis Pasteur*, 1885; *A. Ackté*, 1901). Edelfelt's works are noted for their free, expressive use of form, subtle rendering of light and air, and bright, festive colors. All works mentioned are housed in the Atheneum in Helsinki.

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Hintze, B. *Albert Edelfelt*. Borgå-Helsinki, 1953. [29–1680–2]

EDELMAN, GERALD MAURICE. Born July 1, 1929, in New York. American biochemist. Member of the American Academy of Arts and Sciences and the New York Academy of Sciences.

Edelman graduated from Ursinus College in 1950, and he received his M.D. in 1954. In 1957 he joined the staff of the Rockefeller Institute of Medical Research, and he became a professor there in 1966. Edelman's research has dealt mainly with the primary and tertiary structure of proteins, especially antibodies (immunoglobulins), and with the structure of the cell surface. He applied new methods for the fractionation of antibodies and cells, and he developed a method of fluorescence spectroscopy for proteins. Edelman discovered that the gamma globulin molecule consists of four polypeptide chains.

Together with R. R. Porter, Edelman was awarded a Nobel Prize in 1972. [29–1680–1]

EDEL'SHTEIN, VITALII IVANOVICH. Born Apr. 17 (29), 1881, in Kazan; died Aug. 1, 1965, in Moscow. Soviet scientist, specialist in vegetable cultivation. Honorary member of the V. I. Lenin All-Union Academy of Agricultural Sciences (1956). Hero of Socialist Labor (1961). Member of the CPSU from 1952.

Edel'shtein graduated from the St. Petersburg Forestry Institute in 1902 and worked in the institute's department of botany until 1907. He taught at the Uman' Agricultural School from 1907 to 1913 and later became head of the Tula Fruit and Vegetable Station. In 1916 he became a professor in the department of fruit and vegetable growing of the Moscow Agricultural Institute (now the K. A. Timiriazev Moscow Agricultural Academy). Edel'shtein's principal works deal with the biology of vegetables, vegetable-growing techniques, and methods of obtaining seedlings. They include the textbook *Vegetable Growing* (1944; State Prize, 1946).

Edel'shtein was awarded two Orders of Lenin, the Order of the Badge of Honor, and several medals.

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Vitalii Ivanovich Edel'shtein. Moscow, 1953. (*Uchenye Timiriazevskoi akademii* series.) [29–1680–3]

EDÉN, NILS. Born Aug. 25, 1871, in Piteå; died June 16, 1945, in Stockholm. Swedish political figure and historian. Doctor of sciences (1899).

Edén studied at the University of Uppsala and was a professor at the university from 1903 to 1920. In 1905, at the behest of the government, he developed a program to resolve the crisis in the Swedish-Norwegian Union, which had been formed in 1814.

Edén was a member of the Riksdag from 1909 to 1924. He led the Liberal Coalition Party of Sweden from 1918 to 1923, and from 1917 to 1920 he served as prime minister of a coalition government, which carried out a number of bourgeois democratic reforms. After his party split in 1923, he ceased to play an active role in politics.

Edén's principal works deal with the Swedish-Norwegian Union, the organization of the Swedish central administration in the 16th and 17th centuries, and 17th-century foreign policy. Edén was responsible for the publication of much valuable source material.

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Svenskt biografiskt lexikon, vol. 12, fasc. 36. Stockholm, 1949. Pages 88–103. (Contains bibliography.) [29–1680–5]

EDER, BORIS AFANAS'EVICH. Born July 12 (24), 1894, in Batumi; died Nov. 15, 1970, in Moscow. Soviet circus performer. People's Artist of the RSFSR (1939). Member of the CPSU from 1954.

From the time he first entered the circus ring in 1908, Eder appeared as a gymnast, acrobat, and high-wire artist. He created and performed in the special aerial gymnastic act "Airplane Flight Around the Eiffel Tower." In 1932, Eder gained prominence as an animal trainer; he worked with many different animals, including lions, brown bears, polar bears, tigers, elephants, and ostriches. An advocate of humane methods of training, Eder used affection, encouragement, and precise command gestures and voice inflections. Eder's students include M. P. Nazarova, V. M. Zapashnyi, and E. M. Podchernikova. Eder also served as a consultant for several films, including *Dangerous Trails*, *The Lady Tiger Tamer* and *Don Quixote*.

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Dmitriev, Iu. A. *Sovetskii tsirk segodnia*. Moscow, 1968. [29–1681–2]

EDFU (present-day Idfu), an ancient city in Upper Egypt, in what is now the *muhafazah* (governorate) of Aswan; situated on the left bank of the Nile. From predynastic times, Edfu was the center of the cult of the sun-god, who was depicted as a winged disk. Later this god was identified with Horus and then with Apollo, and as a result the city was known as Apollonopolis Magna in Greco-Roman times.

Preserved structures include a temple complex devoted to the worship of Horus; the complex, which dates from Ptolemaic times (237 B.C. to the mid-first century B.C.), was built on the site of an ancient temple of the time of Ramses III. Excavations conducted in the 1920's and 1930's yielded residential quarters of the city and a necropolis. Articles of everyday use have been found, some from the period of the Old Kingdom but mainly from the Greco-Roman, Coptic, and Byzantine periods.

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Tell Edfou, vols. 1–3. Cairo, 1937–39. [29–1692–5]

EDGE ISLAND, an island in the southwestern part of the Spitzbergen Archipelago. Edge Island, a possession of Norway, covers an area of 5,030 sq km. It is composed primarily of sandstones and shales. The maximum elevation is 716 m. The area of glaciation is 1,880 sq km; the ice cover is not solid, and the Stone and King Johan glaciers, among others, flow into the valleys. The vegetation features arctic wasteland and tundra, consisting of mosses, lichens, and other plants. The island was discovered in 1613 by the English navigator T. Edge, although it had probably been discovered earlier by Russian seafarers. There are no permanent residents on the island. [29–1681–3]

EDGER, in a rolling mill, a roll stand having vertical rolls, designed to compress the metal being rolled along its side surfaces. The design and location of an edger depend on the type of rolling mill. In sheet and slabbing mills, edgers are used to produce smooth, even edges on the sheets and slabs; they have driven rolls and are situated either ahead or behind the main stand with horizontal rolls. The edgers of billet and section mills are designed to eliminate canting and distortion of the metal during rolling; they usually have driven rolls and are situated in alternation between stands having horizontal rolls. The edger rolls of rail and beam mills are situated in the same plane as the horizontal rolls and are designed without drives. Roll stands with both horizontal and vertical rolls are known as universal stands.

[29–1682–3]

EDGEWORTH, FRANCIS YSIDRO. Born Feb. 8, 1845, in Edgeworthstown, County Longford, Ireland; died Feb. 13, 1926, in Oxford. British economist and statistician; representative of the mathematical school of bourgeois political economy.

Edgeworth graduated from Oxford University in 1869. He was a professor of political economy at King's College in London from 1888 to 1891 and at Oxford from 1891 to 1922. He was president of the Royal Statistical Society from 1912 to 1914. Edge-

worth's theoretical views were greatly influenced by W. S. Jevons and A. Marshall. Edgeworth believed in the importance of the use of mathematics in economics. In his philosophical views he was an adherent of English utilitarianism. He was one of the first to introduce the concept of indifference curves into economics. He believed that the curves illustrated the selection by a consumer of the utility of different types of wealth. Edgeworth investigated the logical and philosophical foundations of probability and the possibility of measuring utility. He worked on a mathematical definition of economic equilibrium and on indexes. He emphasized the significance of functional analysis in investigating the relationships between individual elements of an economic system, rejecting the need to analyze cause-and-effect relationships between economic phenomena. Although Edgeworth published a significant number of works, he did not advance a unified and consistent theory. Individual positions developed by him were further developed by other Western economists.

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S. B. ZELENEV [29–1683–1]

EDGEWORTH, MARIA. Born Jan. 1, 1767, in Black Bourton, Great Britain; died May 22, 1849, in Edgeworthstown, Ireland. Irish writer.

In *Letters to Literary Ladies* (1795) and *Practical Education* (vols. 1–2, 1798), Edgeworth presented a detailed program of education, including that of women, in the spirit of the pedagogical ideas of the Enlightenment. A profound penetration into child psychology can be observed in her didactic stories for children. Edgeworth gained fame for her "Irish novels." The destruction of the patriarchal way of life and the triumph of bourgeois relationships are the subject matter of the novel of society and everyday life *Castle Rackrent* (1800; Russian translation, 1972). The novel *The Absentee* (1812; Russian translation, 1972) is devoted to the urgent problems of early 19th-century Ireland. In laying bare class haughtiness and affectation, Edgeworth proved herself to be an outstanding satirist. Her realistic mastery comes to life most brilliantly in her portraits of heroes from among the people. She was the author of the novels *Belinda* (1801) and *Tales of Fashionable Life* (series 1–2, 1809–12). Edgeworth's pedagogical essays and stories for children were popular in Russia.

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Hurst, M. *Maria Edgeworth and the Public Scene*. [London, 1970.]
Butler, M. *Maria Edgeworth*. Oxford, 1972.
V. A. KHARITONOV [29–1682–4]

EDICT. (1) In Roman law, an authoritative order or statement issued by a magistrate, especially a praetor, upon assumption of office to present his program. The edict remained in force throughout the magistrate's term. In practice, the basic legal provisions of the praetorian edict were recopied from year to year and thus took on a general normative character. In the second century A.D., the Roman jurist Salvius Julianus drew up the final text of the praetorian edict.

(2) In the Roman Empire and a number of the medieval monarchies of Western Europe, a type of law issued by the emperor or sovereign. An example of such an edict is the Edict of Nantes, which was issued in 1598 in France. [29–1683–5]

EDIFICATOR, a plant species having a clearly defined habitat-formation ability, that is, the ability to determine the structure and, to a certain extent, the species composition of a plant community, or phytocoenosis. Edificators have a great effect on the environment and, through it, on the lives of the other plants in the community. An example is the fir, whose dense crown retains as much as 50 percent of the precipitation and allows little light to filter through. As a result, it is always dark in a dense fir forest, and only shade-tolerant vegetation can live there. In addition, there is an increased content of watery vapors and carbon dioxide under the foliage canopy of fir trees. The temperature drops during the day and rises at night (in comparison with neighboring open spaces), thereby affecting the average annual temperature within the forest. Edificators are of great importance within the system of phytocoenotypes. [29–1687–1]

EDIL'BAEV SHEEP, a breed of fat-tailed, coarse-wooled sheep raised for meat and tallow. The Edil'baev sheep was developed in the late 19th century by Kazakh herdsmen, who crossed Kazakh fat-tailed sheep with Astrakhan coarse-wooled rams. Subsequently those animals that were best adapted to the natural and climatic conditions of nomadic sheep raising were selected.

Both rams and ewes are polled. The rams weigh 100–120 kg, sometimes as much as 160 kg; the ewes weigh 65–75 kg, sometimes as much as 115 kg. The sheep grow rapidly and mature early. The yield of meat is 50–55 percent. The wool is predominantly rufous, brown, and black, occasionally white or gray. The fleece measures approximately 15 cm in length; the yield of wool from two clippings is 3.5 kg from rams and 2.3–2.6 kg from ewes. Fertility is 110–120 lambs per 100 ewes. The sheep are bred principally in the Kazakh SSR.

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Ovtsevodstvo, vol. 2. Edited by G. R. Litovchenko and P. A. Esaulov, Moscow, 1972. [29–1684–3]

EDINBURGH a city and royal burgh in Great Britain; capital of Scotland and center of the province of Lothian. Population, 543,000 (1971). Edinburgh is situated near the Firth of Forth, an inlet of the North Sea; the port of Leith on the shore of the firth is within the city limits. Edinburgh is a transportation junction and an industrial center, as well as an important cultural center. It has enterprises of the printing, paper, pharmaceutical, and food-processing industries. Machinery is also produced, including electrical equipment and machinery for the paper industry. The city is the home of the Royal Scottish Academy, and it has a university.

The first written information about Edinburgh dates from the sixth century. Edinburgh probably received the rights of a city in the 12th century. It became the capital of Scotland in the mid-15th century. From the 13th to the 17th centuries it was repeatedly occupied by English troops, which caused considerable destruction. The city's importance as a political and administrative center declined in the 17th and 18th centuries as a result of the union of Scotland and England. During the industrial revolution, which began in the mid-18th century, the city's commercial, industrial, and financial role increased. In the 1830's a trade union council was founded in Edinburgh and the Chartist movement spread.

Edinburgh, one of Europe's most beautiful cities, is known as the Athens of the North. It is situated on several hills and has narrow, winding streets lined with towerlike houses, up to 12 stories high, of coarse stone. The new part has a regular layout (plan of 1767–68, architect J. Craig) with beautifully integrated architecture in the classical style. Notable structures include the former royal castle (11th–16th centuries) and Holyrood Palace, residence of the Scottish kings (begun 1128). Also of interest are the city's 16th-century houses, classical-style buildings and architectural complexes, including Charlotte Square (1792–1807, architect R. Adam and others), and neo-Gothic structures. The Turnhouse air terminal was built in 1955 by R. Matthew. Museums include the Royal Scottish Museum, the National Museum of Antiquities of Scotland, and the National Gallery of Scotland.

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Voronikhina, L. N. *Edinburg*. Leningrad, 1974. [29–1684–4]

EDINBURGH, UNIVERSITY OF, the largest higher educational institution in Scotland. The university was founded in 1583. In 1976 it had faculties of divinity, law, arts, social sciences, science, medicine, veterinary medicine, and music. Attached institutions include the New College (founded 1846), an institute of humanities, and a center of rural economy. The university has more than 11,000 students, and the teaching staff numbers 1,370. The university library, founded in 1580, has more than 1 million volumes. [29–1685–1]

EDIRNE, a city in northwestern Turkey; situated in the valley of the Maritsa River, in Eastern Thrace. Administrative center of Edirne Vilayet. Population, 63,000 (1975).

Edirne, an important transportation junction on the border with Bulgaria and Greece, is situated on the Istanbul-Sofia rail line and is a highway junction. It is the trade center of an agricultural region producing grains and oil-yielding seed. Edirne has flour and vegetable-oil mills and a cotton-textile factory.

Edirne is thought to have been founded by the ancient Thracians, who called it Odrys. From the fourth to the mid-second century B.C. it was a colony of Macedonia and was called Orestia. The city came under Roman rule in the second half of the second century B.C. In A.D. 125 it was rebuilt by the Roman emperor Hadrian and named Hadrianopolis (Adrianople) in his honor. From the late fourth to the mid-14th centuries it was part of Byzantium, except for the period 1204–61, when it was part of the Latin Empire. In the early 1360's it was conquered by the Ottoman Turks and named Edirne. It was the capital of the Ottoman Empire until 1453.

Ancient Edirne, which had a regular layout, was situated in the southwestern part of the present-day city. To the northeast there is a medieval Muslim city, with radial streets. Architectural monuments include several notable mosques, for example, Eski Cami (1403–13), Uç Şerefeli (1437–47), and Selimiye Cami (1569–75, architect Sinan). [29–1686–2]

EDISON, THOMAS ALVA. Born Feb. 11, 1847, in Milan, Ohio; died Oct. 18, 1931, in West Orange, N.J. American inventor in electrical engineering, the owner and founder of major electrical engineering companies.

Edison was a descendant of Dutch immigrants. After receiving a primary education, he began working at the age of 12 as a newsboy and later as a telegraph operator. Having made his home in Newark, N.J., he produced his first invention in 1868 and opened a workshop where his devices were manufactured. Between 1869 and 1876, Edison designed a number of original devices, including the stock ticker. He also worked on multiplex telegraphy and improved the typewriter.

In 1876, Edison moved to Menlo Park, N.J., where he resided until 1887. At Menlo Park, he established a major laboratory with workshops. During this period, he improved A. Bell's telephone and, in 1877, invented the phonograph. In 1879 he proposed and introduced a commercially practical incandescent lamp. He also invented various electrical devices, such as the screw socket and base for electric lamps, the electric fuse, a rotary switch, and the electric meter. In addition, Edison carried out experiments on the electrification of railroads and developed a magnetic method of ore separation. In 1883 he discovered thermionic emission, which is known as the Edison effect. Edison also designed electric generators that were the most powerful of their day. In 1882 the world's first DC electric power plant designed to provide power to the public was built in New York City according to his specifications.

In the late 1880's, Edison established a number of major concerns for the production and sale of electric machines and equipment, lighting equipment, and incandescent lamps. His concerns also operated the electric power plants and telegraph stations that he had built in the USA and Europe.

From 1887 until his death, Edison resided in West Orange, N.J., where he headed his "invention factory." During this period, he improved the phonograph and the motion-picture camera. He also invented a device that was the prototype of the dictating machine, equipment for recording telephone conversations, a railroad brake, and the nickel-iron battery.

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G. K. TSVERAVA [29–1686–3]

EDITORIAL TECHNIQUE, methods used in the publication of scholarly texts, primarily well-established ones, such as classical works, historical or linguistic sources, and documents; one of the applied uses of textual criticism.

The most important task in editorial technique is the establishment of a text for publication through studying its history. An established text must correspond to the creative intentions of the writer and be free of extraneous additions and damage, in particular, changes linked with censorship (including self-censorship). Another task is the transcription of the text, which involves applying modern orthography and script while preserving the essence of the content, as well as lexicological, morphological, syntactical, and phonetic peculiarities of the published text. Of utmost importance is the formulation of a reference apparatus, including accompanying articles, indexes, and especially commentaries (notes).

The resolution of all the problems of editorial technique depends on whether the publication is intended to be scholarly or popular. In regard to structure and content, the text may be published as a complete collection of works, selected works, an anthology, or a publication of separate works or documents.

Specialists in editorial technique and textual criticism cannot merely rely on the mechanical application of previously established "rules." Universal conventions do not take into account all the various forms, shades of meaning, and unusual connotations of the written word. Certain rules, such as those set by the latest text, are justified in most cases; however, they do not relieve the scholar of his duty to undertake concrete research to establish the authentic creative intentions of the author. A philological analysis of the text necessitates the collation of sources to make known the latest interpretations; various techniques of scholarly philological research are also indispensable. An established text is not declared the standard one, but is acknowledged as such (at the current level of study) by a number of authorities. The work of the editor is documented and substantiated within the publication and therefore can be checked by the reader.

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See under TEXTUAL CRITICISM.

A. L. GRISHUNIN [29–1687–2]

EDJELEH, a settlement in Algeria, in the northeastern part of the Sahara, near the Algerian-Libyan border. Edjeleh is the center of the Edjeleh petroleum-producing basin, which consists of the Edjeleh, Tiguentourine, and Zarzaitin fields, opened between 1956 and 1958. Approximately 10 million tons of petroleum are extracted from the basin annually. The oil is pumped from the basin to the Mediterranean port of Cekhira, Tunisia. [29–1682–1]

EDMONTON, a city in western Canada, on the North Saskatchewan River. Capital of the province of Alberta. Population, 518,000 (1973; including suburbs). Edmonton is an important center for transportation, commercial distribution, industry, finance, and culture in western Canada. Oil refining and and petroleum chemistry are important industries. Enterprises include a pipe-rolling mill, a plant for the production of oil-drilling equipment, and factories for the processing of agricultural raw material. The city has a university. [29–1688–1]

EDOM (Greek, Idumaea), an ancient country in Southwest Asia, south of Palestine, between the Dead Sea and the Gulf of Aqaba; named for the Edomites.

In the second half of the second millennium B.C., the land was settled by the Edomites, who united to form a state in the late second millennium B.C. In the 11th century B.C., Edom was subjugated by the tribes of Israel. It paid a tribute to Assyria from the ninth to seventh centuries and to the neo-Babylonian kingdom in

the seventh and sixth centuries. Together with the Babylonians, the Edomites laid seige to Jerusalem in 586 B.C. and destroyed the city. By the late sixth century they governed part of southern Palestine.

When the Nabataean kingdom was formed in the late third century B.C., much of Edom was incorporated into it. With part of southern Palestine (capital, Hebron), western Edom became the independent kingdom of Idumaea. In the late second century B.C., Idumaea was conquered by a Judean king of the Hasmonean dynasty, and the population was converted to Judaism.

Together with Judea, Idumaea was subjugated by Rome in 63 B.C. and became a Roman protectorate. King Herod I was an Idumaean. In 106 A.D., a large part of Idumaea was incorporated into the Roman province of Arabia. [29–1688–4]

EDRIOASTEROIDEA, a class of extinct marine Paleozoic animals of the phylum Echinodermata. The theca resembled a pouch or disk and lacked a stalk, arms, and brachioles. Most Edrioasteroidea attached themselves to a substrate, although some lay freely on the bottom. Particles of food entered the oral field along the ambulacral grooves, through the pores of which the tube feet of the abulacral system emerged.

The Edrioasteroidea lived from the Cambrian to the Carboniferous, flourishing in the Middle Ordovician and Late Devonian. Remains are seldom found. About 30 genera with 100 species are known, almost all from Europe and North America. In the USSR they have been found in Ordovician deposits in Estonia and in Devonian deposits in Leningrad and Voronezh oblasts of the RSFSR.

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[29–1689–2]

EDWARD. In England:

Edward I. Born June 17, 1239, in London; died July 7, 1307, near Carlisle. King from 1272. Member of the Plantagenet dynasty.

During the reign of Edward I, the estate monarchy took shape in England as the regular convocation of Parliament became an established practice. In his domestic policy Edward I strove to maintain the equilibrium that had arisen within the class of feudal lords as a result of the civil war of the 1260's and sought to strengthen the alliance of the royal power with the knights and the cities; at the same time he waged a cautious offensive against the secular and clerical aristocracy, especially through the Statutes of Westminster. Because of the great dissatisfaction with rising taxes felt by the knights and the burghers, who were supported by the barons, Edward I was forced in 1297 to recognize officially Parliament's right to sanction state taxes. Under his rule, Wales was forcibly annexed by England between 1282 and 1284. Edward I attempted to conquer Scotland beginning in 1286, but his efforts met with the stubborn resistance of the Scottish people.

Edward III. Born Nov. 13, 1312, in Windsor; died June 21, 1377, in Sheen, now Richmond. King from 1327. Member of the Plantagenet dynasty.

Edward III ruled independently from 1330. A grandson of the French king Philip IV the Fair on his mother's side, Edward III took advantage of the extinction of the Capetian dynasty in France to lay claim to the French throne; he declared war on France in 1337, thereby beginning the Hundred Years' War (1337–1453). After the plague of 1348 (the Black Death), which gave rise to a lack of manpower and to an increase in wages, Edward III promulgated several laws in the interests of the feudal lords that compelled laborers to work at pay rates that had existed before the plague. In an attempt to subordinate the English church to the royal power, he prohibited in 1353 the transfer of cases involving English subjects to the papal curia, and he refused to provide certain traditional cash payments to the pope. In 1371, the decrepit king virtually handed over the conduct of state affairs to his son John of Gaunt.

Edward IV. Born Apr. 28, 1442, in Rouen; died Apr. 9, 1483, in London. King from 1461 to 1483, with an interruption from October 1470 to April 1471. First king of the York dynasty.

Edward IV seized the throne during the Wars of the Roses by deposing Henry VI of Lancaster. His attempts to reduce the political power of the feudal aristocracy led his followers among the barons, headed by the Earl of Warwick, to join the Lancastrians. Edward IV was deposed in October 1470. He regained the throne in April 1471 by defeating the Lancastrians at Barnet; in May 1471 he defeated them again at Tewkesbury. The stability of the royal treasury, which was formed from "voluntary" gifts by the population, compulsory loans from cities, and customs duties, enabled Edward IV generally to rule without convoking Parliament. Edward IV enacted measures promoting English industry, especially cloth manufacture, and trade.

Edward VI. Born Oct. 12, 1537, in Hampton Court; died July 6, 1553, in Greenwich. King from 1547. Member of the Tudor dynasty.

Because of his youth and ill health, Edward VI played virtually no role in the conduct of state affairs.

Edward VII. Born Nov. 9, 1841, in London; died May 5, 1910, in Windsor. King from 1901. First king of the Saxe-Coburg-Gotha dynasty (Windsor dynasty since 1917).

Edward VII took part in the formation of the Entente. At a meeting with the Austro-Hungarian emperor Francis Joseph in 1907, he tried unsuccessfully to make Austria-Hungary break its alliance with Germany. Edward VII did not play a significant role in domestic policy.

Edward VIII. Born June 23, 1894, in Richmond; died May 28, 1972, in Paris. King from January to December 1936.

Edward VIII's attempts to take part in political affairs and his intention to enter into a marriage that was contrary to the traditions of dynastic marriage caused sharp dissatisfaction among certain elements in the ruling circles of Great Britain. A palace crisis ensued, and he abdicated in favor of his younger brother, who became King George VI. On his abdication, Edward VIII was given the title of duke of Windsor. During World War II he was governor of the Bahamas. Edward spent the last years of his life in France. [29–1690–2]

EDWARD (THE BLACK PRINCE). Born June 15, 1330, in Woodstock; died June 8, 1376, in London. Eldest son of the English king Edward III; prince of Wales. Nicknamed the Black Prince probably because of his black armor.

Edward was one of the principal English military commanders in the first phase of the Hundred Years' War of 1337–1453. He gained particular renown as a result of English victories at the battle of Crécy in 1346 and the battle of Poitiers in 1356. In 1362 he became ruler of the French province of Aquitaine, which had been conquered by the English. The levying of taxes and acts of plunder and violence by English troops in the province gave rise to determined resistance on the part of the local population, and Edward was compelled to return to England in 1371. [29–308–4]

EDWARD, a lake in East Africa, in the Nile basin, on the border between Zaïre and Uganda. Lake Edward became known as Lake Idi Amin Dada in 1973. The lake has an area of 2,150 sq km and a maximum depth of 111 m. It is located in a tectonic basin at an elevation of 912 m. The Semliki River flows out of Lake Edward and empties into Lake Albert (Lake Mobutu Sese Seko). Lake Edward is fished commercially. [29–1691–1]

EDWARD VII PENINSULA, the northwestern extremity of Marie Byrd Land, in Western Antarctica. On the south, Edward VII Peninsula adjoins the Ross Ice Shelf. It is covered with an ice sheet that is nearly 500 m thick; above the surface of the ice rise mountain ranges, such as the Rockefeller and Alexandra mountains, and individual peaks, such as La Gorce Peak (elevation, 829 m). The peninsula was discovered in 1842 by a British expedition led by J. Ross; it was named Edward VII Land in honor of the British king. Its peninsula nature was established in 1929 by an American expedition led by R. Byrd. [29–1691–3]

EDWARDS, JONATHAN. Born Oct. 5, 1703, in East Windsor, Conn.; died Mar. 22, 1758, in Princeton, N.J. American religious

philosopher and Calvinist theologian; an opponent of atheism and materialism.

Edwards combined the mysticism of the Cambridge Platonists with views close to those of G. Berkeley and N. de Malebranche. For Edwards, god was the only reality and the cause of all that occurs. At the same time, he differed on a number of points from orthodox Calvinism. Edwards' ideas were sharply criticized by members of the American Enlightenment.

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EDWARDS PLATEAU, a plateau in the southern United States, in the state of Texas, between the valleys of the Columbia River and the Rio Grande. The plateau, which has an elevation of 700–800 m, constitutes part of the Great Plains. It is deeply dissected by canyon-like river valleys. Dry prairie grasses, succulents, and mesquite are the principal forms of vegetation. Livestock graze on the Edwards Plateau. [29–1692–2]

EDWARD THE CONFESSOR. Born circa 1003, in Islip, Oxfordshire; died Jan. 5, 1066, in London. Anglo-Saxon king from 1042.

Edward was chosen king by a council of the nobility, who sought through him to restore the ancient Anglo-Saxon dynasty and end the Danish domination of England. He left the Continent, where he had lived for many years, and returned to England accompanied by a large entourage of Norman feudal lords, who soon occupied key positions at his court. Dissatisfaction with Norman dominance resulted in an uprising in 1051. Led by Godwin of Wessex, Edward's father-in-law, the rebels achieved the expulsion of the Normans from England. The administration of the state passed first to Godwin, who died in 1053, and then to Godwin's son Harold, whom Edward named as his successor to the throne. [29–1691–2]

EEDEN, FREDERIK VAN. Born Apr. 3, 1860, in Haarlem; died June 16, 1932, in Bussum. Dutch writer.

Eeden, one of the "men of the eighties," was a founder and editor of the journal *De nieuwe gids*. His most significant work is his *Little Johannes* (also known as *The Quest*; parts 1–3, 1887–1906; Russian translation, 1914). Eeden's enthusiasm for Christian socialism was reflected in the plays *The Brothers* (1894) and *Lioba* (1897); however, the play *The Promised Land* expresses disenchantment with social reconstruction. Eeden's enthusiasm for Catholicism is reflected in his collection *To My Guardian Angel and Other Poems*.

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EEKHOUD, GEORGES. Born May 27, 1854, in Antwerp; died May 28, 1927, in Brussels. Belgian writer who wrote in French.

Eekhoud, a member of La Jeune Belgique, was one of Belgium's first novelists. At first a regionalist writer, he was the author of the novel *Kees Doorik* (1883) and the short-story collection *Country Fair* (1884). The novel *The New Carthage* (1888) offered a highly original, typically Belgian portrayal of the "octopus city." The novel *The Libertines of Antwerp* (1912) expressed utopian ideas of the "emancipation of the flesh" and deified nature.

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EEMIAN INTERGLACIAL (from Eems, the Dutch name for the Ems River of the North Sea basin), the interglacial that separates the Saale (Riss) glacial from the Vistula (Würm) glacial in Western Europe. The Eemian interglacial occurred 120,000–130,000 years ago; it corresponds to the Mikulino interglacial in the European part of the USSR [*see* ANTHROPOGENIC SYSTEM (PERIOD)]. [29–1693–1]

EGADI ISLANDS, a group of Italian islands in the Mediterranean Sea, west of Sicily. Area, about 40 sq km. Population, 6,100 (1968). The islands are composed mainly of limestones. They are characterized by hills and low mountains, which rise to an elevation of 686 m on the island of Marettimo. The islands contain citrus plantations and vineyards; there is fishing for tuna. [29–1669–5]

EGALITARIANISM, a petit bourgeois utopian philosophy advocating universal leveling as the organizing principle of society.

In its earliest forms, in classical times and the Middle Ages, egalitarianism was associated with a demand for equal redistribution of the land. Under early capitalism two basic trends developed within egalitarianism. The first advocated equalization of the property of individual producers; the institution of private property was to be retained. The Jacobin dictatorship attempted to put into practice this ideal, which derived from the teachings of J.-J. Rousseau. The second trend in egalitarianism was associated with the earliest communist utopian groups, such as the Babouvists; it advocated equal distribution of labor and goods on the basis of communal property.

K. Marx and F. Engels considered the principles of universal asceticism and crude leveling, which were characteristic of early communist literature, to be reactionary elements (see *Soch.*, 2nd ed., vol. 4, p. 455). The reactionary features of egalitarianism found particularly vivid expression in "barracks communism," which reduced people's capabilities and needs to one level. Under conditions in which the proletariat has not yet taken shape as a class, the advancement of the principle of egalitarianism against the exploiting classes is, as Engels said, "a necessary stage of transition" from plebeian and petit bourgeois revolutionism to proletarian revolutionism (*ibid.*, vol. 7, p. 377). In modern times, however, egalitarianism is a reactionary principle that is in opposition to the revolutionary ideals and the principle of equality advanced by the working class. E. G. PANFILOV [29–1670–1]

EGBA UPRISING, a major revolt of the Africans in Nigeria against the British colonial authorities and their network of agents. The uprising, which was provoked by the colonial authorities' introduction of direct taxation, took place in June 1918 in the small state of the Egba in western Nigeria. During the uprising, the Egba seized several administrative buildings, demolished storage facilities, and severed the railroad and telegraph lines that linked the cities of Baro and Minna. The local ruler, or *alake*, was forced to flee. The colonial authorities sent an army unit of approximately 1,000 officers and men to suppress the revolt. The rebels lost more than 3,500 men during the uprising. [29–1670–2]

EGBERT (also Ecgberht, Ecgbryht). Died 839. King of the Anglo-Saxon state of Wessex from 802.

Egbert united the feuding Anglo-Saxon kingdoms under his rule by annexing Cornwall, Kent, Essex, Sussex, Mercia, and Northumbria. [29–1670–4]

EGEDE-NISSEN, ADAM HJALMAR. Born June 29, 1868, near Christiania (now Oslo); died there Apr. 4, 1953. Figure in the Norwegian working-class and communist movement. Nephew of O. Egede-Nissen, a follower of Garibaldi.

A postal worker by profession, A. H. Egede-Nissen was a member of the Storting from 1900 to 1912 and again from 1922 to 1924. In the early 1900's, he helped the Russian Social Democrats print revolutionary literature in Vardö and deliver it to Russia. In January 1918 he visited Soviet Russia and met with V. I. Lenin. Egede-Nissen was a member of the Norwegian Labor Party from 1906 to 1923, when he joined the Communist Party of Norway (CPN). In 1935 he was a delegate to the Seventh Congress of the Comintern, and from 1933 to 1935 he served as chairman of the Society of Friends of the Soviet Union. Egede-Nissen was chairman of the CPN from 1934 to 1940 and in 1945 and 1946. In 1946 he was named an honored member of the CPN.

Egede-Nissen was the author of the memoirs *With Lenin Twenty Years Ago* (1937) and *Life in the Struggle* (1945).

[29–1671–1]

EGER, a city in northern Hungary, on the Eger River. Situated near the southern foot of the Bükk Mountains. Administrative center of the *megye* (county) of Heves. Population, 56,000 (1976). Eger produces engineering equipment, metal products, tobacco, furniture, milk, and wine. The city has a balneological health resort. Notable buildings in Eger, which has retained its medieval layout, include a 13th-century castle with fortifications dating from the 16th century, the Episcopal Palace (15th century), a Turkish minaret (1596–1687), the baroque County Council Hall (1751–55, architect M. Gerl), the Minorite Church (1758–73, architect Gerl), the *lycée* (1765–85, architect J. Fellner), and a cathedral in the classical style (1831–37, architect, J. Hild). The I. Dobi Museum has exhibits of archaeological remains and paintings, mainly Hungarian.

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EGGERT, JOHN EMIL MAX. Born Aug. 1, 1891, in Berlin; died Sept. 29, 1973, in Zürich. German physical chemist.

A student of W. Nernst's, Eggert studied from 1909 to 1913 at the University of Berlin and the Technische Hochschule of Berlin. In 1913 he became a lecturer at the University of Berlin, and from 1923 to 1937 he was a professor there. From 1928 to 1945 he was head of the scientific laboratory of AGFA, and from 1946 to 1961 he was a professor at the Swiss Federal Institute of Technology in Zürich.

Eggert's main work dealt with the chemistry of photographic processes. He studied the photosensitivity of silver halides and determined the quantum yield of photochemical reactions in the halide crystals in emulsion layers. Eggert showed that the optical density of developed emulsion layers is dependent on the degree of dispersion of silver in the layers. [29–1670–6]

EGIN-GOL (also Egiin-Gol), a river in the Mongolian People's Republic, a left tributary of the Selenga River. The Egin-Gol is 475 km long and drains an area of 49,100 sq km. It originates in the lake Khubsugul and flows through a broad valley between mountains and hills; the river has many rapids. The water level rises in the spring, and in the summer there are freshets caused by the rains. The mean flow rate 40 km from the mouth is 100 cu m per sec. The Egin-Gol is frozen over for five or six months a year. The river is not navigable. The landing of Khatgal is situated on the shores of Khubsugul, the source of the Egin-Gol. [29–1675–1]

EGK, WERNER. Born May 17, 1901, in Auchsesheim, near Augsburg. German composer and musical figure (Federal Republic of Germany). Member of the Bavarian Academy of Fine Arts (1951).

Egk received his musical education at the Augsburg Conservatory and pursued further study in Munich with C. Orff. He became known in the 1930's as a conductor and took up residence in Munich in 1954. Egk's work, which developed under the influence of R. Strauss, Hindemith, and Stravinsky, is based on elements drawn from the folklore of ancient Germany, which are transformed through various modern compositional techniques. Egk's finest compositions have generally been written to his own librettos taken from the classics of world literature. Examples are the operas *Peer Gynt* (1938, based on the play by Ibsen), *The Inspector-General* (1957, based on the play by Gogol), and *Betrothal in Santo Domingo* (1963, based on themes from the short story by Kleist). Egk has served as head of the German Composers' Association. [29–1675–4]

EGMONT, COUNT OF (also Lamoral of Egmont). Born Nov. 18, 1522, in La Hamaide; died June 5, 1568, in Brussels. A leader of the oppositional nobility before and during the Netherlands bourgeois revolution of the 16th century.

Egmont opposed only the extreme elements of Spanish policy in the Netherlands and, after the people's Iconoclastic Uprising of 1566, sought a reconciliation with the Spanish government. Nevertheless, he was executed together with Philippe de Montmorency, count of Hoorn. Egmont is portrayed in an idealized manner in Goethe's drama *Egmont* (1788), incidental music to which was composed by L. van Beethoven in 1810. [29–1676–1]

EGOCENTRISM, an attitude toward the world marked by a concentration on oneself; an extreme form of egoism. In philosophy, egocentrism leads to solipsism; in ethics, to individualism. In J. Piaget's genetic psychology, egocentrism characterizes the stage of development of the child between the ages of three and six and dominates his thinking and speech in this stage. The concept of egocentrism is also used in psychopathology and in several schools of depth psychology, including that of A. Adler.

[29–1676–4]

EGOISM, an ethical stance in which private interests are viewed as the basic motive for all action and as the chief criterion of value applied to society and to an individual's immediate milieu.

Egoism arose with the decay of the primitive communal system and the appearance of private property. It reflected the atomization of social associations and the separation from them of self-sufficient individuals, closed groups, and later, classes, for all of which socially useful activity was, and was regarded as, only a means of consolidating and maintaining their social position.

With the development of the commodity, and especially the capitalist, mode of production, private interests, objectively turned into the goal of action, and the principle of egoism became the universal measure of human enterprise. The principle of egoism underlay the philosophical, political-economic, and moral doctrines of such representatives of the Enlightenment as T. Hobbes, B. Mandeville, A. Smith, D. Ricardo, C. Helvétius, P. Holbach, and J. Bentham, the last of whom advocated the ethic of utilitarianism. With later thinkers, such as M. Stirner, adherence to the principle of egoism frequently took the form of extreme individualism and amorality.

Completely unlimited egoism has always been condemned by ordinary moral consciousness. The principle of altruism was advanced as an alternative to it. Only with the elimination of private property under socialism, however, did egoism cease to be the basic means of motivating social activity; it was supplanted by the principle of collectivism. The final elimination of egoism from human relations will take place in the age of mature communism.

O. G. Drobnitskii [29–1676–2]

EGRESSY, GÁBOR. Born Nov. 1, 1808, in Sajólászlófalva; died July 30, 1866, in Pest. Hungarian actor; prominent representative of the romantic revolutionary trend in the Hungarian theater. Friend and comrade of S. Petőfi; participant in the Hungarian Revolution and national liberation struggle of 1848–49.

Egressy began his stage career in 1828. Beginning in 1837, he worked primarily in the first permanent theater in Pest, named the National Theater in 1840. His powerful temperament suited him to heroic and tragic roles, notably the title roles in Shakespeare's *Hamlet, Othello*, and *Richard III*. Egressy gave the first truly profound interpretations of roles of the Hungarian repertoire. In 1834 he appeared in Katona's *Bánk bán*, as Otto; he later played Petur in the same play and in the 1840's undertook the title role.

Egressy was the author of *The Actor's Art* (1866), which reflects his progressive views on the stage arts.

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EĞRİDİR, a lake in southwestern Turkey, in the northwest spurs of the Taurus Mountains; situated in an intermontane basin at an elevation of 924 m. Lake Eğridir has a length of approximately 50 km and an area of approximately 320 sq km. The shores of the south side of the lake are steep, but those on the north side, around the isolated reach known as Hoyran, slope gently. The Eğridir is a freshwater lake, although there is no surface runoff. It is thought that water drains from the lake through karst cavities underground. [29–1677–1]

EGRISI (also Mingrelian), a mountain range in the Greater Caucasus, in the Georgian SSR. The Egrisi Range is parallel to the Glavnyi, or Vodorazdel'nyi, Range and extends from the Inguri River to the Tskhenistskali River. It reaches a maximum elevation of 3,173 m at Mount Tsekuri. Forests of broad-leaved trees, such as oak and beech, grow on the slopes of the range. Subalpine and alpine meadows are found above 2,000 m. [29–1677–2]

EGUCHI KIYOSHI. Born July 20, 1887, in Tokyo; died there Jan. 18, 1975. Japanese writer.

Eguchi studied at the division of English literature of the University of Tokyo. He joined the socialist movement in 1920. Eguchi was a prominent figure in Japanese proletarian literature in the 1920's and 1930s. His early short stories, written between 1910 and 1920, reveal elements of aestheticism; however, burning social issues are typical of the short stories "The Lieutenant and the War Invalid" (1919) and "In the Cell of Preliminary Confinement" (1922). The novella *Love and Prison* (1923; Russian translation, 1927) is devoted to the life and struggle of Japanese revolutionaries. The novella *The Bride and the Horse* (1949) portrays the life of Japanese peasants. Eguchi was the author of the memoirs *Half a Century of My Life in Literature* (vols. 1–2, 1953–58).

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EGVEKINOT, an urban-type settlement and the administrative center of Iul'tin Raion, Chukchi Autonomous Okrug (formerly Chukchi National Okrug), Magadan Oblast, RSFSR. A port on the Krest Gulf of the Bering Sea, Egvekinot has an ore-dressing combine, a construction combine, and a food-processing combine. [29–1670–5]

EICHENDORFF, JOSEPH VON. Born Mar. 10, 1788, at Lubowitz Castle; died Nov. 26, 1857, in Neisse. Baron; German writer.

Eichendorff studied at the University of Halle in 1805 and 1806 and at the University of Heidelberg in 1807 and 1808. He fought in the war of liberation of 1813 against Napoleon. Eichendorff's poems were first published in 1808. His lyrics, which are devoid of tragedy or dark overtones, contain vivid depictions of nature, in harmonious union with which is the figure of the romantic poet. His songs are an intrinsic part of his prose works, such as his novella *Memoirs of a Good-for-nothing* (1826; Russian translation, 1935) and his short stories and novels. Many of Eichendorff's songs were set to music by F. Schubert, F. Mendelssohn, and R. Schumann. Tendencies toward realism appear in his later works. Eichendorff also was the author of works of literary history.

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Krabiel, K. D. *J. Von Eichendorff: Kommentierte Studien Bibliographie*. Frankfurt am Main, 1971. [29–1735–1]

EICHHORN, EMIL. Born Oct. 9, 1863, near Chemnitz; died July 26, 1925, in Berlin. Figure in the German working-class movement; journalist. Member of the Communist Party of Germany from 1919.

Eichhorn became an active member of the Social Democratic Party in 1893 and served as head of the Social Democratic press bureau from 1908 to 1917. In 1917 he joined the Independent Social Democratic Party of Germany and became the head of its press service. In 1918 he was on the staff of the Russian Telegraph Agency in Berlin. During the November Revolution of 1918, the Berlin Council appointed Eichhorn chief of police in Berlin; he supported the revolutionary workers and soldiers. Eichhorn's dismissal by the Prussian government on Jan. 4, 1919, led to a protest staged by the working people of the city; the protest gained strength and resulted in general turbulence lasting several days.

Eichhorn became a deputy to the Weimar Constituent Assembly in 1919 and was elected to the Reichstag several times. [29–1733–2]

EICHHORN, KARL FRIEDRICH. Born Nov. 20, 1781, in Jena; died July 4, 1854, in Cologne. German jurist and historian of law; one of the main representatives of the historical school of law.

Eichhorn was a professor in Frankfurt an der Oder from 1805 to 1811, in Berlin from 1811 to 1813, in Göttingen from 1816 to 1829, and again in Berlin from 1832 to 1847. His main scholarly work was the *History of the German State and Law* (1808–23).

Eichhorn was one of the founders of the historical school of law, which drew on all the sources available to scholarship at that time. He traced the development of Germanic law, as well as the history of state institutions and of some social institutions, from ancient times to 1815. He believed that the state and law are a product of organic development rather than arbitrary acts of legislators and that the nature of the state and legal systems is determined by the "folk spirit."

Eichhorn's outlook was strictly conservative. He was hostile to French bourgeois institutions, and he defended Germanic law, which was derived from feudalism. Eichhorn considered the communal mark, the aristocracy, and retainership to be original German institutions.

WORKS
Deutsche Staats- und Rechsgeschichte, parts 1–4, 5th ed. Göttingen, 1843–44. [29–1733–1]

EICHLER, AUGUST WILHELM. Born Apr. 22, 1839, in Neukirchen; died Mar. 2, 1887, in Berlin. German botanist.

Eichler graduated from the University of Marburg in 1860. He taught at the University of Munich beginning in 1865 and became professor at the university of Graz (1871), Kiel (1872), and Berlin (1878). His main works dealt with the systematics and comparative morphology of vascular plants. In *Diagrams of Flowers* (parts 1–2, 1875–78), he surveyed the comparative morphology of flowers of angiosperms. Eichler proposed a phylogenetic system of plants, which was developed by A. Engler.

REFERENCE
[Schumann, R.] "A. W. Eichler." *Berichte der Deutschen Botanischen Gesellschaft*, vol. 5, 1887. [29–1735–2]

EICHMANN, ADOLF. Born Mar. 19, 1906 in Solingen in the Rhineland; died June 1, 1962, in Ramleh, Israel. Fascist German war criminal.

Eichmann joined the security service of the SS (Schutzstaffel) in 1934 and subsequently headed the subsection on Jewish affairs. In World War II he helped to draft and implement plans for the physical extermination of the Jewish population in Europe, and he was directly in charge of the shipment of Jews to concen-

tration camps. After the defeat of fascist Germany, Eichmann fled to Argentina. In 1960 he was seized by agents of the Israeli intelligence service. Eichmann was sentenced to death after being tried by a court in Jerusalem and was executed in the prison in the city of Ramleh. [29–1735–3]

EIDEMAN, ROBERT PETROVICH (also R. P. Eidemanis). Born Apr. 27 (May 9), 1895, in the village of Lejasciems, in what is now Gulbene Raion, Latvian SSR; died June 12, 1937. Soviet military commander. Corps commander (1935). Member of the CPSU from 1917.

Eideman graduated from the Valka Realschule in 1914 and entered the Petrograd Institute of Forestry. He was called into the army in 1916. After graduating from the Kiev Military School in the same year, he became an ensign and was assigned to Kansk as commander of a battalion in the 16th Siberian Reserve Rifle Regiment. After the February Revolution of 1917 he was elected chairman of the Kansk soviet of soldiers' deputies. In October 1917, at the First All-Siberian Congress of Soviets, Eideman was elected deputy chairman of the Central Executive Committee of Siberian Soviets (Tsentrosibir').

Eideman joined the staff of the Western Siberia headquarters in May 1918 and led detachments of the Red Guard against the counterrevolutionary Czechoslovak troops and White Guards in the Omsk region. Over a period beginning in July 1918 he commanded the 2nd and 3rd Urals divisions and the Special Division of the Third Army of the Eastern Front. He was commander of the 16th, 41st, and 46th rifle divisions on the Southern Front between March 1919 and April 1920, chief of rear services of the Southwestern Front in April and May 1920, and commander of the Thirteenth Army in June and July. From July to September 1920, as commander of the Right-bank Group of Forces of the Southwestern Front, he defended the Kakhovka base of operations. Eideman was commander of the interior service of the Southern and Southwestern fronts from October 1920 to January 1921. From February to May 1921, he was commander of the Kharkov Military District, where he directed the effort to control banditry. Eideman was assistant commander and then deputy commander of the armed forces of the Ukraine and the Crimea between 1921 and 1924 and commander of the Siberian Military District from 1924 to 1925.

Eideman served as director of the M. V. Frunze Military Academy and as its commissar from 1925 to 1932. He was managing editor of the journal *Voina i revoliutsiia* from 1927 to 1936. A member of the Revolutionary Military Council of the USSR from 1932 to 1934, he became a member of the Military Council of the People's Commissariat of Defense in 1934. In 1932, Eideman was made chairman of the Society for Assistance to Defense, Aviation, and Chemical Construction of the USSR (Osoaviakhim).

Eideman was the author of works on verse and prose. He was a member of the board of directors and chairman of the Latvian section of the Union of Writers of the USSR and a member of several convocations of the All-Russian Central Executive Committee and of the Central Executive Committee of the USSR. Eideman was awarded two Orders of the Red Banner and the Order of the Red Star.

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Bor'ba s kulatskim povstanchestvom i banditizmom, 3rd ed. Kharkov, 1921.

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Pankov, D. V. *Komkor Eideman*. Moscow, 1965.

D. V. PANKOV [29–1698–1]

EIDETIC MEMORY, a particular type of pictorial memory, primarily of visual impressions, that permits one to retain and reproduce an extraordinarily vivid image of a previously perceived object—an image that in clarity and detail is almost a copy of the originally perceived image.

Eidetic memory is present in some form and to some degree in all persons, and especially in children and teen-agers, but is seldom encountered in a clear-cut form. One of the first to describe eidetic memory was the Russian researcher Urbanchich (1907). The basic research on eidetic images was done by the German psychologist E. Jaensch and his students in the 1920's.

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EIDINOV, GRIGORII BORISOVICH. Born Aug. 28 (Sept. 10), 1908, in Baku; died May 2, 1977, in Minsk. Soviet party and state figure. A leader of the partisan movement in Byelorussia during the Great Patriotic War of 1941–45. Member of the CPSU from 1927.

The son of a worker, Eidinov graduated from the Higher Party School Under the Central Committee of the CPSU in 1958. Beginning in 1928, he engaged in work for the Komsomol and the party in Moscow and Byelorussia. From 1940 to 1944 he was secretary of the Central Committee of the Communist Party of Byelorussia (Bolshevik). In 1942, Eidinov headed the northwest command group of the Central Committee and of the Council of Peoples Commissars (CPC) of the Byelorussian SSR set up to organize partisan detachments and the party underground in occupied Byelorussia. From 1942 to 1944 he was first deputy chief of the Byelorussian headquarters of the partisan movement.

In 1944, Eidinov became deputy chairman of the Byelorussian CPC (renamed the Council of Ministers in 1946) and chairman of the Gosplan (State Planning Committee of the Byelorussian SSR). In 1948 he took up an administrative position on the staff of the Council of Ministers of the RSFSR. He served as a deputy to the second convocation of the Supreme Soviet of the USSR. Eidinov was awarded the Order of Lenin, three other orders, and various medals. [29–1699–1]

EIDLIN, LEV ZALMANOVICH. Born Dec. 23, 1909 (Jan. 5, 1910), in Chernigov. Soviet scholar, translator, and professor (since 1969) of Chinese literature. Member of the CPSU since 1932.

Eidlin graduated from the N. N. Narimanov Moscow Institute of Oriental Studies in 1937; his doctoral dissertation was entitled *T'ao Yüan-ming and His Poetry* (1968; book of the same title, 1967). He is the author of *On Chinese Literature of Our Times* (1955), *Chinese Literature* (1962; with V. F. Sorokin), and articles on the history of Chinese literature and theater and on the theory of translating poetry. He has translated the works of Po Chü-I, T'ao Yüan-ming, and other poets.

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Fedorenko, N. T. "Prizvanie kitaista." *Teoreticheskie problemy izucheniia literatur Dal'nego Vostoka*. Moscow, 1970. [29–1699–2]

EIDOS, a term that was originally used in ancient philosophy and literature to designate the visible, or "that which is seen," but that gradually acquired a deeper meaning—"concrete manifestness," or "physical or plastic givenness in thought."

For Homer the term meant "outward appearance," and primarily "beautiful outward appearance." In ancient natural philosophy (Empedocles and Democritus) eidos was interpreted al-

most exclusively as "image." Parmenides, however, regarded it as the essence, or truth, that is visible in one way or another. Plato's eidos had different meanings, such as "the external," "the internal," or even the characteristically Platonic "substantial idea." Aristotle used eidos to mean "form" as well. In Stoicism and Neoplatonism the term ranges in meaning from "body appearance" to "independent substantial idea."

In the phenomenology of E. Husserl, eidos, or rather its Latin translation *species*, designates the highest intellectual abstraction that is nonetheless a concrete, obvious, and entirely independent given.

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Hartmann, N. *Zur Lehre vom Eidos bei Platon und Aristoteles*. Berlin, 1941.
A. F. LOSEV [29–1699–3]

EIDSVOLL CONSTITUTION OF 1814, the constitution of Norway; adopted on May 17, 1814, by the Constituent Assembly in the city of Eidsvoll.

The Eidsvoll Constitution was adopted after the Danish king had been forced to renounce the Norwegian crown; in accordance with the Treaties of Kiel (1814), the crown was to pass to Sweden, but Norway was preparing to resist Sweden's plans for annexation. The Eidsvoll Constitution proclaimed Norway an independent state, and it recognized a parliament known as the Storting to be the supreme representative body. The members of the Storting were to be chosen by direct election, but with age, property, and residence qualifications for voting; the body was given broad legislative and financial powers. The king was granted executive power over the country's administration, defense, and foreign policy; he could not dissolve the Storting, however, and although he could supervise legislation, he had only qualified veto power over the parliament's decisions. The constitution introduced the freedoms of speech, press, and enterprise, and it proclaimed the inviolability of the person.

Norway was united with Sweden in 1814, but in accordance with the law that confirmed this action, Sweden pledged to recognize the Eidsvoll Constitution, as amended to allow for the union of the two countries. The constitution is still in force in Norway, although some changes and amendments were made in, for example, 1905, 1935, and 1946 (*see* NORWAY: Constitution and government). [29–1700–1]

EIDUKEVIČIUS, PRANAS (also Frants Vikent'evich Eidukevich). Born Sept. 25 (Oct. 7), 1869, in Kybartai, in what is now Vilkaviškis Raion, Lithuanian SSR; died Mar. 7, 1926, in Moscow. One of the organizers of the Communist Party of Lithuania. Member of the Communist Party from 1918.

The son of a railroad worker, Eidukevičius was himself a metalworker. He joined the revolutionary movement in the late 1880's, working first in Kaunas and then in Riga and Grodno. He took part in the Revolution of 1905–07 in Łódź and in Vilnius. From 1906 to 1918, Eidukevičius was a member of the Central Committee of the Social Democratic Party of Lithuania and a contributor to the Bolshevik newspapers *Sotsial-demokrat* and *Pravda*. He was arrested several times.

Eidukevičius was chairman of the Central Bureau of Workers' Trade Unions in Vilnius from 1915 to 1918. He began working in the party's underground in May 1918. In October, he helped organize the First Congress of the Communist Party of Lithuania and was elected chairman of the Central Committee. Eidukevičius helped establish Soviet power in Lithuania and was chairman of the presidium of the Vilnius city soviet. After the fall of Soviet power in Lithuania in 1919, he held high government and economic posts in the RSFSR. Eidukevičius was a delegate to the Tenth Congress of the RCP(B).

REFERENCE
Tamošiūnas, M. "Pranas Eidukiavichius." *Kommunist* (Vilnius), 1969, no. 10.
[29–1700–2]

EIFEL, the western part of the Rhenish Slate Mountains, north of the Mosel River, in the Federal Republic of Germany. The Eifel is approximately 90 km long and rises to an elevation of 747 m in the Hohe Acht. It consists primarily of slates overlain in places by basalts and tuffs. There is a plateau characterized by volcanic forms such as maars and the domes of extinct volcanoes. There are numerous lakes. Peat bogs and heaths are encountered, and coniferous and mixed forests are found in the northwest. The Sudeifel and Nordeifel natural parks are in the Eifel. [29–1731–5]

EIFELIAN STAGE, the lower stage of the Middle Devonian system (period). The Eifelian was established in the Eifel Mountains (in what is now the Federal Republic of Germany) in 1848 by the Belgian geologist A. Dumont. The stratotype of the Eifelian is represented chiefly by marls. In the Ardennes of Belgium it corresponds approximately to the shales of the Couvinian stage of J. d'Omalius d'Halloi, whose base is stratigraphically lower than the base of the Eifelian.

In the USSR the Eifelian (Couvinian) is taken to be more inclusive than in the stratotype and includes the analogues of the Zlihovian stage of Czechoslovakia and the upper part of the Emsian stage of the Rhine region. The Eifelian, which is divided into two substages, is widespread and represented by various rocks, such as marine carbonate and terrigenous rocks, evaporites, continental detrital rocks, and effusive rocks. In the USSR, complex ores, bauxites, iron, manganese, titanium, petroleum, rock salt, and other mineral products are associated with Eifelian beds.
[29–1731–6]

EIFFEL, ALEXANDER GUSTAVE. Born Dec. 15, 1832, in Dijon; died Dec. 28, 1923, in Paris. French structural engineer.

Eiffel graduated from the Ecole Centrale des Arts et Manufactures in Paris in 1855. He used metal structural members to build a number of bridges, viaducts, and other structures, including a bridge over the Douro River at Porto, Portugal. Eiffel became world famous for the wrought-iron latticed tower known as the Eiffel Tower, which is approximately 300 m high and was built according to his specifications for the Paris International Exposition of 1889 as a symbol of the technological achievements of the 19th century. During the erection of the tower, a number of advanced assembly methods were used.

Beginning in 1900, Eiffel devoted himself mainly to research in aerodynamics.

REFERENCE
Besset, M. *Gustave Eiffel*. Paris, 1957.
[29–1731–4]

EIGEN, MANFRED. Born May 9, 1927, in Bochum. German physical chemist (Federal Republic of Germany).

Eigen graduated from the University of Göttingen in 1951. He joined the staff of the Max Planck Institute of Physical Chemistry in 1953 and became chairman of the institute in 1964.

Eigen's principal works are devoted to the development of methods for investigating the kinetics of chemical reactions. He proposed a class of methods known collectively as the relaxation method for studying extremely fast chemical reactions. The term is used to describe a method in which the chemical equilibrium of a system is disturbed and the rate at which the system returns to equilibrium is observed; the equilibrium is disturbed by sending a single energy pulse or periodic pulses through the system in order to affect such factors as temperature, pressure, and electric field. Using this method, Eigen and his colleagues studied, for example, the kinetics of reactions of hydrogen and hydroxyl ions in aqueous solutions with acid-base indicators. Another important study involved the kinetics of the association of carboxylic acids.

Together with R. Norrish and G. Porter, Eigen won a Nobel Prize in 1967.

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Chibisov, A. K. "M. Eigen, Dzh. Porter, R. Norrish." *Zhurnal Vsesoiuznogo khimicheskogo obshchestva im. D. I. Mendeleeva*, 1975, vol. 20, no. 6, pp. 690–92.
[29–1697–7]

EIGHTS COAST, a section of the coast of Ellsworth Land, in Western Antarctica. Eights Coast extends more than 500 km from 85° to 102° W long.; a large part of the coast is occupied by the Abbot Ice Shelf. The mountainous Thurston Island, which reaches a maximum elevation of 1,000 m, is situated in the western part of the region. Eights Coast was named for J. Eights, who in 1829 and 1830 was the first American geologist to visit the antarctic. [29–1731–3]

EIJKMAN, CHRISTIAAN. Born Aug. 11, 1858, in Nijkerk, Gelderland; died Nov. 5, 1930, in Utrecht. Dutch bacteriologist and physician.

Eijkman earned his doctorate in medicine from the University of Amsterdam in 1883 and worked under R. Koch in Berlin. He served as an army physician in Indonesia in 1886, became director of the Batavian Laboratory of Pathology in Jakarta in 1888, and served as professor of hygiene at the University of Utrecht in The Netherlands from 1898 to 1928. Eijkman, whose works were mainly concerned with vitamins, discovered that vitamin deficiency is the cause of several diseases.

Eijkman was awarded a Nobel Prize in 1929, together with F. Hopkins. [29–1707–2]

EIKE VON REPGAU (also Eike von Repkow). Born circa 1180; died after 1233. German jurist; member (*Schöffe*) of a jurymen's court.

Eike von Repgau was the compiler of the *Saxon Mirror*. The *Saxon World Chronicle* (early 1230's), the first historical work written in Low German, has also been attributed to Eike von Repgau. [29–1705–3]

EIKHE, GENRIKH KHRISTOFOROVICH. Born Sept. 29 (Oct. 12), 1893, in Riga; died July 25, 1968, in Jurmala. Soviet military commander and military historian.

The son of a worker, Eikhe graduated from the Riga Commercial School in 1914 and the Petergof School for Ensigns in 1915. He served in World War I as a company commander and as a staff captain. Eikhe was elected a member of his regimental committee after the February Revolution of 1917 and was chairman of the military revolutionary committee of the 245th Infantry Regiment during the October Revolution. In November 1917 he was elected to the soviet of soldiers' deputies of the Tenth Army. Eikhe volunteered for the Red Army in March 1918, after serving as a member of the collegium on the formation of the Red Guard and after helping suppress the revolt of General J. Dowbór-Muśnicki's Polish Corps.

Between August 1918 and November 1919, Eikhe served on the Eastern Front, commanding a regiment, a brigade, and, from April 1919, the 26th Rifle Division. He served as Fifth Army commander from November 1919 to January 1920 and as commander in chief of the People's Revolutionary Army of the Far East Republic from March 1920 to April 1921. From 1921 to 1923, Eikhe was troop commander in the Minsk region and in Fergana Oblast. In 1924 he joined the People's Commissariat of Foreign Trade.

Eikhe was the author of several works on the history of the Civil War in Siberia. He was awarded the Order of Lenin, two Orders of the Red Banner, and various medals.

WORKS

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Oprokinutyi tyl. Moscow, 1966. [29–1733–3]

EIKHE, ROBERT INDRIKOVICH (in Latvian, Roberts Eihe). Born July 31 (Aug. 12), 1890, on the Avotiņu estate in Dobele District, Courland Province; died Feb. 2, 1940. Soviet state and party figure. Member of the Communist Party from 1905.

The son of a farmhand, Eikhe became a metalworker. In 1908 he joined the city committee of the Social Democracy of the Latvian Territory (SDLT) in Mitava (now Jelgava). After leaving Latvia in late 1908, he took part in the work of the London group of the SDLT. In 1911 he returned to Riga, and in 1914 he became a member of the Central Committee of the SDLT. In 1915, Eikhe was exiled to Siberia, but he escaped. He became a member of the presidium of the Riga soviet in 1917. During the German occupation, he engaged in underground work.

In 1919, Eikhe became people's commissar for foodstuffs of Soviet Latvia. After the fall of Soviet power in Latvia, he performed executive work in the People's Commissariat for Foodstuffs of the RSFSR until 1924. From 1925 to 1927 he was chairman of the Siberian Krai Executive Committee and secretary of the Western Siberian Krai Committee of the ACP(B). In October 1937 he became people's commissar of agriculture of the USSR.

Eikhe was a delegate to the Fourteenth through Seventeenth Party Congresses. At the Fourteenth and Fifteenth Congresses he was named a candidate member of the Central Committee of the ACP(B), and at the Sixteenth and Seventeenth Congresses, a member. Eikhe became a candidate member of the Politburo of the Central Committee of the ACP(B) in 1935. In 1921 he served as a delegate to the Third Congress of the Comintern. Eikhe was a member of the Central Executive Committee of the USSR.

Eikhe was awarded the Order of Lenin.

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EIKHENBAUM, BORIS MIKHAILOVICH. Born Oct. 4 (16), 1886, in the city of Krasnyi, in what is now Smolensk Oblast; died Nov. 24, 1959, in Leningrad. Soviet literary scholar; doctor of philology; professor at various higher educational institutions in Leningrad.

Eikhenbaum graduated from the faculty of history and philology of the University of St. Petersburg in 1912. In 1918 he joined the Society for the Study of Poetic Language (OPOIAZ). Eikhenbaum dealt with problems of structure, rhythm, and style in such studies as "How Gogol's 'Overcoat' Was Made" (1919) and *The Melody of Russian Lyric Verse* (1922). These works are noticeably influenced by the principles and inconsistencies of the formal method in literary scholarship. In his later works, which dealt primarily with L. N. Tolstoy (*L. Tolstoi*, books 1–3, 1928–60) and M. Iu. Lermontov, Eikhenbaum adopted a more balanced approach. He analyzed writers' works against a broad historical, social, and cultural background, employing large quantities of biographical, documentary, and archival materials. He never returned to the solitary study of structure that characterized his early, formalist writings.

Eikhenbaum's best works are noted for the acuteness with which he poses literary problems, the originality of his insights, and the elegance of his exposition. One of the foremost Soviet textual critics, Eikhenbaum edited works by such writers as I. S. Turgenev, N. S. Leskov, and M. E. Saltykov-Shchedrin.

WORKS

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T. Iu. Khmel'nitskaia [29–1734–2]

EIKHENVAL'D, ALEKSANDR ALEKSANDROVICH. Born Dec. 23, 1863 (Jan. 4, 1864), in St. Petersburg; died 1944. Russian physicist.

Eikhenval'd graduated from the St. Petersburg Institute of Railroad Engineers in 1888 and became an engineer. In 1897, after graduating from the Kaiser Wilhelm University (the University of Strasbourg), he joined the staff of the Moscow Engineering School; he was the director of the school from 1905 to 1908. In 1901, Eikhenval'd became a teacher in advanced courses for women. He taught at Moscow University from 1906 to 1911 and from 1917 to 1920. He emigrated in 1920.

Eikhenval'd demonstrated experimentally that a magnetic field arises during the mechanical movement of electrified bodies. In 1904 he proved that convection currents and conduction currents

are equivalent. In the same year, he became the first to show experimentally that a magnetic field is created when the polarization of a dielectric changes, that is, in the presence of displacement currents. In 1908 he performed a theoretical study of the propagation of energy during the total internal reflection of light. In 1934, Eikhenval'd carried out a theoretical investigation of the properties of large-amplitude acoustic waves.

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Izbr. raboty. Moscow, 1956. (Contains a biographical essay.)
[29–1734–3]

EIKHFEL'D, IOGAN GANSOVICH. Born Jan. 13 (25), 1893, in the city of Paide, in what is now the Estonian SSR. Soviet biologist, plant breeder, and public figure. Academician of the V. I. Lenin All-Union Academy of Agricultural Sciences (1935) and of the Academy of Sciences of the Estonian SSR (1946; president, 1950–68). Corresponding member of the Academy of Sciences of the USSR (1953). Hero of Socialist Labor (1963). Member of the CPSU since 1961.

In 1923, Eikhfel'd graduated from the Petrograd Agricultural Institute, where he was a student of N. I. Vavilov. In that year he also organized the Khibiny Agricultural Experiment Station in Murmansk Oblast; he was director of the station until 1930. From 1930 to 1940, after the station was reorganized, he was head of its arctic division. Eikhfel'd also directed the Arctic Experiment Station of the All-Union Institute of Horticulture. From 1940 to 1951 he was director of the All-Union Institute of Horticulture. Eikhfel'd was chairman of the Presidium of the Supreme Soviet of the Estonian SSR and vice-chairman of the Presidium of the Supreme Soviet of the USSR (1958–61).

Eikhfel'd's work has been devoted mainly to problems of growing crops in the Far North, reclamation and cultivation of bog and mineral soils of the north, and the development of various new farming practices. He has bred early-maturing varieties of basic crops regionalized for the North.

Eikhfel'd was a delegate to the Twenty-second Congress of the CPSU and deputy to the fourth to sixth convocations of the Supreme Soviet of the USSR. He received the State Prize of the USSR in 1942 and has been awarded six Orders of Lenin, the Order of the October Revolution, four other orders, and several medals. [29–1736–1]

EIKHVAL'D, EDUARD IVANOVICH (Karl Eduard von Eichwald). Born July 4 (15), 1795, in Jelgava, in what is now the Latvian SSR; died Nov. 4 (16), 1876, in St. Petersburg. Russian naturalist. Corresponding member of the St. Petersburg Academy of Sciences (1826).

Between 1814 and 1817, Eikhval'd studied medicine and natural sciences at the University of Berlin. After returning to Russia in 1819 he served as a professor at universities in Dorpat (present-day Tartu; from 1821), Kazan (from 1823), and Vilno (present-day Vilnius; from 1829) and at the St. Petersburg Medical-Surgical Academy (1838–51). Between 1839 and 1855 he lectured on paleontology at the St. Petersburg Mining Institute.

Eikhval'd's main works dealt with the taxonomy of plants and animals, paleontology, geology, and mineralogy. After traveling to the Caucasus and the Caspian Sea (1825–26) and to southwestern Russia (1829), he described several new species of plants and of Caspian-Caucasian fauna, mainly mollusks, fish, and reptiles. He also brought back information on the geography of the regions he visited. In *Zoologia specialis* (vols. 1–3, 1829–31), Eikhval'd provided an outline for the classification of animals based on comparative anatomy, physiology, and paleontology and proposed his own taxonomical system of the animal kingdom.

Eikhval'd was the author of textbooks on mineralogy (*Oryctognosy Mainly With Regard to Russia*, 1844) and geology (*Geognosy Mainly With Regard to Russia*, 1846) and of a textbook on paleontology, which was the only textbook of its kind in the Russian language at that time (*The Paleontology of Russia*, parts 1–2, 1854–61). Between 1860 and 1868, Eikhval'd published *Lethaea Rossica, or The Paleontology of Russia*, a four-volume monograph with an atlas.

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Raikov, B. E. *Russkie biologi-evoliutsionisty do Darvina*, vol. 2. Moscow-Leningrad, 1951. Pages 321–89. [29–1732–2]

EIKONAL (also characteristic function, characteristic), in geometrical optics, a function that specifies the optical path length of a ray of light between two arbitrary points, one (point A) in object space and the other (point A') in image space (*see* IMAGE, OPTICAL).

Depending on the choice of parameters, several different types of eikonals are distinguished. The point characteristic, which is also referred to as Hamilton's characteristic or the characteristic function of Hamilton, is the eikonal of an optical system with respect to the coordinates x, y, and z of A and x', y', and z' of A'. The angle characteristic, which was discovered by H. E. Bruns, is the eikonal of an optical system with respect to a ray's direction cosines μ, ν and μ', ν'. An example of a more complex eikonal is the characteristic function that was discovered by K. Schwarzschild.

In the designing of an optical system, the use of an eikonal makes it possible to obtain expressions for the system's transverse aberrations by differentiating the eikonal with respect to certain parameters. Functions called eikonals are widely used in charged-particle optics in the framework of the general analogy that exists between charged-particle and classical optics. Such functions are also used to describe particle and wave scattering processes in cases where analogies with optics arise. Examples of the techniques employed in such cases include the Hamiltonian method and the eikonal, or slowly varying amplitude, approximation in quantum mechanics and quantum field theory.

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Goldberger, M., and K. Watson. *Teoriia stolknovenii*. Moscow, 1967. (Translated from English.) [29–1707–3]

EILENBURG, a city in the German Democratic Republic, in Leipzig District, on the Mulde River. Railroad junction. Population, 22,200 (1975). Industry includes the production of Celluloid, construction machinery, furniture, and confectionery. [29–1708–3]

EIMER, THEODOR GUSTAV HEINRICH. Born Feb. 22, 1843, in Stäffa, near Zürich, Switzerland; died May 29, 1898, in Tübingen. German zoologist.

Eimer studied medicine and the natural sciences at the universities of Tübingen, Freiburg, Heidelberg, and Berlin. In 1869 he became a doctor of philosophy. He became a professor at the polytechnic institute in Darmstadt in 1874 and at the University of Tübingen in 1875. Eimer's main works deal with the morphology, histology, and physiology of invertebrates and vertebrates and with the study of variations in the coloration of coelenterates, lepidopterans, and saurians. In his theoretical works, Eimer upheld the theory of the inheritance of acquired traits and the predetermined autonomous development of certain traits (*see* ORTHOGENESIS). In regard to the origin of organisms he supported polygenesis. Eimer was a representative of classical transformism.

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Die Entstehung der Arten auf Grund von Vererben erwerbener Eigenschaften, vols. 1–3. Jena-Leipzig, 1888–1901. [29–1719–2]

EINAUDI, LUIGI. Born Mar. 24, 1874, in Carrù, near Cuneo; died Oct. 30, 1961, in Rome. Italian political and state figure; prominent economist.

Einaudi graduated from the University of Turin. He published a number of economics journals and taught at the universities of Milan and Turin. Between 1943 and 1945 he lived as an exile in Switzerland.

From 1945 to 1948, Einaudi was governor of the Bank of Italy.

He became a member of the Consulta Nazionale (National Council) in 1945 and was elected to the Constituent Assembly as a Liberal in 1946. Einaudi served as vice-premier and minister of the budget in 1947 and 1948. He was the president of the republic from 1948 to 1955, when he was appointed a life member of the Senate.

An author of works on economics and finance, Einaudi was a member or honorary member of many academies and scholarly organizations, both in Italy and abroad. [29–1719–6]

EINDHOVEN, a city in the Netherlands, in the province of North Brabant, on the Drommel River. Population, 192,600 (1977); greater metropolitan area, 360,700.

Eindhoven is an important transportation junction and a major center of the electrical-engineering and electronics industry. Plants of the concern N. V. Philips of the Netherlands produce radio and television equipment, sound-recording and sound-reproduction gear, electronic components, and household electrical appliances. Motor vehicles and bicycles are manufactured in Eindhoven, and the city's light industry includes textiles, leather goods, and footwear. Eindhoven also has a food-processing industry. Eindhoven University of Technology (founded 1956) and a museum associated with the N. V. Philips company are located there. [29–1720–2]

EINHARD (also Eginhard). Born circa 770, in Maingau; died Mar. 14, 840, in Seligenstadt. A figure in the Carolingian renaissance; friend and adviser to Charlemagne.

Einhard was educated in the monastery at Fulda. At the court of Charlemagne he won recognition for his knowledge of science and the arts, and he became an active member of the Academy. He supervised the construction of the cathedral at Aachen and the royal palace at Ingelheim. The *Vita Caroli Magni* (Life of Charlemagne) written by Einhard in Latin after Charlemagne's death enjoyed wide popularity in the Middle Ages. The work contains a great deal of factual information, but owing to his adulation of Charlemagne, Einhard distorted his accounts of the emperor's foreign policy and wars. Some of Einhard's religious works and more than 60 of his letters have been preserved.

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Kleinclausz, A. *Eginhard*. Paris, 1942. [29–1720–1]

EINMANN, EDUARD. Born Jan. 10 (23), 1913, in the village of Kullamaa, in what is now Rapla Raion, Estonian SSR. Estonian graphic artist and painter. People's Artist of the Estonian SSR (1963). Corresponding member of the Academy of Arts of the USSR (1958). Member of the CPSU since 1948.

Einmann studied in Tallinn at the State Higher Art School (the J. Koort School of Applied Art) from 1938 to 1941. He taught at the Tartu Art Institute from 1944 to 1951 and was its director from 1948 to 1951. He founded the Artists' Union of the Estonian SSR in 1943 and was chairman of its administrative board from 1950 to 1957.

Einmann, a master of portrait drawings and engravings, objectively and thoroughly depicts the physical appearance and spiritual world of his subjects. His works are remarkable for their use of chiaroscuro to render form. Notable examples include *V. Loik* (carbon, 1955), *Leili From Vigala* (red chalk, 1958), and *S. Korn* (drypoint, 1960).

Einmann has been awarded the Order of Lenin, three other orders, and various medals.

REFERENCE
Bernštein, B. *E. Einmann*. Tallinn, 1956. [29–1721–1]

EINSIEDEL, JOHANN AUGUST VON. Born Mar. 4, 1754, in Lumpzig, near Altenburg; died May 8, 1837, at Scharfenstein Castle, near Zschopau. German materialist philosopher.

Einsiedel was Goethe's and Herder's friend. (Herder's extracts from Einsiedel's works were first published in Berlin in 1957 under the title *Ideen*.) According to Einsiedel, the task of philosophy is to "reduce the spiritual world to the physical world"; in his view, thoughts are the "movements of the brain" caused by the external world's effect on the sensory organs.

Rejecting the biblical myth of creation and the doctrine of the immortality of the soul, Einsiedel defended the idea of the natural origin of life and of man. He considered religion to result from ignorance and described Christianity as the religion of slaves. He criticized religious morality, maintaining that "true morality" is nonreligious. He attacked absolutism and the feudal order on the basis of the principles of enlightenment and democracy, and he condemned political and spiritual oppression. He was convinced that a "golden age" was imminent, when wars would cease, when inequality, injustice, and selfishness would disappear, and when work would become a pleasure. Einsiedel's utopian notions about the society of the future bore the marks of petit bourgeois illusions.

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Stolpe, H. "Materialistische Strömungen im klassischen Weimar." *Weimar Beiträge*, 1963, no. 3. B. V. MEEROVSKII [29–1720–3]

EINSTEIN, ALBERT. Born Mar. 14, 1879, in Ulm, Germany; died Apr. 18, 1955, in Princeton, N.J., USA. Physicist; creator of the theory of relativity (*see* RELATIVITY, THEORY OF) and one of the creators of quantum theory and statistical mechanics.

Beginning at the age of 14, Einstein lived with his family in Switzerland. After graduating from the Zürich Polytechnic in 1900, he taught, first in Winterthur and then in Schaffhasen. In 1902 he was appointed examiner of patents in the federal patent office in Bern, where he worked until 1909. During these years, Einstein created the special theory of relativity and conducted studies in statistical mechanics, Brownian motion, theory of radiation, and other fields. His work gained renown, and in 1909, Einstein was appointed a professor at the University of Zürich. In 1911–12 he was a professor at the German University in Prague. In 1912, Einstein returned to Zürich, where he was appointed to a chair at the Zürich Polytechnic. In 1913 he was elected a member of the Prussian and Bavarian academies of sciences. In 1914 he moved to Berlin, where he was director of the physics institute and a professor at the University of Berlin. While in Berlin, Einstein completed the formulation of the general theory of relativity and further developed the quantum theory of radiation. For his works in theoretical physics and for the discovery of the laws of the photoelectric effect he was awarded a Nobel Prize in 1921.

In 1933, Einstein was forced to leave Germany, and subsequently he renounced his German citizenship in protest against fascism and left the academy. He then came to the USA, to Princeton, N.J., where he joined the faculty of the Institute for Advanced Study. Here he sought to work out the unified field theory and worked on problems in cosmology.

Theory of relativity. Einstein's principal scientific achievement was the theory of relativity, which essentially is a general theory of space, time, and gravitation. The concepts of space and time that prevailed before Einstein had been formulated by I. Newton in the late 17th century and were not in apparent contradiction with facts until advances in physics led to the development of electrodynamics and in general to the study of motion at speeds close to the speed of light. The equations of electrodynamics (Maxwell's equations) proved to be incompatible with the equations of Newtonian classical mechanics. The contradictions were further exacerbated after the Michelson experiment, the results of which could not be explained within the framework of classical physics.

The special theory of relativity, whose subject is the description of physical phenomena (including the propagation of light) in inertial frames of reference, was published by Einstein in 1905 in near-final form. One of its basic assumptions—the total equivalence of all inertial frames of reference—renders the concepts of absolute space and time of Newtonian physics meaningless. Only those conclusions that are not dependent on the rate of motion of the inertial frame of reference retain physical meaning.

On the basis of these concepts, Einstein derived new laws of motion that reduce, in the case of small velocities, to Newton's laws, and proposed a theory of optical phenomena in moving bodies. Turning to the ether hypothesis, he arrived at the conclusion that the description of an electromagnetic field requires no medium whatever and that theory turns out to be noncontradictory if, in addition to the principle of relativity, it is postulated that the speed of light is independent of the frame of reference. The detailed analysis of the concept of simultaneity and the processes of measurement of time and length intervals (which had also been conducted to some extent by H. Poincaré) demonstrated the physical need for the postulate formulated.

Also in 1905, Einstein published a paper in which he showed that the mass of a body m is proportional to its energy E, and in the following year he derived the famous equation $E = mc^2$, where c is the speed of light in a vacuum. The work of H. Minkowski on four-dimensional space-time was of major importance in helping complete the formulation of the special theory of relativity. The special theory of relativity has become an essential tool of physical research (for example, in nuclear physics and elementary particle physics), and its conclusions have been experimentally confirmed.

The special theory of relativity did not touch upon the phenomenon of gravitation and did not even raise the question of the nature of gravitation or the question of the equations of the gravitational field and the laws governing its propagation. Einstein noted the fundamental importance of the proportionality between the gravitational and inertial masses (the equivalence principle). Attempting to correlate the principle with the invariance of the four-dimensional interval, Einstein arrived at the idea that the geometry of space-time was dependent on matter, and after extensive research he derived (1915–16) the equations of the gravitational field (Einstein's field equations). This work laid the foundations of the general theory of relativity (*see* GRAVITATION).

Einstein attempted to apply his equation to the study of the global properties of the universe. In a 1917 paper he showed that a relation between the density of matter and the radius of curvature of space-time can be obained from the theory's principle of homogeneity. Confining himself to a static model of the universe, however, he was forced to include in the equation a negative pressure (the cosmological constant) to balance the attractive forces. The correct approach to the problem was found by A. A. Fridman (Friedman), who conceived the idea of an expanding universe. These studies gave rise to relativistic cosmology.

In 1916, Einstein predicted the existence of gravitational waves, solving the problem of the propagation of a gravitational perturbation. He thus completed the construction of the foundations of the general theory of relativity.

The general theory of relativity explained (1915) the anomalous behavior of the orbit of the planet Mercury, which could not be explained within the framework of Newtonian mechanics. It predicted the deflection of a light ray in the sun's gravitational field (detected 1919–22) and a shift in the spectral lines of atoms located in a gravitational field (detected 1925). The experimental proof of the existence of these phenomena were brilliant confirmations of the general theory of relativity.

The development of the general theory of relativity in the works of Einstein and his colleagues was connected with the attempt to construct a unified field theory, in which the electromagnetic field is organically linked to the space-time metric, like the gravitational field. These attempts were unsuccessful, but interest in the problem has grown because of the construction of a relativistic quantum field theory (*see* QUANTUM FIELD THEORY).

Quantum theory. Einstein was instrumental in working out the foundations of quantum theory. He introduced the concept of the discrete structure of a radiation field and on the basis of this derived the laws of the photoelectric effect and explained luminescent and photochemical regularities. Einstein's ideas regarding the quantum structure of light (published 1905) were in apparent contradiction with the wave nature of light, a contradiction that was resolved only after the creation of quantum mechanics (*see* QUANTUM MECHANICS).

Successfully developing quantum theory, Einstein arrived in 1916 at the division of radiation processes into spontaneous and induced processes and introduced the Einstein coefficients A and B to define the probabilities of the processes. A consequence of Einstein's reasoning was the statistical derivation of Planck's radiation law from the condition of equilibrium between radiators and radiation (*see* PLANCK'S RADIATION LAW). This work by Einstein forms the basis of modern quantum electronics (*see* QUANTUM ELECTRONICS).

Applying the same statistical approach to the vibrations of a crystal lattice rather than the emission of light, Einstein created the theory of the specific heat of solids (1907, 1911). In 1909 he derived the formula for the energy fluctuation in a radiation field, which confirmed his quantum theory of radiation and played an important part in the rise of fluctuation theory.

Statistical mechanics. Einstein's first study in statistical mechanics (statistical physics) appeared in 1902, in which Einstein, unaware of J. W. Gibbs' research, developed his own version of statistical mechanics, defining the probability of a state as the average over time. This view of the principal assumptions of statistical mechanics led Einstein to develop the theory of Brownian motion (published 1905), which became the basis for the theory of fluctuations.

In 1924, after becoming acquainted with S. Bose's paper on the statistics of light quanta and perceiving its importance, Einstein published Bose's paper along with his comments, in which he extended Bose's theory to an ideal gas. Shortly after, Einstein's work on the quantum theory of an ideal gas appeared. Bose-Einstein statistics arose in this manner (*see* BOSE-EINSTEIN STATISTICS).

Other research. Developing the theory of molecular mobility (1905) and investigating the reality of Ampère currents, which give rise to magnetic moments, Einstein predicted, and with the Dutch physicist W. de Haas, experimentally detected the effects of a change in the mechanical moment of a body upon magnetization (the Einstein–de Haas effect).

Importance of research. Einstein's scientific works were of major importance in the development of modern physics. The special theory of relativity and the quantum theory of radiation formed the foundation of quantum electrodynamics, quantum field theory, atomic and nuclear physics, elementary particle physics, quantum electronics, relativistic cosmology, and other branches of physics and astrophysics.

Einstein's ideas proved to have great methodological consequence. They changed the mechanistic concepts of space and time that had prevailed in physics since Newton's time and led to a new, materialist picture of the universe based on the profound, organic link between these concepts and matter and the motion of matter. Gravitation proved to be one manifestation of this link. Einstein's ideas became the principal component of the modern theory of a dynamic, continuously expanding universe, which has made it possible to explain the extraordinarily broad range of phenomena observed.

Einstein's discoveries were recognized by scientists throughout the world and earned him international prestige. Einstein was greatly disturbed by the sociopolitical events of the 1920's to 1940's and denounced fascism, war, and the use of nuclear weapons. He took part in the antiwar campaign in the early 1930's. In 1940, Einstein signed a letter to the president of the United States calling attention to the danger of the appearance of nuclear weapons in fascist Germany, which was directly responsible for the emergence of nuclear research in the United States.

Einstein was a member of many scientific societies and academies throughout the world, including the Academy of Sciences of the USSR, of which he became an honorary member in 1926.

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IA. A. SMORODINSKII [29–1722–2]

EINSTEIN, ALFRED. Born Dec. 30, 1880, in Munich; died Feb. 13, 1952, in El Cerrito, Calif. German musicologist.

A music critic in Munich and Berlin, Einstein published the journal *Zeitschrift für Musikwissenschaft* from 1918 to 1933. After the fascists came to power, he lived in Great Britain and Italy, eventually taking up residence in the USA in 1939. An important part of Einstein's work was his bibliographies and dictionaries. He edited and wrote several articles for the ninth, tenth, and 11th editions of H. Riemann's *Dictionary of Music* (1919, 1922, and 1929) and translated and revised A. Eaglefield-Hull's *Dictionary of Modern Music and Musicians*, which he published under the title *New Dictionary of Music* (1926).

Particularly valuable are Einstein's works *The Italian Madrigal* (vols. 1–3, 1939), *Greatness in Music* (1941), and *Music in the Romantic Era* (1947) and his monographs on various composers, including H. Schütz (1928), C. W. Gluck, (1936), W. A. Mozart (1945), and F. Schubert (1951). [29–1725–1]

EINSTEIN, a unit of energy of electromagnetic radiation in the optical range. The einstein, which is used in photochemistry, is equal to $N_A h\nu$, where N_A is Avogadro's number and $h\nu$ is the energy of the photon. It was named in honor of Albert Einstein and is abbreviated E. When a radiant energy of 1 E is absorbed, the photochemical conversion of 1 mole of the substance should occur, according to Einstein's law of photochemical equivalence. It follows from the definition of the einstein that the dimension of the unit is determined by the radiation frequency (ν) (h is Planck's constant). [29–1725–2]

EINSTEIN COEFFICIENTS, coefficients that characterize the probabilities of radiative quantum transitions. The Einstein coefficients were introduced by Albert Einstein in 1916 in the course of his formulation of the theory of the emission and absorption of radiation by atoms and molecules on the basis of the concept of photons. Einstein was the first to advance the idea that stimulated emission existed. The probabilities of spontaneous emission, absorption, and stimulated emission are characterized by the coefficients A_{ki}, B_{ik}, and B_{ki}, respectively, in which the subscripts indicate the direction of the transition between the upper energy level E_k and the lower level E_i. The relations between the Einstein coefficients were originally obtained by Einstein in the course of the derivation of Planck's radiation law from the thermodynamic equilibrium between matter and radiation.

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M. A. EL'IASHEVICH [29–1726–2]

EINSTEIN–DE HAAS EFFECT, an effect whereby a body (a ferromagnetic material), when magnetized along some axis, acquires an angular impulse relative to the axis, which is proportional to the acquired magnetization. The effect was experimentally discovered and theoretically explained in 1915 by Albert Einstein and the Dutch physicist W. de Haas.

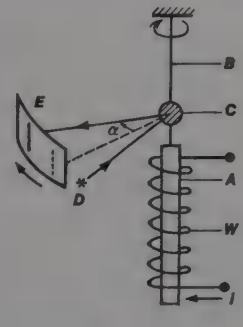

Figure 1. Diagram of apparatus for measuring the Einstein-de Haas effect: (A) sample, (B) elastic thread of suspension device, (C) mirror, (α) angle of rotation of sample, registered from the change in position of the reflected light ray, (D) light source, (E) scale, (W) magnetizing solenoid carrying the current i

A schematic diagram of one of the experimental apparatus for observing the Einstein–de Haas effect is shown in Figure 1. In the apparatus, magnetization of a cylindrical specimen suspended on an elastic thread causes the specimen to rotate by some small angle. The rotation is measured from the angular deflection of a mirror rigidly fixed to the specimen. The effect is explained theoretically by the fact that the magnetic moments of the atoms of the specimen, being oriented in the direction of the external magnetic field, cause a change in the atomic mechanical moments—the magnetic moment **M** of an atom is proportional to the resultant angular momentum **J**, that is, $\mathbf{M} = \gamma\mathbf{J}$, where γ is the gyromagnetic ratio (*see* GYROMAGNETIC RATIO). On the basis of the law of the conservation of angular momentum, the total angular momentum of a body must remain unchanged, and upon magnetization the body therefore acquires an angular impulse (very small in magnitude) that is inverse with respect to the axis of magnetization.

The study of the Einstein–de Haas effect, like that of other gyromagnetic effects, makes it possible to obtain data on the nature of the carriers of magnetism in matter and on the structure of the atoms of a substance (*see* GYROMAGNETIC EFFECTS). In modern physics other effects are used for the same purpose (*see* MAGNETIC RESONANCE).

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Vonsovskii, S. V. *Magnetizm*. Moscow, 1971. [29–1726–3]

EINSTEINIUM, Es, a synthetic radioactive chemical element, a member of the actinide series; atomic number, 99. Einsteinium has no stable isotopes; it has known isotopes with mass numbers 243 through 256.

The seventh transuranium element to be discovered, einsteinium was identified by A. Ghiorso and others in December 1952 in the debris from a thermonuclear explosion in the course of work involving members of the University of California Radiation Laboratory, the Argonne National Laboratory, and the Los Alamos Scientific Laboratory (USA). The isotope produced was ^{253}Es, with a half-life of 20.5 days, originating from the beta decay of ^{253}U and daughters; the ^{253}U was formed by the essentially successive capture of 15 neutrons by ^{238}U.

Einsteinium can be investigated with macroscopic quantities using the isotopes ^{253}Es (half-life 20.5 days), ^{254}Es (half-life 276 days), and ^{255}Es (half-life 38.3 days), whose production by the irradiation of lighter elements is severely limited because of the required long sequence of neutron capture reactions over long periods of time in high-neutron-flux reactors. Most of the investigations have used the short-lived ^{253}Es because of its greater availability, but the use of ^{254}Es will increase as it becomes more available. In any case, the investigation of einsteinium is very difficult because of the high specific radioactivity and small available quantities of the isotopes.

Einsteinium metal, which is quite volatile, can be prepared by the reduction of EsF_3 with lithium and has a face-centered cubic crystal structure. The melting point is 860±30°C.

Einsteinium exists in normal aqueous solution in most stable form as Es^{+3} (green), although Es^{+2} can be produced under strong reducing conditions. The Es^{+3}/Es^{+2} reduction potential is estimated to be -1.24 ± 0.2 volt on the scale in which the hydrogen ion–hydrogen potential is 0.0 volt.

Numerous solid compounds, such as Es_2O_3, $EsCl_3$, EsOCl, $EsBr_2$, $EsBr_3$, EsI_2, and EsI_3, have been synthesized and studied.

The electron structure of the gaseous element is $5f^{11}7s^2$ (beyond the radon structure).

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EINSTEIN LAW OF PHOTOCHEMICAL EQUIVALENCE, a fundamental law of photochemistry that establishes that every photon absorbed causes one elementary reaction. The reaction may consist in the chemical transformation of molecules of the substance or in their physical excitation and the emission of the energy absorbed (or in the transformation of the energy into thermal energy). The number N of reacted molecules is related to the energy E absorbed by the system by the equation

$$E = Nh\nu = Nh\frac{c}{\lambda}$$

where ν is the frequency of radiation, c is the velocity of light, λ is the wavelength of the light, and h is Planck's constant. The quantity γ (the quantum yield of the photochemical reaction), which is equal to the ratio of the number of reacted molecules of a given substance to the number of light quanta absorbed, is usually the criterion for applicability of the Einstein law of photochemical equivalence. According to the law, γ must be equal to unity.

The deviations from the Einstein law of photochemical equivalence that are frequently observed in nature are usually explained by secondary processes (for more details *see* PHOTOCHEMISTRY). The law was discovered in 1912 by Albert Einstein. [29–1725–3]

EINTHOVEN, WILLEM. Born May 21, 1860, in Samarang, Java; died Sept. 29, 1927, in Leiden, The Netherlands. Dutch physiologist.

Einthoven, upon graduating from the University of Utrecht in 1885, became a professor of physiology at the University of Leiden. His works dealt mainly with electrophysiology. By analyzing electrocardiograms mathematically, Einthoven interpreted the electrical reactions of the heart with unprecedented accuracy. He made a fundamental contribution to clinical electrocardiography in 1903 by devising a string galvanometer.

Einthoven conceived the idea of recording heart currents from three leads, and suggested the use of a triangle to illustrate change in the height of electrocardiographic waves and their interaction in relation to the recording method; he provided a physiological explanation for every wave and interval on the EKG. Einthoven also invented vectorcardiography in 1913. He was one of the first to do research in neuroelectrophysiology. He detected impulses in the depressor nerve and recorded impulses in the pathways of the sympathetic nerves.

Einthoven was awarded a Nobel Prize in 1924.

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L. V. SOKOLOVA [29–1721–2]

EIREN, a group leader in the *agele*, a restricted state institution for the upbringing of the young male members of the Spartiates, the Spartan slaveholding aristocracy. *Eirenes* were chosen from among the group members to assist the adult instructors. [29–1729–1]

EIRENE (also Irene), in Greek mythology, the goddess of peace and either the nurse or mother of Plutus, the god of wealth.

Aristophanes' comedy *Eirene* (421 B.C.) depicts the goddess' liberation from the cavern in which the fierce god of war had immured her. A statue by Cephisodotus (first half of the fourth century B.C.) of the beautiful goddess carrying the infant Plutus was erected in Athens circa 374 B.C. The statue survives through various Roman copies, such as the one in the Glyptothek in Munich.

Eirene was venerated in Rome under the name of Pax. In 1957 an international organization of classical scholars from socialist countries was founded under the name "Eirene"; its journal also bears the goddess' name. [29–1728–5]

EISELE, DONN FULTON. Born June 23, 1930, in Columbus, Ohio. US pilot and astronaut; major in the air force.

Eisele graduated in 1952 from the US Naval Academy, where he received the degree of bachelor of science. He also graduated from the Aerospace Research Pilot School at Edwards Air Force Base in California. He was awarded a master's degree in astronautics from the Air Force Institute of Technology at Wright-Patterson Air Force Base in Ohio. He served as an experimental flight test officer at Kirtland Air Force Base in New Mexico. In 1963 he became an astronaut with the National Aeronautics and Space Administration.

From Oct. 11 to Oct. 22, 1968, Eisele, together with W. Cunningham and W. Schirra, undertook a flight in the spacecraft Apollo 7, which orbited the earth 163 times. During the mission, which lasted 10 days 20 hr 9 min, Eisele conducted the first flight test of the command module of the Apollo spacecraft. [29–1701–1]

EISENACH, a city in the German Democratic Republic, in Erfurt District, on the Hörsel River. Population, 50,000 (1975). Eisenach is a railroad junction. Machine building, including the manufacture of Wartburg automobiles, plays an important role in the local economy. The city also has textile, furniture, and chemical industries. Cultural institutions include a museum devoted to J. S. Bach, who was born in the city. Luther and Goethe also lived in Eisenach. [29–1701–3]

EISENACHER, a member of the Social Democratic Workers' Party of Germany, which was founded under the leadership of A. Bebel and W. Liebknecht at an all-German workers' congress in the city of Eisenach in August 1869. Although based on the revolutionary principles of the First International, the party's program contained certain imprecisely formulated propositions. According to the party's charter, democratic centralism was the basic organizing principle of the party.

The Eisenachers defended the line of the First International in the international working-class movement, and they supported the movement's Marxist wing. During the Franco-Prussian War of 1870–71, they adopted an internationalist position and declared their solidarity with the Paris Commune. The Eisenachers were staunch advocates of the unification of Germany by revolutionary means, and they carried on a struggle against the militarist police regime.

At a congress in Gotha in 1875, the Eisenachers and the Lassalleans united to form a single party of the working class (*see* SOCIAL DEMOCRATIC PARTY OF GERMANY). [29–1701–4]

EISENERZ, a city in Austria, in the *Bundesland* (state) of Styria, at the foot of the Eisenerzer Alpen. Population, 11,600 (1971). There is a large deposit of iron ore in the Erzberg, near Eisenerz. [29–1705–1]

EISENHOWER, DWIGHT DAVID. Born Oct. 14, 1890, in Denison, Texas; died Mar. 28, 1969, in Washington, D.C. US statesman and military leader; general of the army (1944).

Eisenhower graduated from the US Military Academy at West Point in 1915 and subsequently served in the American Army in the USA and abroad, in the War Department, and on the Army Staff. With the coming of World War II, Eisenhower was appointed in June 1942 as commander of US forces in Europe, and in November 1942 as commander of Allied forces in North Africa and the Mediterranean. In 1943 he was made supreme commander of Allied Expeditionary Forces in Europe and directed the landing of the British and American forces on the coast of northwestern France. This landing established the second front in Europe. Eisenhower was awarded orders of many countries, among them the Soviet Order of Victory (1945). After the rout of fascist Germany, Eisenhower was appointed commander of US occupation forces in Germany. He was US Army chief of staff from November 1945 to February 1948, and he was supreme commander of the North Atlantic Treaty Organization's armed forces in Europe from 1950 to 1952. During the years 1948–52 he was president of Columbia University in New York.

Eisenhower, a Republican, was president of the United States from 1953 to 1961. In domestic politics, the Eisenhower administration drastically reduced expenditures for social services, supported the anticommunist propaganda unleashed by rightist groups, and openly violated many civil rights guaranteed in bourgeois-democratic societies. In foreign policy, the Eisenhower administration continued the arms race and the cold war and sought to strengthen the strategic position of the USA in various regions of the world. Its military strategy was based on increasing the capabilities of nuclear arms, accelerating the development of strate-

gic aviation, and building a fleet of missile-carrying nuclear submarines. Under Eisenhower, relations with the USSR and other socialist countries were governed by the principle of "brinkmanship," and steps were taken to subvert the socialist order in Central and East European countries (the so-called "liberation" doctrine). The Eisenhower administration initiated a program to create new, aggressive military alliances and to acquire more military bases. An armed intervention against the government of Guatemala was organized in 1954. The Eisenhower doctrine was proclaimed in 1957. It was aimed at strengthening the position of the USA in the Middle East and counteracting the nationalist liberation movement within the area.

The Eisenhower administration, however, recognized the increasing might of the global socialist system and therefore took some realistic steps in the area of international relations. In 1953 an armistice was signed in Korea, and in 1955, Eisenhower took part in the Geneva conference attended by the heads of government of the USA, the USSR, Great Britain, and France. In 1959 the chairman of the Council of Ministers of the USSR accepted an invitation from Eisenhower and paid a state visit to the USA.

[29–1702–1]

EISENHOWER DOCTRINE, a foreign policy position of the US government regarding the Middle East, adopted after the failure of the Anglo-French-Israeli aggression against Egypt in 1956 and the significant weakening of the position of the colonialist powers in the Middle East. It was developed with the assistance of the US secretary of state, J. F. Dulles. The doctrine was first laid out in an address to Congress by the president of the USA, D. D. Eisenhower, on Jan. 15, 1957, and was adopted by means of a congressional resolution in March 1957.

The doctrine was intended to strengthen the position of the USA in the Middle East and to systematically oppose the forces of the national liberation movement. The US president was given the "right" to offer military and economic "aid" to countries in the Middle East and, at his own discretion, to use American armed forces in the area. The doctrine signified the aspiration of the USA to arbitrarily and unilaterally decide questions of war and peace in the Middle East, to interfere in the internal affairs of countries of the area, and to establish control over the foreign policy of these countries. Such objectives were in fundamental contradiction to the interests of peace and security and to the principles of state sovereignty and the independence of peoples. The doctrine grossly violated international law and a number of provisions of the UN Charter. It also violated US constitutional practice, since it bypassed Congress and gave the president virtually uncontrolled military authority.

The USA implemented the doctrine repeatedly (the plots against Syria, 1957; aggression against Lebanon, 1958). The national liberation movements of the peoples of the Arab East—as well as the consistent foreign policy of the USSR and the other countries of the socialist cooperation—directed at ensuring peace and supporting the just demands of the Arab peoples, frustrated the plan of the USA to fully implement the doctrine. However, the basic principles and aims of the Eisenhower doctrine have in open or covert form been a part of US policy regarding the Middle East in later times as well (support of Israel's aggressive actions and of reactionary forces in Arab states). [29–1703–1]

EISENHÜTTENSTADT, a city in the German Democratic Republic, in Frankfurt/Oder District. Port on the Oder-Spree Canal. Population, 47,400 (1975). Eisenhüttenstadt was founded in 1950 in connection with the building of the Ost ferrous metal combine. River vessels are built in the city. In 1961 the city of Fürstenberg merged with Eisenhüttenstadt.

The city is divided into neighborhood districts, each with approximately 6,000 residents. All neighborhoods have squares, parks, and shops. Typical examples of the city's architecture, with three- to five-story buildings predominating, include apartment houses on Heinrich-Heine-Allee and Maxim-Gorky-Strasse (1956, architect W. Stamm), Republikstrasse (1957, architects O. Schmidt and W. Knof), and the House of the Organizations (1955, architect H. Wunderlich).

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[29–1703–2]

EISENSTEIN, SERGEI MIKHAILOVICH. Born Jan. 10 (22), 1898, in Riga; died Feb. 11, 1948, in Moscow. Soviet motion-picture director, theoretician of art, and teacher. Honored Artist of the RSFSR (1935). Doctor of arts (1939).

Eisenstein, the son of an architect, studied at the Petrograd Institute of Civil Engineering. In 1918 he went to work on Red Army agitational trains. In 1920 he was in charge of stage design for the First Proletkul't Workers' Theater in Moscow. He studied under V. E. Meyerhold at the State Higher Directing Studios in 1921–22, and together with S. I. Iutkevich he staged a series of performances at the Mastfor Theater (Foregger's Workshop). His first independent production was *The Wise Man*, based on A. N. Ostrovskii's comedy *Even a Wise Man Stumbles* (1923). In 1923, Eisenstein published the article "The Montage of Attractions," in which he expressed his fundamental theories of effecting social change through art.

Eisenstein's *Strike* (released 1925) was the first film to depict the revolutionary masses as the moving force of history. The ideological and aesthetic principles of *Strike* were developed in *Battleship Potemkin* (1925), one of the greatest achievements of Soviet and world film-making. With classical perfection the film embodied the theme of revolution as a struggle for class equality, freedom, and human dignity. At the 1958 World's Fair in Brussels it was ranked first among the 12 best films in history. In *October* (1927), Eisenstein, director G. V. Aleksandrov, and cameraman E. K. Tisse re-created the events of 1917 and made the first attempt to depict V. I. Lenin in a feature film. Advances in montage enabled Eisenstein to promote the idea of the "intellectual cinematographer" as a synthesizer of art and science. In 1929 he completed *Old and New*, the first Soviet film about cooperation and collectivization in the countryside.

Between 1929 and 1932, Eisenstein, Aleksandrov, and Tisse worked in France, the United States, and Mexico. The conditions of capitalist film-making prevented Eisenstein from realizing his artistic dreams. *Que viva Mexico!* remained unfinished, although it did mark the beginning of Mexican film-making.

After returning to his homeland, Eisenstein continued to work as a director, theoretician, and teacher. From 1935 to 1937 he worked on *Bezhin Meadow*, based on the murder of the pioneer Pavlik Morozov, but the film was not completed. *Alexander Nevsky* (1938), a patriotic film about the defeat of the German knights in the 13th century, became a triumph of Soviet film-making. Eisenstein's last motion picture, the tragedy *Ivan the Terrible* (part I, 1945; part II released 1958), dealt with the theme of power. With its profound historical subject matter and intensive use of the expressive devices of the cinema, it became Eisenstein's second masterpiece.

Eisenstein's enormous theoretical heritage covers the fundamental problems of artistic creation, from general aesthetic concepts to concrete problems of film-making. He also wrote sociopolitical articles, essays, and memoirs. His drawings, which have been shown at posthumous exhibitions, reveal his unusual talent in the graphic arts. Eisenstein taught at the State Technicum of Cinematography from 1928, becoming a professor in 1937 (in 1938 it was renamed the All-Union State Institute of Cinematography).

Eisenstein was awarded the State Prize of the USSR (1941, 1946), the Order of Lenin, the Order of the Badge of Honor, and several medals.

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[29–1704–1]

EIŠIŠKĖS, a city in Šalčininkai Raion, Lithuanian SSR. The city is located in the southeastern part of the republic, on the Vilnius-Grodno highway. It is 35 km east of the Varėna railroad station and 70 km southwest of Vilnius. Enterprises include a butter factory. [29–1736–2]

EISLEBEN, a city in the German Democratic Republic, in Halle District. Population, 295,000 (1975). Crude copper is produced at the site of the Mansfeld copper-ore deposit. [29–1730–1]

EISLER, HANNS. Born July 6, 1898, in Leipzig; died Sept. 6, 1962, in Berlin. German composer and public figure (German Democratic Republic [GDR]). Member of the Academy of Arts of the GDR.

Eisler studied composition in Vienna with A. Schönberg from 1919 to 1923 and took up residence in Berlin in 1924. Although his early works show the influence of his teacher, Eisler's progressive views, his study of Marxism, and his increasing contacts with the revolutionary movement made his art more democratic. Eisler worked closely with E. Weinert, B. Brecht, and the singer E. Busch, who performed many of his songs for the masses, and he taught and addressed workers' choral groups.

Eisler composed many workers' songs, marches, and ballads on current political topics, such as "Song of Solidarity," "Song of the Unemployed," "Song of the United Front," "Red Wedding," and "The Comintern." He was a founder of a new style of revolutionary song for the masses. In addition, he composed works in the larger forms, including *Requiem for Lenin* (1937) and music for theatrical productions, notably the music to Brecht's *The Measures Taken* (1930).

In 1938, after the fascists had come to power, Eisler emigrated to the USA, where he worked in Hollywood. Accused of un-American activities, he left the USA in 1948 as a "voluntary deportee." He settled in Berlin in 1948 and played an active role in developing the musical culture of the GDR. In 1950 he began teaching composition at the Academy of Arts of the GDR and music theory at the Hochschule für Musik, which is now named in his honor. He helped found the Union of Composers and Musicologists of the GDR.

Eisler's most important works include the cantatas *German Symphony* (1937), *Serenade of the Age* (1950), and *The Carpet-weavers of Kuyan-Bulak* (1957) and the symphonic triptych *Song of Peace* (1951). In his finest works Eisler combines the characteristic features of mass and revolutionary songs with varied means of musical expression. He used polyphony, atonal music, jazz elements, and folk song effects. Rhythm is an important organizing principle in Eisler's vocal music, in which extensive use is made of recitative. His symphonic music is notable for its complex and subtle orchestration.

Eisler composed the national anthem of the GDR (words by Brecht), and he was awarded the National Prize of the GDR in 1949 and 1958.

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M. M. IAKOVLEV [29–1730–2]

EISNER, JÁN. Born Apr. 26, 1885, in Bradlo; died May 2, 1967, in Prague. Czechoslovak historian and archaeologist. Academician of the Czechoslovak Academy of Sciences (1952).

Eisner was a professor at Charles University in Prague from 1939 to 1957. His research centered on the prehistoric and ancient periods in Slovakia. He also made important contributions to Slavic archaeology and, in particular, Slavic ethnogeny. Eisner edited the collections entitled *The Origin and Emergence of the Slavs*.

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Rukověť slovanské archeologie. Prague, 1966. [29–1731–1]

EISNER, KURT. Born May 14, 1867, in Berlin; died Feb. 21, 1919, in Munich. Figure in the German workers' movement; journalist.

Eisner joined the Social Democratic Party of Germany in 1898. From 1898 to 1905 he was editor in chief of the newspaper *Vorwärts*, a party organ, and was closely associated with revisionists. During World War I he assumed an anti-imperialist stance. Eisner became a member of the Independent Social Democratic Party of Germany in 1917. After leading a strike at military plants in Munich in January 1918, he was imprisoned. During the November Revolution of 1918, Eisner was the chairman of the Munich council of workers, soldiers, and peasants; he subsequently became prime minister of the republican government of Bavaria. [29–1730–3]

EISRIESENWELT, a karst grotto in Austria, in the Tennengebirge, 35 km southeast of Salzburg. Eisriesenwelt measures 42 km in length and 407 m in depth. The entrance to the grotto lies at an elevation of 1,641 m, 1,120 m above the bottom of the valley of the Salzach River. For a length of 2 km from the entrance there is an abundant accumulation of ice, which gave the name to the grotto, "giant ice world" in German. [29–1731–2]

EIZEN, ARTUR ARTUROVICH. Born June 8, 1927, in Moscow. Soviet Russian bass. People's Artist of the USSR (1976). Member of the CPSU since 1964.

In 1948, Eizen graduated from the Shchukin Moscow Theatrical School, and in 1956 he graduated from the Moscow Conservatory, where he studied voice under V. M. Politkovskii. He was a soloist with the A. V. Aleksandrov Song and Dance Ensemble of the Soviet Army from 1949 to 1957 and has been a soloist with the Bolshoi Theater since 1957.

Eizen has a high bass of a beautiful mellow timbre. He is also an accomplished actor. He has sung more than 30 roles, including Boris and Varlaam in *Boris Godunov* and Ivan Khovanskii in *Khovanshchina*, both by Mussorgsky, Galitskii in Borodin's *Prince Igor*, Mephistopheles in Gounod's *Faust*, Pestel' in Shaporin's *The Decembrists*, the General in Prokofiev's *The Gambler*, and Vaskov in Molchanov's *Dawns Are Quiet Here*. He performed the role of V. I. Lenin in Muradeli's *October* (1964). Eizen also gives concerts and has toured many countries of the world. [29–1701–2]

EJECTIVE, a consonant articulated with a closure and upward movement of the glottis, as a result of which air is ejected in a sharp burst, giving the effect of a glottal stop. Ejectives are usually stops. They are found in the languages of Asia, America, and Africa and in the Dagestan and Kartevelian languages (*p'*, *t'*, *k'*, *c'*). Fricative ejectives are less common, for example, Hausa *'ya'ya* ("children"). [29–1700–3]

EJECTOR, a device in which kinetic energy is transferred from a medium that is moving at high velocity to another medium. The energy is transferred as the media are mixed (*see* JET APPARATUS). Ejectors are used in jet and vacuum pumps. They are widely used as mixers in the chemical and petroleum-refining industries.

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ÉK, SÁNDOR (pseudonym, Alex Keil). Born Aug. 27, 1902, in the village of Szentmihályfalva. Hungarian painter and graphic artist.

Ék studied at the Free Art School in Budapest at the time of the Hungarian Soviet Republic (1919). After the fall of Soviet power in Hungary he emigrated to Germany and, in 1933, to the USSR. He produced revolutionary posters and caricatures of striking design, notably the poster *Ten Years Without Lenin* (1934). After returning to Hungary in 1945 he worked as a graphic artist, producing the series of lithographs *Memento* (1958), and as a painter.

Ék, an unyielding supporter of realist art, was awarded the Kossuth Prize in 1951.

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Ék Sándor. [Berlin, 1960.] [29–1736–5]

EKA-ELEMENTS, a term introduced by D. I. Mendeleev in 1871 for chemical elements that were predicted by him but still unknown in his time; the elements were arranged in the periodic table under the corresponding known elements. All the eka-elements were later discovered: eka-aluminum (1875) was called gallium; eka-boron (1879), scandium; and eka-silicon (1886), germanium. Mendeleev also predicted the existence of analogues of manganese (future Tc and Re), and tellurium (Po), iodine (At), cesium (Fr), barium (Ra), and tantalum (Pa).

The term "eka-element" is sometimes used to designate transuranium elements that have not yet been discovered and synthesized; for example, element no. 118 is called eka-radon. (*See also* PERIODIC SYSTEM OF ELEMENTS.)

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EKHOF, KONRAD. Born Aug. 12, 1720, in Hamburg; died June 16, 1778, in Gotha. German actor and theatrical figure.

Ekhof began his stage career in 1740 in Hamburg, appearing with J. Schönemann's company. He appeared with the companies of H. Koch and K. Ackermann, and from 1767 to 1768 performed at the National Theater in Hamburg. He was the favorite actor of G. E. Lessing, with whom he held many common views, and was the first interpreter of bourgeois Enlightenment drama on the German stage.

Ekhof helped develop a theory of acting and was a superb teacher; his student F. L. Schröder was an outstanding reformer of the German stage. Basing his generalized theories on stage experience, Ekhof established the Academy of the Schönemann Society in Schwerin in 1753. Ekhof also was a critic, translator, and historian of the German theater.

Ekhof was famous for his performances as Barnwell in Lillo's *The London Merchant* and Odoardo, Mellefont, and Tellheim in Lessing's *Emilia Galotti, Miss Sara Sampson*, and *Minna von Barnhelm*.

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EKIBASTUZ, a city under oblast jurisdiction in Pavlodar Oblast, Kazakh SSR. Railroad station on the Tselinograd-Pavlodar line, 132 km southwest of Pavlodar. Population, 55,000 (1977). Coal is mined in the vicinity of Ekibastuz. The city has a plant for the production of reinforced-concrete products and a machinery and repair plant for the repair of mining and transport equipment. It also has a meat combine, a milk plant, and a brewery. Among the educational institutions are the general technical department of the Pavlodar Industrial Institute, a mining technicum, and a pedagogical school. [29–1763–5]

EKIBASTUZ COAL BASIN, a coal basin located in Baianul Raion, Pavlodar Oblast, Kazakh SSR. The Pavlodar-Tselinograd main railroad line passes near the basin, as do the Irtysh-Karaganda Canal and the Pavlodar-Karaganda Highway. The basin is confined to an enclosed depression covering an area of 155 sq km. It is 24 km wide and has a maximum width of 8.5 km. The total estimated geological reserves of coal are 10 billion tons.

The Ekibastuz Coal Basin was discovered in 1876. However, intensive geological exploration was begun only in 1940, which established the possibility of mining the coal by the open-pit method. Construction of the first coal pit was begun in 1948; it was put into operation in 1954.

The margin and basement of the basin consist of Lower Devonian volcanogenic formations. The coal-bearing formation of the Lower (Viséan and Namurian) and Middle Carboniferous and the underlying marine sediments of the Middle and Upper Devonian and Lower (Tournaisian) Carboniferous constitute a brachysyncline, bounded on the northeast and southwest by major longitudinal faults. Rocks along the limbs of the brachysyncline are gently bedded (9°–30° degrees), while those in the areas close to the faults are steeply bedded (some even overturned) and complicated by fractures. The lower, unproductive, complex of sedimentary rocks is about 1,000 m thick; the upper, productive, complex reaches a thickness of 1,690 m. The lowermost strata of the coal-bearing formation (the Akkudukian and Ashliarikian suites) contain interlayers of carbonaceous rocks and coals in the upper horizons. The Karagandian suite (to 600 m) and the Suprakaragandian suite (to 390 m), which encompass the central part of the brachysyncline over an area of 74 sq km, contain 11 and nine coal seams, respectively. Three thick, contiguous seams of the Karagandian suite are industrially important: the lower, or third, seam, which is 84–108 m thick (average, 95 m); the middle, or second, seam, which is 33–43 m thick (average, 38 m); and the upper, or first seam, which is 20–25 m thick (average, 22.5 m). Coal seams up to 1.5 m thick alternate with interlayers of sandy-clayey and carbonaceous rocks ranging in thickness from fractions of a centimeter to a few meters. The first and second seams have a more compact structure.

The coals are hard humus coals, with an industrial grade of WCa (weak caking). They have a high ash content, which increases with increasing depth in the coal-bearing cross section and are difficult to enrich. The ash content of coal concentrates with a density of less than 1.8 g/cm^3 ranges from 28 percent (first seam) to 35 percent (third seam).

All the coals in the basin, down to their full depth, are suitable for open-pit mining. Coal extraction in 1975 amounted to 45.8 million tons. The total capacity of the coal sections in 1976 reached 52 million tons. The coals are used as fuel at large power plants (pulverized coal burning) in the Middle and Southern Urals and in Kazakhstan. The Ekibastuz Coal Basin is a key part of the Pavlodar-Ekibastuz Territorial-Production Complex.

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K. V. MIRONOV [29–1763–7]

EKIBASTUZ STATE REGIONAL POWER PLANT, a thermal power plant under construction (1980) near the city of Ekibastuz in Pavlodar Oblast, Kazakh SSR. The planned capacity is 4,000 megawatts (eight 500-megawatt units). Ekibastuz hard coal will serve as the fuel. The water supply is of the circulating type, with Lake Zhengel'dy serving as the cooling pond. Power is transmitted over 220- and 500-kilovolt power lines to the integrated power grid of Northern Kazakhstan. [29–1763–6]

EKIMCHAN, an urban-type settlement and the administrative center of Selemdzha Raion, Amur Oblast, RSFSR. Ekimchan is situated on the Selemdzha River of the Amur River basin, 655 km northeast of Blagoveshchensk. [29–1764–2]

EKINCHI (*Äkinchi*; The Plowman), the first Azerbaijani newspaper, published from July 22, 1875, through September 1877 in Baku. *Ekinchi* was founded and edited by G. Zardabi. M. F. Akhundov and Seid Azim Shirvani were among the contributors. Influenced by revolutionary populism, *Ekinchi* championed democratic ideas and denounced tsarist officials, local rulers, and rural extortioners. It promoted enlightened thought and published articles devoted to the development of realistic literature and art. Publication of the newspaper was hindered by the censors, who prohibited it from dealing with political issues after the outbreak of the Russo-Turkish War of 1877–78. *Ekinchi* had a considerable influence on the development of sociopolitical and artistic thought in Azerbaijan.

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A. MIRAKHMEDOV [29–1764–3]

EKK, NIKOLAI VLADIMIROVICH (real surname, Ivakin). Born June 1 (14), 1902, in Riga; died July 14, 1976, in Moscow. Soviet motion-picture director. Honored Art Worker of the USSR (1973).

In the 1920's, Ekk graduated from the State Higher Workshops and the State Technicum of Cinematography. After working in the Meyerhold Theater he began his career as a film director. His best known films include the first Soviet sound film, *A Start in Life* (1931), and the first Soviet color film, *Grunia Kornakova* (*Nightingale, Little Nightingale*, 1936). Ekk also made a color film version of *Sorochintsy Fair* (1939), the television film *When the Snow Falls* (1962), and the stereoscopic film *The Man With the Green Glove* (1968). He also directed stage plays.

Ekk was awarded the Order of the Red Banner of Labor. [29–1765–3]

EKMAN, VAGN WALFRID. Born May 3, 1874, in Stockholm; died Mar. 9, 1954, in Göstad. Swedish geophysicist. Member of the Royal Swedish Academy of Sciences.

Ekman studied at the University of Uppsala from 1893 to 1896 and at the University of Stockholm from 1896 to 1901. He was a professor at the University of Stockholm from 1910 to 1939.

Ekman's main works dealt with physical oceanography. In 1905, he developed the theory of drift, or wind-driven, currents and gradient currents in the sea. Ekman discovered the rotation of the velocity vector of a current with depth; the theoretical representation of the current distribution is known as the Ekman spiral.

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EKMOLIN (ecmoline), an antibiotic protein preparation derived from sturgeon milt. It exhibits antibacterial properties and prolongs the action of penicillin and other antibiotics (it is a component of *ekmonovotsillin*). [29–1770–3]

EKONOMICHESKAIA GAZETA (Economic Gazette), a weekly newspaper of the Central Committee of the CPSU. Founded in November 1918 as *Ekonomicheskaia zhizn'* (Economic Life), it was originally published by the Supreme Council on the National Economy and the people's commissariats dealing with economic affairs. It became an organ of the Council of Labor and Defense in mid-1921. Beginning in 1931, the newspaper was published by the State Planning Committee (Gosplan) and People's Commissariat of Finance of the USSR, the five Union banks, and the Central Committee of the Union of Financial and Bank Workers.

The newspaper took the name *Finansovaia gazeta* (Financial Gazette) in November 1937. It was not published from the beginning of the Great Patriotic War until 1956, when, in February, it was revived under the name *Promyshlenno-ekonomicheskaia gazeta* (Industrial and Economic Gazette), as an organ of the State Committee on New Technology of the Council of Ministers of the USSR. After being reorganized in June 1960 as a daily organ of the Central Committee of the CPSU, under the name *Ekonomicheskaia gazeta*, it became a weekly in August 1961.

Ekonomicheskaia gazeta publicizes the economic policy of the CPSU and mobilizes the masses for its implementation. The newspaper focuses on economic theory, new developments in economic practice, and socialist competition directed at raising efficiency and the quality of work. Charged with assisting the education of the working people in the area of economics, the newspaper publishes methodological and educational materials on course topics and provides recommendations and advice on management of the system of economic education. It was awarded the Order of the Red Banner of Labor in 1971. Circulation, approximately 850,000 (1978). [29–1814–3]

EKONOMICHESKIE KREST'IANE, a category of peasants in Russia in the second half of the 18th century who were feudally dependent on the state.

Before the secularization of church lands in 1764, the *ekonomicheskie krest'iane* lived on lands held by the Orthodox Church and were known as *monastyrskie krest'iane* (monasterial peasants). In 1764, they were placed under the control of the Collegium of the Economy. The *ekonomicheskie krest'iane* included approximately 2 million peasants settled in various regions of European Russia. They paid *obrok* (quitrent) in cash rather than rendering *barshchina* (*corvée*) or *obrok* in kind; in the 1770's and early 1780's the treasury received more than 1.3 million rubles from them annually.

When the Collegium of the Economy was abolished in 1786, control of the *ekonomicheskie krest'iane* passed to local administrative bodies (financial boards), and the peasants soon ceased to be distinguished from the general mass of state peasants.

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EKONOMIKA, a publishing house of the State Committee of the Council of Ministers of the USSR on Publishing, Printing, and the Book Trade. Located in Moscow, it was established in 1963 through the consolidation of three houses: Ekonomizdat, Gostorgizdat, and the publishing house of the Central Cooperative Alliance.

Ekonomika publishes works on general economic problems, the economics of industry and agriculture, planning, material and technical supply and marketing, the organization of national economic management, the economies of the socialist countries, and questions of state trade. It publishes the journals *Planovoe khoziaistvo* (The Planned Economy), *Sovetskaia torgovlia* (Soviet Trade), *Obshchestvennoe pitanie* (Food Service), *Material'no-tekhnicheskoe snabzhenie* (Material and Technical Supply), and *Sovetskaia potrebitel'skaia kooperatsiia* (Soviet Consumers' Cooperative), as well as the bulletins *Novye tovary* (New Products) and *Torgovlia za rubezhom* (Trade Abroad).

In 1979, Ekonomika published 183 titles of books and pamphlets with a total of 6.2 million copies, using approximately 70 million printed sheets. [29–1796–1]

EKONOMIKA I MATEMATICHESKIE METODY (Economics and Mathematical Methods), a scientific journal of the Central Economic Mathematical Institute of the Academy of Sciences of the USSR. Published in Moscow since 1965, the journal is issued six times a year. It deals with problems of the optimal functioning of a socialist economy and with the use of mathematical methods and computer technology for the solution of important problems of planning and administration at the national, sectorial, regional, and plant levels. Results pertaining to the development of the appropriate software are published, along with critiques of bourgeois economic and econometric theories. The journal carries discussions of timely economic problems and provides information on the current literature and on scientific activities. Circulation, more than 6,000 (1978). [29–1801–1]

EKONOMIKA SEL'SKOGO KHOZIAISTVA (Agricultural Economics), a monthly journal of the All-Union Scientific Research Institute of Agricultural Economics of the V. I. Lenin All-Union Academy of Agricultural Sciences. The journal has been published in Moscow since 1926. It deals with Marxist-Leninist agrarian theory and with the economic activity of kolkhozes and sovkhozes. The journal publishes lectures and advice of use in improving the economic education of persons studying in the party system and carries book reviews. Circulation, 70,000 (1978). [29–1805–1]

EKONOMIKA STROITEL'STVA (Construction Economics), a monthly journal of the USSR State Committee for Construction (Gosstroi). The journal has been published in Moscow since January 1959. It is intended for managerial, scientific, and engineering personnel in ministries, departments, construction organizations, design organizations, research organizations, and construction enterprises, as well as for the employees of banks that finance capital construction and for teachers at higher educational institutions and technicums.

Ekonomika stroitel'stva is devoted to problems of increasing the economic efficiency and quality of construction, shortening the time required to put production facilities into operation and to utilize production capacities, refining the system of construction management, and improving cost estimation and price determination. The journal also carries articles on the economics of labor, planning and profit-and-loss accounting in construction, and the economics of both engineering design and solutions to design problems. It encourages innovation and socialist competition by construction workers. Circulation, about 60,000 (1978).

[29–1806–1]

EKSKUZOVICH, IVAN VASIL'EVICH. Born Jan. 26 (Feb. 7), 1882, in Elizavetgrad (present-day Kirovograd); died June 11, 1942, in Leningrad. Soviet theater figure.

Ekskuzovich graduated from the St. Petersburg Institute of Civil Engineering in 1909. In 1918 he was made supervisor of the state academic theaters of Petrograd, and from 1923 to 1928 he managed the state academic theaters of the RSFSR. At the same time he was director of the department of state theaters of the People's Commissariat of Education and of the art division of Glavnauka (Central Administration of Scientific, Scholarly-Artistic, and Museum Institutions). Beginning in 1928, he was engaged in organizational work.

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Tekhnika teatral'noi stseny v proshlom i nastoiashchem. Foreword by A. V. Lunacharskii. Leningrad, 1930. [29–1902–5]

EKWENSI, CYPRIAN. Born 1921 in Minna. Nigerian novelist who writes in English.

In the novels *People of the City* (1954; Russian translation, 1965) and *Jagua Nana* (1961), Ekwensi criticizes the morality of Nigeria's developing bourgeoisie and reveals the psychological problems of urbanization in Africa. In the novel *Beautiful Feathers* (1963) he appealed to the people to unite. The fate of the people involved in the ethnic conflict that initiated the civil war of 1967–70 are dealt with in the novel *Iska* (1966). The life of the Fula cattle breeders is depicted poetically in the novella *Burning Grass* (1962; Russian translation, 1963).

Ekwensi has also written books for young people and retellings of popular legends.

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S. P. KARTUZOV [29–1745–4]

EKZEKUTOR, a marshal of the court (in prerevolutionary Russia, a civil servant) who managed an institution or office.

[29–1754–1]

ELAT (also Elath), a city in Israel. Population, 13,000 (1972). Elat, a port on the Red Sea, is connected by highway with Tel Aviv. Its industries include diamond-cutting and jewelry-making. The manufacture of cement and food products (mainly fish products and wine) is also important. Nearby there are deposits of copper, at Timna, and semiprecious stones. Oil pipelines lead from Elat to Haifa and through Ashqelon. There is commercial fishing. [29–1708–2]

ELATERIDAE (click beetles), a family of beetles. The body is elongated and the short legs have tarsi with five segments. The body ranges in length from 2 mm to 50 mm, although it most commonly measures 7–20 mm. The antennae have 11–12 segments and are serrated or pectinate, rarely filiform. The prothorax has a process that is directed back into a special cavity in the mesothorax. With the aid of this mechanism beetles that fall on their backs are able to turn over by jumping up with a clicking noise. The wings are usually well developed.

The family embraces approximately 10,000 species, more than 500 of which are found in the USSR. The ubiquitous insects live on plants, on which they feed. The larvae, which are called wireworms, develop in the soil and in rotting wood and feed on disintegrating plant remains, living roots, or the larvae of other insects. The larvae of *Agriotes, Selatosomus*, and other genera are agricultural pests, harming germinating seeds or gnawing into the tillering crown of cereal grasses until the plant weakens and dies. They are also harmful to forest plantings.

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O. L. KRYZHANOVSKII [29–1585–3]

ELEKTROKHIMPROM CHIRCHIK PRODUCTION ASSOCIATION (until 1975, the Chirchik Electrochemical Combine), a unit of the Soiuzazot All-Union Association of the Ministry of the Chemical Industry, located in the city of Chirchik, Tashkent Oblast. It manufactures ammonium nitrate, urea, ammonia water, liquid ammonia, nitric acid, various catalysts, and other products.

The combine was one of the first chemical enterprises in the USSR to be designed by Soviet engineers and outfitted with equipment manufactured in the Soviet Union. Construction was begun in 1936. The first product to be manufactured (November 1940) was ammonium nitrate. The second stage of production facilities was put into service in 1944. It manufactured ammonia by gasifying local coal; since 1961 it has produced ammonia by cracking natural gas from the Bukhara gas fields. A catalyst production plant was put into service in 1949, and a urea production shop in 1964. The main shops have been enlarged and rebuilt several times.

Between 1940 and 1975, production volume increased by a factor of 30, and labor productivity rose by a factor of 9.5. The increases were achieved mainly by introducing new technologies and inventions and by following the recommendations of efficiency experts. The total annual production of the association is valued at 100 million rubles. Products are exported to 12 foreign countries. The association was awarded the Order of Lenin in 1971 and the Order of the Red Banner of Labor in 1943.

[29–619–1]

EMERGENCY, STATE OF, a special legal state declared in a country for a given period of time to cope with extraordinary circumstances and permitting the use of special measures to maintain order.

A state of emergency usually involves the establishment of agencies with special powers, the introduction of extraordinary security measures, and the extension of the competence of administrative bodies to include the right to suspend existing legislation.

In capitalist countries, a state of emergency in the form of martial law or a state of siege is usually proclaimed to counter a drastic intensification of the class struggle or an upsurge of a revolutionary or national liberation movement. It is also declared in the event of a war or a natural disaster. In Chile, for example, the military-fascist junta of Pinochet, in violation of the constitution, declared a state of internal war and then a state of siege in order to justify a reign of terror and lawlessness and the repression of Chilean patriots without inquest or trial.

The Constitution of the USSR (art. 121, par. 15) provides the Supreme Soviet of the USSR with the right to declare martial law in specific areas or throughout the entire country in the interests of the defense of the USSR. [29–691–1]

EMERGENCY BUDGET, a schedule of state revenues and expenditures that is regarded as an addition to, rather than a formal part of, the ordinary state budget and is approved by a special procedure differing from that for the ordinary budget.

In capitalist countries of the era of premonopoly capital, emer-

gency budgets were introduced sporadically, chiefly in wartime. In the present stage of the general crisis of capitalism, emergency budgets, which have become a recurring phenomenon, are used to conceal or minimize chronic budget deficits, to help provide funds for military appropriations and strategic construction projects, and to service the national debt. They exist in several capitalist countries in various forms, including supplementary budgets and budgets comprising special receipts and expenditures. The USSR does not have emergency budgets. [29–692–1]

EMERGENCY LEGISLATION, extraordinary or exceptional laws that become effective in a state of emergency and that give the government extraordinary powers, such as the right to establish legal norms the executive is ordinarily not entitled to establish and the right to suspend individual laws or certain of their norms, including constitutional guarantees. Emergency legislation is widely used by imperialist states to combat revolutionary and national liberation movements. It was employed to establish fascist regimes in Germany, Spain, and Portugal and the dictatorship of Pinochet's military-fascist junta in Chile. In the 1950's the Federal Republic of Germany passed a number of antidemocratic emergency laws directed against progressive forces; for example, the right to choose and practice a profession was limited, the right to strike was revoked, and freedom of movement was restricted. [29–690–4]

EMERGENCY TAX, a mandatory payment made to the state and exacted only under special circumstances, such as the advent of war.

Emergency taxes are levied either by imposing new taxes or by raising existing tax rates. They were widely used in Russia and Great Britain during World War I and in Great Britain, the USA, and Germany during World War II. In capitalist countries the working people pay the bulk of emergency taxes; the capitalists usually try to avoid such taxation. When the monopolies have to pay emergency taxes, the expenditure is recovered through a faster rate of depreciation or through overt or covert subsidies granted by the state—for example, military orders may be filled at higher prices. Thus, between 1945 and 1955, American monopolies were repaid $25.7 billion, which amounted to over half of the taxes they paid in World War II.

Emergency taxes have been used in the USSR as a way of attracting capital from the population to finance extraordinary state expenditures. In 1918, during the Civil War, a one-time emergency revolutionary tax was imposed on the well-off strata of the population, raising 10 billion rubles. A tax was collected from all citizens in 1922 to help famine victims, and a one-time tax was introduced in 1924 to counter the effects of a crop failure. A war increment imposed on income and agricultural taxes in 1941 was replaced in 1942 by a war tax, which was abolished in 1946. [29–691–2]

END-MEASURING INSTRUMENT, any of a certain class of instruments that are used to measure or lay out inside and outside dimensions. An end-measuring instrument consists of two measuring surfaces, which are usually called jaws. A dimension is determined between the two measuring surfaces. One of the surfaces constitutes the base of a single unit that includes a rule, or a graduated bar; the other surface is on a head that slides along the rule. The rule is divided into millimeters, and a vernier scale is installed or engraved on the sliding head. To increase their reliability, end-measuring instruments are made of materials that have a high abrasion resistance and are not subject to corrosion, such as hardened steels. In addition, the measuring surfaces are chrome-plated or are reinforced by a hard alloy. Plastic end-measuring instruments are also used.

In the USSR, several types of end-measuring instruments with readings in 0.05 or 0.1 mm are manufactured in several standard sizes. The manufacture of end-measuring instruments with readings in 0.02 mm has been discontinued. Depending on their purpose and design features, end-measuring instruments are classified as vernier calipers, height gauges, height-and-depth gauges (*see* DEPTH GAUGE), or gear-tooth calipers.

The vernier caliper (Figure 1) is the most widely used end-measuring instrument. The first vernier calipers appeared in the late 18th century in London, although wooden caliper rules without verniers were used as early as the 17th century. Three types of vernier calipers are manufactured in eight standard sizes; the types differ in design and in the number of measuring jaws. For measurements of up to 400 mm, the jaws may be extended from the zero reading. For larger dimensions, the zero point of a measurement does not coincide with the zero mark.

Vernier calipers with an instrument range extending from 0 to 125 or 150 mm and with readings in 0.1 mm have two sets of jaws (Figure 1,a) as well as a rule depth gauge for measuring such dimensions as the depth to a shoulder or the depth of a groove or a hole. The lower jaws are used to measure outside dimensions; the upper jaws, inside dimensions.

Vernier calipers with an instrument range extending up to 250 or 160 mm and with readings in 0.1 or 0.05 mm (Figure 1,b) also have two sets of jaws. However, the lower jaws are used for both outside and inside measurements, while the upper jaws are employed to lay out or measure outside dimensions inside narrow shallow grooves and holes. The upper jaws may be used to scribe parallel lines, circles, and other elements of the shape of a part to be machined (*see* LAYOUT TOOL). In such vernier calipers, the jaws for measuring inside dimensions have cylindrical surfaces. The size of the jaws when closed is usually 10 mm; the jaw size is stamped on a surface that is not used for measurement and is added to the reading when inside dimensions are measured.

Vernier calipers with an instrument range extending to an upper limit of 400 to 2,000 mm have a single set of jaws that is similar in design to the lower jaws of the caliper shown in Figure 1,b. The last two types of vernier calipers have a micrometer feed, which is used mainly in layout work, for the more precise determination of a dimension. The readings on such calipers are in 0.1 mm.

In contrast to a vernier caliper, a height gauge (Figure 2) has a base rather than a fixed jaw. Measurements are made from the bottom of the base, which corresponds to the zero reading on the scale. The sliding head is equipped with a holder rather than a movable jaw. For layout work, a stylus or a scriber is attached to the holder; for measurement, a special set of measuring jaws or a bracket for fastening a meter—such as a dial indicator—is attached to the holder. Height gauges are usually employed in layout work on plates. In such work, the gauge is mounted on the plate together with the workpiece to be laid out or measured. On ▪ workpiece to be laid out, lines are scribed with a scriber when the height gauge is moved over the surface of the plate. Height gauges are manufactured in six standard sizes with readings in

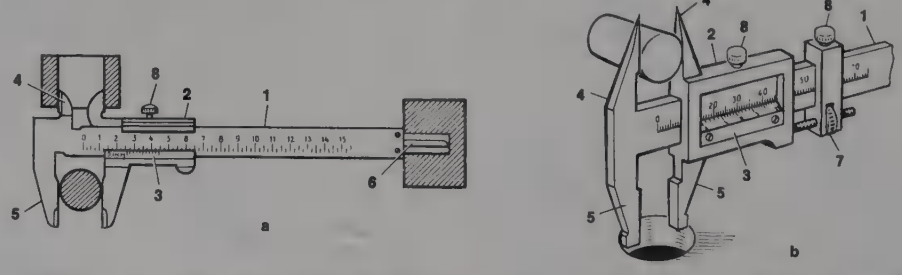

Figure 1. Vernier calipers: (1) graduated bar, (2) sliding head, (3) vernier, (4) upper jaws, (5) lower jaws, (6) rule depth gauge, (7) micrometer feed, (8) setscrews

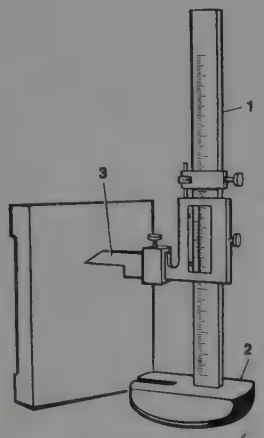

Figure 2. A height gauge: (1) graduated bar, (2) base, (3) scriber

0.05 mm for an instrument range extending to an upper limit of 400 mm or with readings in 0.1 mm for instrument ranges extending to an upper limit of 400 to 2,000 mm.

A gear-tooth caliper, which is a combination of a height-and-depth gauge and ▪ vernier caliper, is designed to measure the thickness of gear teeth. The vertical rule of a gear-tooth caliper is used to determine the depth of a tooth from the tooth's tip, where the tooth thickness is measured. The horizontal caliper is used for the direct measurement of the tooth thickness. Gear-tooth calipers with readings in 0.05 mm are manufactured in two standard sizes for the measurement of the tooth thickness of gears with a modulus of up to 36 mm. Owing to the rapid abrasion of their tips and to their relatively low accuracy, gear-tooth calipers are being replaced to an increasing extent by displacement tooth gauges and tangent tooth gauges.

N. N. MARKOV [29–1451–4]

ENRICHMENT SYSTEM, a set of devices in the carburetor of an internal-combustion engine. An enrichment system is used to enrich the fuel-air mixture when the throttle valve is wide open or nearly wide open. It enhances the economical operation of an engine. [29–1787–1]

ENTRENCHING TOOLS, regulation-issue military tools used in manual engineering work. Two general classes are distinguished: entrenching tools that are part of a soldier's personal gear and those that are part of the standard equipment of a vehicle. The first class consists simply of a small shovel, although before the Great Patriotic War of 1941–45 it also included a small ax and a pick-mattock. The small shovel is included in the field equipment issued to sergeants and to enlisted men of lower rank and is used primarily for digging trenches. Entrenching tools of the second class, issued to motor pools and convoys, are part of the standard equipment of fighting and transport vehicles and comprise a long-handled shovel, a broadax, a pick-mattock, and ▪ crosscut saw. They are used for such work as preparing field positions and billeting areas. [29–840–2]

ENVIRONMENTAL PHYSIOLOGY, a branch of physiology that studies the dependence of human and animal functions on conditions of life and activity in different physicogeographical zones, during different times of the year and day, and at different phases of the moon and tidal rhythms. Environmental physiology, which reveals the physiological bases of adaptations to natural factors, is closely tied in with ecology, chronobiology, the physiology of aging and evolution, the physiology of farm animals, and ethology; when the subject of study is man, it is also closely related to climatophysiology and the physiology of work and sports. All levels of physiological integration are studied: supraorganismic (populational), organismic, organic and systemic, and cellular and subcellular (molecular). In human environmental physiology, clinical, chemical and electrophysiological laboratory methods, such as radiotelemetry, are used.

The development of adaptations is studied by isolating an organism from individual environmental factors (controlled cultivation and rearing) and by comparing the parameters of physiological reactions in species that are taxonomically similar but that have different ecological specialization, such as arctic, tropical, desert, terrestrial, and semiaquatic organisms with different levels of muscle activity. In research on sensory systems, signalization, echolocation and ranging (bats, birds, fish), and chemical links (pheromones) between organisms, environmental physiology depends upon biophysical and biochemical data.

Environmental physiology enables man to forecast the mass multiplication of pests (rodents, insects) and acclimatize beneficial animal species; it also makes possible the regionalization of farm animals by breeds and the acclimatization of man to new climatic regions as new areas are developed (high latitudes, mountains, deserts). It studies the physiological characteristics that determine the course of the adaptive reactions in various animals inhabiting particular regions (*see* LIFE FORM). At various phylogenetic levels, such general characteristics include mechanisms for the conservation of water in desert animals, osmotic control in desert, semiaquatic, and aquatic organisms, and the energy flow in organisms and their individual systems (high in northern latitudes and low in arid and tropical zones).

In the USSR, research in environmental physiology has been conducted since the 1930's, including the study of thermoregulation (A. D. Slonim, O. P. Shcherbakova), adaptation to hot and cold climates (A. Iu. Iunusov, I. A. Izrael'), adaptation to mountainous conditions (A. G. Ginetsinskii, N. N. Sirotinin, M. M. Mirrakhimov), adaptation to environments with ▪ variable gaseous composition (E. M. Kreps, Z. I. Barbasheva), and mechanisms of hibernation (N. I. Kalabukhov). The ecological approach was also used in the study of the nervous system (D. A. Biriukov) and the genetics of behavior (D. K. Beliaev, M. E. Lobashev). Beginning in the 1950's, research in environmental physiology expanded in connection with the development of new territories, such as the arctic, subarctic, deserts, and mountainous regions; bases have been established at mountain, desert, and marine stations, and laboratories have been set up at wildlife sanctuaries. A pressing need is developing to investigate the effects of noise, vibration, and temperature factors on the human body as a whole and on the function of individual organs (V. V. Parin, A. S. Troshin).

Various aspects of environmental physiology have been studied abroad since the 1920's, including the comparative physiology of respiration and muscle activity (A. Krogh), the effect of decreased air pressure on the respiratory function of the blood (J. Barcroft), adaptation to low temperatures (C. L. Prosser, T. H. Bullock, and P. F. Scholander; USA), the adaptation of animals to desert life (K. Schmidt-Nielsen; USA), and the physiology of human work under extreme arctic and desert conditions (O. G. Edholm; Great Britain). Since the 1970's, the problems of environmental physiology have become closely linked with those of conservation. (*See also* PHYSIOLOGY.)

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A. D. SLONIM [29–1773–1]

ÉPÉE, a fencing weapon consisting of a flexible steel blade with a protective guard and handle. The blade has a three-sided section (the maximum width of a side is 24 mm) that grows thinner toward the point, where there is a tip with a movable electrical con-

tact. The overall length is no more than 110 cm (the blade itself is no longer than 90 cm), the diameter of the guard is 135 mm, and the weight ranges up to 770 g. Only men engage in fencing competition with the épée. [29–1384–2]

EQBAL, ABBAS. Born 1897; died Feb. 11, 1956, in Rome. Iranian historian and philologist.

Eqbal graduated from the University of Paris in 1926. Together with M. Qazvini, he founded the literary and historical journal *Yadegar* (Monument). He wrote on medieval and modern Iran. Eqbal was responsible for the publication of many medieval sources and the memoirs of various Europeans who had visited Iran.

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EQUANT, an auxiliary point in the Ptolemaic system (the point E in the figure), introduced by Ptolemy to match observed planetary motions with motions previously calculated with deferents and epicycles.

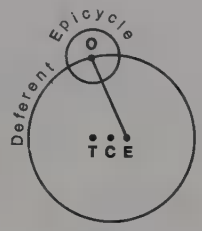

Figure 1

Describing the motion of the planets with circles and constant angular velocities, Ptolemy placed the earth (T) outside the center of the deferent (C). He assumed that the center of the epicycle (O) of a planet moved nonuniformly along the deferent, but in such a manner that the motion seemed uniform to an observer located at the equant, which was symmetric to the position of the earth relative to the center of the deferent. [29–1737–5]

EQUATIONAL DIVISION, a method of reproduction in animal and plant cells; a rarely used synonym for mitosis. As a result of equational division the initial number of chromosomes in the cell is preserved. Equational division is contrasted with reduction division, or meiosis, as a result of which the number of chromosomes in the cell is halved. [29–1745–3]

EQUATORIAL, a lens or mirror telescope on a parallactic, or equatorial, mounting (*see* TELESCOPE MOUNTING). A clock mechanism rotates the telescope around a polar axis at a rate of one rotation per 24 sidereal hours, so that the celestial object being observed, which moves because of the apparent diurnal rotation of the celestial sphere, remains in the field of view of the telescope. Graduated circles with measuring devices are secured to the axes to direct the telescope at the celestial object according to its hour angle and declination and to enable the approximate determination of its coordinates. Auxiliary astronomical tubes mounted on the primary one, called the finder and the guide, are used to locate the necesssary object and to keep the instrument directed at it during photography.

Equatorials may be visual (equipped with an ocular that has a micrometer for differential measurements) or photographic (with plateholders). (*See* ASTRONOMICAL INSTRUMENTS AND DEVICES.) [29–1738–4]

EQUATORIAL AIR, air masses that form in the equatorial zone or flow from it to the higher latitudes (for example, the air of the summer monsoon over the northern part of the Indian Ocean). Equatorial air is separated from tropical air by the intertropical zone of convergence or tropical front. [29–1743–7]

EQUATORIAL BELT, a geographic belt of the earth located on both sides of the equator between 5°–8° N lat. and 4°–11° S lat., between the subequatorial belts. Some scientists include the equatorial belt in the tropical belt (*see* TROPICAL BELT). The equatorial belt is characterized by the prevalence of equatorial air masses, weakly expressed sectors on the continents, and the presence of *gilea*-type forests on the plains of the latitudinal zone and zones of *gilea* and paramo vegetation in the mountains (*see* GILEA).

The climate is caused by the large influx of solar energy. The radiation balance on land is 70–80 kcal/cm^2 per year, sometimes reaching 90 kcal/cm^2. The average monthly temperatures in the lowlands are 24°–28°C; the annual variation in the average monthly temperature is 2°–3°C, the lowest on the earth. The equatorial belt is characterized by the presence of the equatorial low, which is linked to the intertropical zones of convergence of the tradewinds, in which air masses rise, moisture condenses, and abundant precipitation falls (1,500–3,000 mm a year, up to 10,000 mm on the windward slopes of mountains). Precipitation almost always exceeds evaporation, and moisturization is excessive. The rivers have abundant water, with relatively small fluctuations in the flow rate, except those rivers whose basins lie in other geographic belts. The equatorial parts of the continents typically have no seasonal rhythms, but all natural processes are highly active. Thick weathering crusts are characteristic. Acidic red-yellow ferralitic (lateritic) soils with total humification of dead plant matter and rapid mineralization of organomineral complexes predominate. These soils are poor in bases and humus (2–3 percent) and rich in the hydroxides of iron and aluminum. The vital activities of microorganisms and small animals in the soil and on the soil surface are extremely vigorous. When the forests are cleared and the ground plowed, given the high temperatures and drainage conditions, the soils of the equatorial belt lose their fertility quickly.

The humid equatorial evergreen forests (*gilea*, the Brazilian *selva*) are distinguished by the different times of periodic functions of individual plants in the absence of seasonal aspects within the community as a whole, the dense tree growth, the unusual wealth and age of the species composition, the abundance of lianas and epiphytes, and the high productivity of the aboveground biomass (40–50 tons/ha, up to 100). Mangrove thickets are common along the sea and ocean. Economically useful plants abound, such as rubber plants (including *Hevea*), the cacao tree, the breadfruit tree, the cotton tree (*Ceiba*), various palms, and trees with valuable wood. The animals that inhabit the equatorial forests are adapted to life in the trees, for example, monkeys, lemurs, sloths, and cats. Common ground animals are the tapirs, rhinoceroses, peccaries, and hippopotamuses. Birds, reptiles, and insects are numerous. Two subzones are identified in the *gilea* zone: the continually humid equatorial forests and the equatorial forests with a short dry season (two to three months). The latter occur in the parts of the belt farthest from the equator and in the eastern sectors, which come under the influence of the continental tradewinds. A mixture of deciduous species (losing their leaves in the dry season) occurs in the forests, as well as patches of savanna, formed primarily as a result of human economic activities. Some of the land, mostly in the more accessible marginal parts of the equatorial forest, is planted with subsistence and plantation crops. The chief occupations of the population in the continually humid equatorial forest subzone are logging, fishing, hunting, and primitive subsistence farming.

The uniformity of annual temperatures and precipitation is maintained in the mountains of the equatorial belt. Owing to the drop in temperature with elevation, the change in the nature of precipitation, the greater thinness of the air, and the increase in insolation, three zones of humid mountain equatorial forest are identified below 3,000–3,500 m—tierra caliente, tierra templada, and tierra fria. Above this elevation is a belt of high-mountain equatorial meadows called paramos, which at 4,300–4,800 m gives way to the nival zone.

In the ocean regions, the equatorial belt is characterized by an even higher radiation balance (up to 120 kcal/cm^2 per year), a thicker cloud cover, abundant rainfall, and mild winds and calms. The surface waters are slightly less saline (about 34 parts per thousand) than the average ocean waters and are rich in plank-

ton. In connection with the characteristics of circulation of the atmosphere and water, the equatorial belt is clearly delineated in the western sectors of the Pacific and Atlantic oceans; in the eastern sectors it is clearly delineated only north of the equator, and in the Indian Ocean, only in the central and eastern sectors.

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E. N. LUKASHOVA [29–1744–1]

EQUATORIAL CHANNEL, a strait in the southern Maldives, between Suvadiva Atoll and Fua Mulaku Island. The Equatorial Channel is 85 km wide, with depths to 2,421 m. It flows westward in winter and eastward in summer at a velocity of approximately 2 km per hour.

[29–1745–1]

EQUATORIAL CLIMATE, the climate in the zone of the humid forests of the equatorial belt, characterized by mild winds, very small annual temperature fluctuations (24°–28°C at sea level), and abundant precipitation (1,500–5,000 mm a year), which occurs more or less evenly throughout the year.

[29–1743–8]

EQUATORIAL FOREST ZONE, a natural zone of the equatorial belt, in whose natural landscapes forests predominate (*see* RAIN FORESTS and GILEA). The zone encompasses primarily the lowlands on both sides of the equator, including the Amazon River basin, Equatorial Africa, the islands of the Malay Archipelago, and New Guinea. Characteristic features of the equatorial forest zone are a relatively constant length of day, a lack of seasonal rhythms in the development of nature, an equatorial climate, and a thick weathering crust. Dense evergreen forests with a rich species composition grow in the equatorial forest zone, as well as many palms, lianas, and epiphytes. Deciduous species are intermixed in the forests of the outer parts of the zone.

[29–1745–2]

EQUATORIAL GUINEA (Republic of Equatorial Guinea [República de Guinea Ecuatorial]), a country in Central Africa, on the Gulf of Guinea. It comprises the mainland territory of Río Muni and the islands of Bioko (formerly Fernando Póo), Corisco, and Palagu (formerly Annobón). Area, 28,000 sq km. Population, 320,000 (1976). Río Muni borders on Cameroon in the north and Gabon in the east and south. The capital is the city of Malabo. Equatorial Guinea is divided into two provinces.

Constitution and government. Equatorial Guinea is a republic. As a result of the military coup of Aug. 3, 1979, all legislative and executive power rests with the Supreme Military Council. The chairman of the council is also the chief of state.

Natural features. Equatorial Guinea is situated near the equator in the natural region of Lower Guinea. Río Muni is a highland, with elevations of 600–900 m; the maximum elevation is 1,500 m. A low-lying strip of land extends along the coast. The climate is equatorial and is humid throughout the year. The average monthly temperature is 24°–28°C, and annual precipitation exceeds 2,000 mm, reaching 2,500 mm on the islands. The country has a dense network of broad rivers, which have many rapids and can be navigated only in their lower courses. The principal river is the Mbini.

Flora is represented by evergreen equatorial rain forests on red-yellow lateritic soils. More than 150 valuable wood species grow in the forests, including oil and coconut palms, Persian parrotia, and okume. The fauna of Equatorial Guinea is abundant and varied.

Population. More than 90 percent of the population of Equatorial Guinea is made up of members of the Fang and Bube (Bubi) peoples, who belong to the northwestern Bantu. The Fang inhabit primarily continental Guinea (Río Muni); the Bube constitute the indigenous population of Bioko. The coast of Río Muni is inhabited by a group of tribes known collectively as the *playeros*, who include the Benga, Balenge, Bujeba, Kombe (Combe), and Indowe. Although the dominant religion is Roman Catholicism, there are some Protestants, and part of the population still adheres to traditional forms of worship. The official language is Spanish. Equatorial Guinea uses the Gregorian calendar.

The average annual population increase between 1970 and 1974 was 1.7 percent. The economically active population numbers 103,000, of whom 78.7 percent are employed in agriculture (1970). The average population density exceeds 11 persons per sq km. The most populous regions are Bioko and the coastal area of Río Muni. The main cities are Malabo, with 45,000 inhabitants (1975), and Bata.

Historical survey. The island of Bioko was discovered by the Portuguese in the early 1470's and named after its discoverer, the navigator Fernão do Po. In 1778 it passed to the Spanish, who did not permanently establish themselves on the island until 1843. At the same time, the Spanish fought with the local population for control over continental Guinea—Río Muni. In 1900, borders between the Spanish and French possessions on the mainland were drawn.

The Spanish colonialists cruelly exploited the local population, drove it from the most fertile lands, and introduced a system of forced labor. To deal with the labor shortage, the Spanish plantation owners recruited African workers from other African countries, chiefly Nigeria. For many years the people of Equatorial Guinea fought to liberate themselves, a struggle that intensified in the late 1930's; in 1937, 1947, and 1959 mass demonstrations demanding independence took place. The first political parties, formed in 1959, devoted their energies to achieving national independence. In December 1960 Nigerian workers on Fernando Póo struck in protest against the tyrannical rule of the Spanish plantation owners.

In an attempt to disguise the colonial regime, Spain announced in 1960 the abolition of colonial status and the transformation of Fernando Póo and Río Muni into an overseas province. In January 1964 the regions were granted "internal autonomy," and an autonomous government council and an autonomous general assembly were created in the colony. Four years later, the growth of the national liberation movement forced Spain to grant political independence to Spanish Equatorial Guinea. The independent Republic of Equatorial Guinea (REG) was proclaimed on Oct. 12, 1968.

The United National Party was founded in 1970 and renamed the United National Workers' Party in July 1972. All previously existing political parties and mass organizations were dissolved. According to the new constitution of the Republic of Guinea, adopted in July 1973, the party "develops general policy for the nation" and sets the task of "abolishing once and for all the exploitation of man by man." The role of the state in the economy is increasing. As a result of a military coup in August 1979, all power passed to the Supreme Military Council, which banned all political activity in the country.

In foreign policy, the REG has declared itself a nonaligned nation. It is a member of the UN and the Organization of African Unity. Diplomatic relations between the USSR and the REG were established on Dec. 7, 1968, and the two countries have signed agreements on economic and technological cooperation, cooperation in ocean fishing, and trade.

Political parties. The United National Workers' Party (Partido Unico Nacional de los Trabajadores, or PUNT) was founded in 1970 and called the United National Party until July 1972. It is the only party in the country, and, in accordance with its charter, it unites the entire adult population of the REG. A youth and a women's organization function under the auspices of PUNT.

Economic geography. Equatorial Guinea is an agricultural country, with two main economic sectors: the state sector and the private capitalist sector. In addition to encouraging private enterprise and attracting foreign capital, the government is committed

to establishing state intervention in the national economy. A decree adopted in 1974 gave the state control over plantations abandoned by the Spanish. According to a law on foreign investments passed in 1975 the state must control more than 50 percent of the capital in any company. The 1973 constitution introduced a state monopoly over foreign trade; domestic trade is also in the hands of the state. A national monetary system and a central national bank have been created.

AGRICULTURE. The economy of Equatorial Guinea is based on agriculture. The main branches are land cultivation, which produces chiefly for export, and timber felling. Shifting hoe farming predominates in Río Muni, and a plantation economy predominates on the island of Bioko. The cultivated land takes up more than 150,000 hectares (ha), including 90,000 ha in Río Muni (approximately 4 percent of the mainland area) and more than 60,000 ha on Bioko (25 percent of the island's area).

The principal export crops are cocoa and coffee. Cocoa is grown primarily on Bioko, which produces 90 percent of the harvest; cocoa plantings occupy 52,000 ha, including 42,000 ha on Bioko, which produced a harvest of 12,000 tons in 1976. Coffee, of which 6,000 tons were harvested in 1977, is grown mainly in Río Muni, which accounts for more than 80 percent of the total harvest. Oil palms produced 2,000 tons of seed kernels in 1976. The country's 3,000 ha of banana trees yield a harvest of 12,000 tons. In addition to yams and other vegetables, crops grown for local consumption include rice, peanuts, sugarcane, and citrus fruits.

Animal husbandry is poorly developed. In 1975 there were 4,000 head of cattle, 32,000 sheep, and 8,000 goats. Commercial fishing, with a catch of 2,000 tons in 1976, and shrimping are of local importance. Río Muni is the principal timber region; 100,000 cu m were cut in 1975, primarily valuable wood species. Also of some economic importance are the fruit of wild oil palms and the sap of rubber trees.

INDUSTRY. Industry, which is little developed, is represented mainly by small cottage enterprises. Small plants for the production of palm oil produced 2,400 liters in 1976; there are also sawmills and wood-products enterprises. The output of electric power was 15.8 million kilowatt-hours in 1970.

TRANSPORTATION. Equatorial Guinea has 1,200 km of roads, including 400 km of tarred roads. There is maritime navigation. The country's chief ports are Malabo, Bata, and Luba.

FOREIGN TRADE. In addition to cocoa, which accounts, on the average, for 40 percent of all exports, Equatorial Guinea exports coffee (20 percent of all exports), lumber, bananas, and oil-palm products. The country imports petroleum products, cement, textiles, food products, and other necessary commodities. The monetary unit is the ekuele. S. Iu. SOROKINA

Education. Education is compulsory for children from six to 14, and all educational institutions are state-run. There is little preschool education; elementary education continues for six years. In the 1973–74 school year more than 35,900 pupils were enrolled in elementary schools. Secondary education lasts four years at the partial secondary school and six years at the full secondary school. In the 1972–73 academic year more than 4,700 students were enrolled in the secondary schools. In that same year, 586 students attended vocational-technical schools, which have a course of instruction lasting three and one-half years. Elementary school teachers are trained at two three-year pedagogical schools, which had more than 200 students in the 1972–73 academic year. Citizens of Equatorial Guinea must go abroad for higher education. There is a library in Malabo. V. Z. KLEPIKOV

Press and radio. Until mid-1975, Equatorial Guinea had two newspapers which were state owned and published in Spanish: *Unidad de la Guinea Ecuatorial* (founded 1937), a daily newspaper with a circulation of 1,000, and *Libertad* (founded 1970), a weekly newspaper with a circulation of 800. In mid-1975 publication of both papers was suspended because of national economic difficulties. At the end of 1975 the state-owned daily *Diario de la Guinea Ecuatorial* and *Guinea Ecuatorial Revolucionaria al Dia*, issued irregularly, first appeared; publication of *Libertad* was resumed.

The country's two state-owned radio stations are Radio Malabo, located in the city of Malabo, and Radio Ecuatorial, located in the city of Bata. Broadcasts are in Spanish and Fang. There is a television station in Malabo.

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EQUATORIAL (NEGRO-AUSTRALOID) RACE, the collective name of the Negroid and Australoid races in the tropical zone of Africa, South and Southeast Asia, Oceania, and Australia. Representatives of the Equatorial race are characterized by curly or wavy hair, dark skin, hair, and eyes, prognathism, a wide nose, and thick lips. Some anthropologists consider the Negroid and Australoid races to be genetically related and combine them into one large race, while others regard them as having developed convergently in the process of adaptation to the ecological conditions of a hot climate. Dark coloration of the skin could possibly provide protection from the harmful effects of intense sunlight, as could curly hair, which forms a natural protective "cap" on the head. Thick lips and wide nostrils may have had adaptive significance for high evaporation of moisture through the mucosa. [29–1742–3]

EQUATORIAL PLATE, in a dividing cell, the arrangement of the chromosomes at the same distance from both poles. The equatorial plate is formed during the metaphase stage of cell division. At this stage it is difficult to distinguish separate chromosomes, but in aggregate they have the appearance of a plate. When, however, the cell is viewed from the poles, the chromosomes in the equatorial plane of the spindle appear in the form of a star. After the formation of the equatorial plate, the daughter chromosomes separate and migrate to opposite poles. [29–1742–4]

EQUATORIAL UNDERCURRENT OF THE INDIAN OCEAN (also Tareev current), a deep current in the Indian Ocean that flows eastward along the equator. It is 220–230 km wide and has an average velocity of 20–30 cm/sec; the maximum velocity is 100 cm/sec, occurring in the western part of the ocean at depths of 100–125 m. The current is most developed during the winter in the northern hemisphere, when the surface Monsoon Current is flowing in the opposite direction. The current was discovered in 1959–60 through expeditionary studies on the Soviet ship *Vitiaz'*. It was named in honor of the Soviet oceanographer B. A. Tareev (1931–72) in 1974. [29–1743–3]

EQUIDENSITOMETRY, a method of photometric measurement without instruments, widely used in astronomical photometry, spectrochemical analysis, X-ray diffraction analysis, and interferometry.

In equidensitometry, a halftone photographic image of an object is converted into an image consisting of lines made up of geometric points at which the value of the optical density does not exceed some narrow range. In the first applications of the technique, a negative of the object and a positive obtained from the negative were superimposed, and a combined image was then printed in transmitted light. The combined printed image was a set of curved lines of equal density (called equidensities, which gave the technique its name). Later, the method was replaced by direct printing from the negative and partial reversal of the positive by means of the Sabattier effect (*see* PHOTOGRAPHIC EFFECTS). In the 1960's and 1970's a third variant was used, in which the printing was done on special double-layer photographic materials.

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A. L. KARTUZHANSKII [29–1749–3]

EQUIDISTANT CURVE. The set of the ends of equal segments laid off in a fixed direction along the normals to a given plane curve L is known as an equidistant curve of L. For example, an equidistant curve of a circle is a circle. In Lobachevskian geometry an equidistant curve of a straight line—that is, the locus of points at a given distance from the line—is called an equidistant curve (with that line as base) or, less frequently, a hypercycle. In Euclidean geometry an equidistant curve of a straight line is a straight line. [29–1749–4]

EQUIPLAIN, a denudation surface occurring as a result of cirque denudation. It forms with the development of cirques on both slopes of an elevation. The walls of the cirques retreat toward one another, then connect, forming a sharp, crested divide. Finally they disintegrate completely and the bottoms of the cirques join. The term "equiplain" is sometimes used for planation surfaces of permafrost-solifluction origin.

[29–1749–6]

EQUIPOTENTIAL SURFACE, a surface all of whose points have the same potential. For example, the surface of a conductor in electrostatics is an equipotential surface. In a force field the lines of force are normal, or perpendicular, to an equipotential surface.

[29–1749–7]

EQUIVALENCE, PRINCIPLE OF, in economics, the principle according to which a given amount of labor in one form is exchanged for an equal amount of labor in another. The principle of equivalence constitutes the internal basis of exchange proportions when exchange corresponds to the expenditure of socially necessary working time.

In the socioeconomic formations characterized by commodity production, the operative principle is that of value equivalence; where commodity production is absent (that is, under the primitive communal and communist modes of production), it is the principle of labor equivalence that is operative. The principle of value equivalence evolved in conjunction with the growing social division of labor and increasing exchange of commodities. In the initial stages of commodity exchange, when exchange transactions were sporadic and exchange proportions were random in character, the principle of equivalence lacked regulatory effect. It was only when exchange between individual private producers became a constantly repeated social act, representing an essential element of reproduction, that the prerequisites were created for the equivalence principle.

With the expansion of commodity-money relations and the establishment of the system of commodity production, in which the producers' social interrelations take place exclusively through the market, "it is not exchange of commodities which regulates the magnitude of their value; but, on the contrary, it is the magnitude of their value which controls their exchange proportions" (K. Marx, in K. Marx and F. Engels, *Soch.*, 2nd ed., vol. 23, p. 73). With the advent of money, the value of commodities acquires a uniform social form of expression, making it possible to assess and account for expenditures of abstract labor in the use value of the universal equivalent; the proportions of production and exchange are regulated by the law of value, the equivalence principle being a manifestation of the law.

The principle of equivalence operated to a limited extent in precapitalist socioeconomic formations, where production was primarily in kind and where the merchants' exchange transactions were for the most part nonequivalent. Under the conditions of capitalist commodity production, the equivalence principle reaches full development.

The transformation of labor power into a commodity means that the purchase and sale of labor power are in accordance with the law of value—that is, they are based on the equivalence principle. The capitalist pays for labor power on the basis of value, and hence the equivalence principle retains its significance in the sphere of exchange. The use of labor power, however, entails not only the formation of new value but also an increase in value—that is, the production of surplus value.

The value of labor power and the value created by it are of different magnitudes. On the one hand, the equivalence principle is not violated, and the transaction between capitalists and hired workers is based on the law of value. In the production sphere, on the other hand, the increase in value is automatic, and a greater amount of live labor is exchanged for a lesser amount of embodied labor. Capitalist production is characterized by the exploitation and appropriation of the unpaid labor of hired workers. Consequently under capitalism the equivalence principle contradicts its own content.

In socialist society, the principle of value equivalence loses its general meaning. The dominance of public ownership excludes the exploitation of man by man. Labor power ceases to be a commodity and is joined to the means of production by a directly social method. Relations between society and individual members are regulated by the principle of labor equivalence: "the individual producer receives back from society—after the deductions have been made—exactly what he gives to it" (*ibid.*, vol. 19, p. 18).

The law of distribution according to labor, which underlies the principle of labor equivalence, presupposes that the extent to which all working people share in the total consumption fund is determined by the magnitude of their labor input. Whereas in the case of value equivalence the exchange of equal values is observed only on the average, in the case of labor equivalence the amount of labor that the producer gives to society in a certain form is always returned to him in another form (*ibid*).

Together with the principle of labor equivalence, the principle of value equivalence is also preserved under socialism. The principle of value equivalence occupies a subordinate place in the system of socialist production relations; this is because social production is regulated not by the law of value but by the law of planned proportional development of the national economy. Nonetheless, the existence of commodity-money relations presupposes a value relationship between relatively separate enterprises as well as between the enterprises and society. The profit-and-loss accounting system represents such a value relationship. In profit-and-loss accounting relations, the operation of the equivalence principle does not negate the possiblity of planned deviation of prices from value in the interest of the socialist economy.

A. A. KHANDRUEV [29–1746–6]

EQUIVALENCE, PRINCIPLE OF, the assertion that the gravitational field in a small region of space and time is identical in its manifestation to an accelerated frame of reference. The essence of the equivalence principle is as follows. In a gravitational field all bodies move with the same acceleration, regardless of their mass and other properties (Galileo's law). In the absence of a gravitational field, however, when an observation is made from an accelerated frame of reference, such as a rocket moving with an acceleration imparted by an engine, all bodies undergoing inertial motion also have the same acceleration with respect to the reference frame. In this sense, an accelerated reference frame is equivalent to a gravitational field.

The equivalence principle is called the weak equivalence principle only when applied to the laws of motion of bodies in space. In creating the general theory of relativity (the theory of gravitation), Albert Einstein assumed that not only mechanical motion but all physical processes, given identical initial conditions, proceed identically within and without a gravitational field but in an accelerated reference frame. This assertion is called the strong equivalence principle. The equivalence principle is local; that is, the identity of a gravitational field with an accelerated reference frame is valid only in the small region of space and time in which the gravitational field may be assumed homogeneous and constant in time. The equivalence principle has been proved experimentally to high accuracy (*see* GRAVITATION).

I. D. NOVIKOV [29–1748–1]

EQUIVALENCE RELATION, an equality-type relation, that is, a binary relation that is reflexive, symmetric, and transitive. For example, if two geometric figures are congruent or similar or if two sets of objects are isomorphic or equipotent, the figures or sets are equal or identical in some regard. Thus, isomorphic sets are indistinguishable in structure if by "structure" is meant the aggregate of the properties with respect to which the sets are isomorphic.

[29–1748–2]

EQUIVALENT. The equivalent of an element is the weight, expressed in carbon mass units, that will combine with or replace one atomic weight of hydrogen or one-half atomic weight of oxygen.

The equivalent of an acid is equal to the acid's molecular weight divided by its alkalinity (number of hydrogen ions).

The equivalent of a base is equal to the base's molecular weight divided by its acidity (number of hydroxyl groups).

The equivalent of a salt is equal to the molecular weight of the salt divided by the sum of the charges of the cations or anions forming the salt.

In oxidation-reduction reactions, the equivalent of an oxidizing agent is equal to the quotient obtained as a result of dividing the agent's molecular weight by the number of electrons obtained by the atom or atoms of the reduced element. The equivalent may vary, depending on the number of electrons accepted by the oxidizing agent.

The concept of equivalent is widely used in the stoichiometric calculations of chemical reactions. S. A. POGODIN [29–1746–2]

EQUIVALENT POWER, an arbitrary power rating used, for example, in the analysis of statistical data to compare engines, machines, and other equipment of different powers in order to depict them as a given number of machines having the same power rating. Thus, data on a tractor fleet in the USSR are sometimes converted into arbitrary units of 15-hp tractors (1 hp = 0.736 kilowatt), that is, 15 hp at the drawbar is taken to be the equivalent power. A tractor that develops 75 hp at the drawbar, then, is equivalent to five tractors of 15 hp each. [29–1746–4]

EQUIVALENTS, LAW OF, a law of chemistry according to which the proportions of the masses of substances entering into chemical reaction are equal to or multiples of their equivalent weights. At the end of the 18th century, J. Richter presented a partial formulation of the law for the neutralization of an acid by a base; the law was formulated in more general terms by the British chemist W. Wollaston in 1807. [29–1749–2]

ERIC THE RED (also Eric Thorvaldsson). Tenth-century Norse navigator; father of Leif Ericson.

In 981 or 982, Eric the Red was the first to explore the southern and southwestern coasts of Greenland and gave the island its name. He established the first Norse settlements on its southern coast. In 985, Eric returned to Greenland. [29–1729–3]

ESOCIDAE, a family of fishes of the suborder Esocidei. The body is sagittate and reaches 1.5 m in length and 35 kg in weight. The head is large, and the snout extremely elongated and flattened on top. The teeth are located on the intermaxillary bones, vomer, palatal bones, lower jaw, and tongue. The mandibular teeth are dagger-shaped. The gill membranes are not fused. The operculum is rectangular and elongate. Small scales cover the body and head.

The family contains a single genus, *Esox* (pike), with the two subgenera *Esox* and *Kenoza*, which embrace five extant species. The northern pike (*E. lucius*) is distributed in northern waters of Europe, Asia, and America, and the Amur pike (*E. reicherti*) inhabits the basin of the Amur and bodies of water on Sakhalin Island. The muskellunge (*E. masquinongy*), the common pickerel (*E. niger*), and the redfin pickerel (*E. americanus*) are found only in eastern North America.

The Esocidae inhabit fresh or slightly brackish waters with rich vegetation. They feed on other fishes, including their own young, as well as frogs, small rodents, and swimming birds. They reach sexual maturity in three to four years. The fish spawn in early spring and early summer near the coast in shallows (0.4–1 m). They deposit 17,500–215,000 roe on coastal plants. The eggs adhere to the plants and in two or three days fall to the bottom and develop there. The Esocidae are popular commercial fish. In some places, for example, in the Byelorussian SSR, they are farmed.

The Esocidae are known in fossil form from the Oligocene.

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E. K. SYCHEVSKAIA [29–1619–1]

ESOCOIDEI, a suborder of bony fishes of the order Salmoniformes. The soft fin rays have no barbs. The adipose fin is absent, and the dorsal and anal fins are usually located on the rear third of the body. The teeth are located on the premaxillary and palatine bones, on the dentry and vomer, and at the base of the gill and hyoid apparatus. The swim bladder is connected to the intestine. The scales are cycloid. The Esocoidei are predatory fish; some are omnivorous. They are distributed in the temperate zones of the northern hemisphere, usually in freshwaters. Fossils have been found in late Paleocene and in Eocene deposits. The suborder comprises three families: Esocidae, with the single genus *Esox* (pikes); Umbridae (mudminnows); and Dallidae (blackfish).

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[29–1618–3]

ESOPHAGITIS, inflammation of the mucosa of the esophagus. Esophagitis may be an independent disease or, more often, a symptom of another disease of the esophagus, stomach, or other organ. The inflammation is frequently caused by chemical, mechanical, or thermal irritation of the esophagus; for example, it may be caused by eating very hot and spicy food.

Catarrhal, phlegmonous, necrotic, and other forms of esophagitis are distinguished based on the severity of the inflammatory changes. In severe cases the inflammatory process may extend to the muscular layer of the esophagus, and sometimes, to the surrounding mediastinal tissue, giving rise to mediastinitis. One form of the disease, peptic esophagitis, is caused mostly by a reflux of the acidic contents of the stomach into the esophageal lumen in cases of hiatus hernia. Peptic esophagitis is sometimes associated with the development of an ulcer in the esophageal wall.

The course of the disease may be acute or chronic. Chronic esophagitis is frequently caused by alcohol abuse or smoking. The symptoms include a burning sensation, retrosternal pain on swallowing, excessive salivation, and regurgitation of food. Esophagoscopy is sometimes used to diagnose the disease. Treatment is by diet (eliminating coarse, hot, and acidic foods), pain relievers, astringent and antispasmodic drugs, and, in some forms, antibiotics and surgery.

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I. V. IAREMA [29–1696–1]

ESOPHAGOSCOPY, examination of the inner surface of the esophagus with a special instrument, esophagoscope, which is equipped with an optical system. The esophagoscope is introduced through the mouth under local or general anesthesia. Esophagoscopy is used for diagnostic and therapeutic purposes. It is helpful in detecting tumors and other diseases of the esophagus, as well as the cicatricial narrowing of the esophageal lumen. Esophagoscopy is also used in taking a biopsy, performing bougienage, and locating and removing a foreign body. The once widely used rigid steel esophagoscopes were replaced in the 1970's by flexible and less traumatic fiberscopes. [29–1696–2]

ESOPHAGOTOMY, incision or transection of the esophageal wall to open and pass through the lumen of the esophagus. Esophagotomy is performed to remove foreign bodies from the esophagus or eliminate any obstruction, for example, a tumor. Transection of the esophagus and healing of its ends to the skin are used in experimental physiology (*see* SHAM FEEDING). [29–1695–3]

ESPALIER, a method of crop cultivation by which the above-ground portion of the plant is attached to some type of support, or espalier (poles, stakes, trellises made from rods, walls, or frames with several rows of wire or cord stretched across them). This method of cultivation is used for grapevines, fruit trees, berry shrubs, vegetable crops, and ornamental plants. [29–1386–2]

ESPIONAGE, a crime involving the secret gathering or stealing of information (including economic information) that constitutes state secrets with the intent of turning the information over to another state to the detriment of the state from which the information was taken. Espionage is treated as a crime by the legal systems of all countries. It is one type of subversive activity used by imperialist intelligence services against the USSR and other countries of the socialist camp.

Under Soviet criminal law, espionage is defined as an especially dangerous state crime involving the transmission, or the stealing or gathering with the intent to transmit, of military or state secrets to a foreign state or organization or to agents thereof. It may also include the transmission of other information to be used against the interests of the USSR or the collection of such information on commission from a foreign intelligence agency.

Espionage is considered to have been committed from the moment that the information is obtained, regardless of whether or not it has been transmitted. An unsuccessful attempt to obtain espionage information—for example, an attempt to buy a state secret from a person who legally possesses it—constitutes attempted espionage. If classified state or military information has been obtained and transmitted, the actions of the guilty person are defined as espionage, whether he acted on his own initiative or on commission from a foreign state or organization or from agents thereof. Obtaining and transmitting other information is defined as espionage if these actions are performed on commission from foreign intelligence bodies and if the information is obtained or transmitted for use against the interests of the USSR.

Espionage committed by a citizen of the USSR is treason against the homeland. It carries a sentence of ten to 15 years' deprivation of freedom with confiscation of property, with or without additional exile for a term of two to five years, or execution with confiscation of property (art. 64 of the Criminal Code of the RSFSR and the corresponding articles of the criminal codes of the other Union republics). Espionage committed by a foreigner or person without citizenship is punishable by deprivation of freedom for seven to 15 years with confiscation of property, with or without additional exile for a term of two to five years, or by execution with confiscation of property (art. 65 of the Criminal Code of the RSFSR and the corresponding articles of the criminal codes of the other Union republics).

Espionage is used extensively by the bourgeois states. The USA, for example, has a special intelligence agency known as the Central Intelligence Agency. Intelligence divisions within other departments and ministries also perform espionage and intelligence-gathering activities. At the same time, every capitalist state maintains extremely harsh punishments for espionage committed against it. In accordance with the criminal code of France, espionage is punished by execution. The penalty under British law is execution or hard labor.

Liability for military espionage—that is, secretly and under false pretenses collecting information about the enemy in a zone of military action for the purpose of transmitting the information to one's own command—is regulated by international law under the Statute on the Laws and Customs of Land Warfare, which is appended to the Hague Convention of 1907. A state that has arrested a spy has the right to punish him according to the state's discretion, after a legal trial. [29–1397–2]

EUCALYPTUS, a genus of plants of the family Myrtaceae. The genus consists mainly of evergreen trees frequently reaching a height of 100 m; there are some shrubs. The arrangement and shape of the leaves vary according to the age of the plant. The leaves are always entire, and they are usually fragrant owing to the presence of essential oil. The flowers are regular and bisexual. There are numerous stamens, and the ovary is inferior. The fruit is a capsule consisting of a truncated woody calyx tube to which the ovary is fused.

There are more than 525 species of eucalyptus; they are commonly found in Australia and Tasmania, as well as on neighboring islands. The USSR has more than 30 cultivated species, growing mainly on the Black Sea coast of the Caucasus. Almost all subtropical and tropical countries cultivate eucalypts, since the plants yield valuable wood and grow rapidly. Also of economic value are the leaves, which yield essential oil, and the bark, which yields tannins. Eucalyptus oil and eucalyptus teas or tinctures are used medicinally as antiseptic and anti-inflammatory rinses and inhalants to treat infections of the upper respiratory tract; the medicines are also used to treat wounds and some gynecological disorders. A eucalyptus tincture may also be prescribed to treat inflammation of the mouth and, sometimes, as a sedative.

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M. E. KIRPICHNIKOV [29–1650–2]

EUCALYPTUS FORESTS, forests of various species of eucalyptus. Eucalyptus forests are common in Australia and, to a lesser extent, in Tasmania and Indonesia. Because of the vertical arrangement of eucalyptus leaves, a significant amount of light penetrates the forest canopy, and a well-expressed grass stratum and, often, a brush stratum form.

Eucalyptus forests are most widespread in regions having a subtropical climate with atmospheric precipitation occurring in the winter. The height and density of the stand diminish as the climate becomes more arid. In the more humid regions of southwestern Australia, where atmospheric precipitation is more than 1,250 mm a year, there are forests of *Eucalyptus diversicolor*. The open stands have an average canopy height of 60–75 m. In the drier eastern regions, where precipitation totals 625–1,250 mm a year, low eucalyptus forests of *Eucalyptus marginata*, averaging 15–20 m in height, occur. Fully developed brush and grass strata predominate, and insectivorous plants are characteristic. In the center of the continent, where atmospheric precipitation is 500–625 mm, there are open woodlands of *Eucalyptus nedunca* spp. *wando*. In arid regions low eucalyptus savannas, called mollees, occur. [29–1650–4]

EUCALYPTUS OIL, a natural essential oil obtained from the leaves and young shoots of various eucalypts by distilling with steam. The most important eucalyptus oil is obtained from the Tasmanian blue gum (*Eucalyptus globulus* Labill); its primary component is cineole. A colorless or light yellow liquid, it has a cooling taste and a camphoraceous-ethereal odor. The density at 15°C is 0.905–0.922 g/cm^3. The oil is used in medicine.

Another oil is obtained from *Eucalyptus dives*, which contains piperitone, the source of thymol and menthol. The oil derived from *Eucalyptus citric dora* Hook is a component of fragrances for bath soap and a source of citronellal. [29–1650–3]

EUCKEN, RUDOLF. Born Jan. 5, 1846, in Aurich, East Friesland; died Sept. 15, 1926, in Jena. German idealist philosopher.

A follower of J. G. Fichte, Eucken formulated the concept of a "metaphysics of the spirit." He was professor of philosophy in Basel from 1871, and in Jena from 1874.

Eucken opposed the positivist-naturalist world view and called for a revival of idealist metaphysics. Asserting the eternity and unity of the spiritual world and its absolute meaning and value, Eucken worked out a "noological" interpretation of spiritual life whereby the latter was regarded not only as a psychological phenomenon but also as an eternal value. He called for the establishment of a vitalist religious system with a personalized being at its

center, and he considered spiritual life to be permeated with moral principles. Although he viewed religion as the absolute basis of spiritual life, he criticized its historical forms and had a negative attitude toward the church.

Eucken was awarded the Nobel Prize for literature in 1908.

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[29–1706–1]

EUCKEN, WALTER. Born Jan. 17, 1891, in Jena; died Mar. 20, 1950, in London. German economist.

Eucken received his doctorate from the University of Berlin in 1921. He became a professor at the University of Tübingen in 1925 and was a professor at the University of Freiburg from 1927 to 1950. Eucken was a theorist of West German neoliberalism, a doctrine of large-scale monopoly capital that advocates government intervention in the economy but disguises it as a defense of free enterprise.

According to Eucken, all economic systems in the history of mankind can be divided into two ideal types: free-market economies and centrally managed economies. In this classification, which is based on forms of economic management, the socialist economy is treated as a centrally managed economy, a category that includes, along with the economic systems of the pharaohs and feudalism, the economy of fascist Germany. The socialist economy is regarded as a "supermonopoly," allegedly lacking effective management, as opposed to a "rational and harmonious social market economy," such as that of the Federal Republic of Germany.

Eucken's theory, which distorts the nature of socialism and socialist planning, is demagogic in character and attempts to conceal the growing strength of large-scale monopoly capital.

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[29–1705–4]

EUCLASE, a mineral of the nesosilicate subclass, with the chemical composition $AlBe[SiO_4](OH)$. Euclase contains admixtures of Ge, Mn, Cu, and, sometimes, Y, B, Sn, Zn, and Pb.

Euclase crystallizes in the monoclinic system. Its structure consists of zigzag-like chains of $[BeO_3(OH)]$ incrustated with SiO_4 tetrahedrons. The latter are bound by aluminum atoms in octahedral coordination. Lamellar and short and long prismatic crystals are typical, as well as plumose and divergent aggregates, seldom larger than 1 cm across. Vertical striation is common on the facets of the prism. Euclase may be colorless, milky white, light yellow, pale blue, or greenish. It has a vitreous luster and is transparent to translucent. It typically has perfect cleavage. Its hardness on Mohs' scale is 7.5, and its density is 3,020–3,100 kg/m^3.

Euclase is usually found in hydrothermal deposits of the fluorite-phenakite-bertrandite formation, where it is associated with muscovite, quartz, fluorite, phenakite, and bertrandite or with tourmaline, fluorite, and chrysoberyl. It sometimes occurs in granitic pegmatites, where it develops together with bertrandite after beryl, and in alpine veins. Large transparent crystals of euclase are gems of order, or class, I. Euclase, together with phenakite, bertrandite, and sometimes chrysoberyl, is included in the composition of complex beryl ores.

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A. I. GINZBURG [29–1651–2]

EUCOMMIA, the sole genus of plants of the family Eucommiaceae. The single species, *Eucommia ulmoides*, is native to China. A deciduous tree reaching 10–20 m in height, it has elongate or oblong-ovate serrated alternate leaves. Some shrub forms are known. The plants are mostly dioecious, with small regular flowers lacking a perianth. The ovary consists of two carpels but is single-valved. The fruit is closed, usually one-seeded, and winged. There are laticiferous cells in all parts of the plant except the wood and seeds; the cells contain gutta, the main component of gutta-percha.

Since early antiquity, *Eucommia* has been used as a medicinal plant to treat broken bones and various internal diseases; it has also been used as a tonic. In the USSR the plant is cultivated primarily in Transcaucasia, Krasnodar Krai, Moldavia, and Middle Asia mainly for the extraction of gutta-percha. It is also cultivated as an ornamental. The bark is used medicinally for the preparation of decoctions, fluid extracts, and tinctures that are used as antispasmodic and hypotensive agents to treat the early stages of hypertension.

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M. E. KIRPICHNIKOV [29–1651–4]

EUDAEMONISM, in ancient times the interpretation of life and later, in ethics, the interpretation and theoretical justification of morality according to the principle that happiness, or "bliss," is man's highest goal.

A premise of ancient eudaemonism was the Socratic idea of inner freedom, achievable through the individual's self-knowledge and nondependence on the outside world. Although eudaemonism and hedonism arose at the same time and were closely interrelated, they are in a certain sense opposites. Happiness is not simply Aristotle's protracted and harmonious pleasure but rather the result of overcoming the desire for sensual gratification—a result achieved through practice, self-restraint, asceticism, renunciation of one's attachment to the outside world and its blessings, and consequent freedom from external necessity and from the vicissitudes of life; happiness is judicious reasoning, identical to true virtue.

For the Cynics, the governing principle of life is the struggle against the passions that enslave mankind. The Cyrenaics' doctrine is essentially an elaboration of the same motifs—namely, that happiness depends not on external circumstances but on the right attitude toward them. The Stoics define man's inner freedom as the joyful submission to fate, inasmuch as what has meaning for man depends only on man's attitude toward external circumstances and not on life's vicissitudes.

In the modern age this ideal of inner freedom has been developed by many philosophers; B. Spinoza, in particular, showed exceptional acuity in his antithesis between rational consciousness and sensual passions and in his purely intellectual conception of bliss—*amor dei intellectualis*, or "intellectual love of god."

The French materialists, such as C. A. Helvétius and P. Holbach, gave the concept of happiness a frankly hedonist cast; naturalist motifs became predominant in eudaemonism, as can be seen particularly in English utilitarianism.

T. A. KUZ'MINA [29–1638–1]

EUDES, ÉMILE FRANÇOIS DESIRÉ. Born Sept. 12, 1843, in Roncey; died Aug. 5, 1888, in Paris. Member of the Paris Commune of 1871; Blanquist.

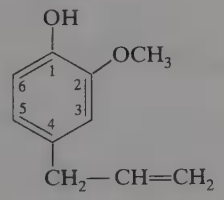
Eudes contributed to Blanquist publications and took an active part in the work of the organization that was founded by L. A. Blanqui in 1868 and 1869. For his participation in the Blanquist uprising that took place on Aug. 14, 1870, in the la Villette quarter of Paris, he was sentenced to death; he was subsequently freed, however, as a result of the September Revolution of 1870. During the seige of Paris by Prussian troops, Eudes was the commander of a battalion of the National Guard. He played a prominent role in the uprising of Mar. 18, 1871. Eudes was a member of the Paris Commune and served on its executive and military commissions. He commanded one of the columns of the National Guard in its march on Versailles on Apr. 3 and 4, 1871.

Eudes emigrated after the fall of the Commune, but he returned to France after the amnesty of 1880 was declared. Eudes was one of the leaders of the Blanquist Central Revolutionary Committee, which was formed in 1881. [29–1677–5]

EUDIALYTE, a mineral; a zirconium silicate with the chemical composition $Na_2Ca_6Fe_3Zr_3[Si_3O_9]_2[Si_9O_{24}(OH)_3]_2$. Eudialyte contains 12–14.5 percent ZrO_2 and admixtures of rare-earth elements (up to 7 percent TR_2O_3). It crystallizes in the trigonal system, forming lamellar, prismatic, and rhombohedral crystals. It usually occurs in the form of granular masses. It is raspberry red, pink, brown, or yellow and has an imperfect cleavage and a vitreous luster. Its hardness on Mohs' scale is 5, and its density is 2,600–3,190 kg/m^3.

Eudialyte fuses easily and dissolves in acids. It is found in nepheline syenites, syenitic pegmatites, albite-aegerine metasomites, and other rocks. It occurs on the Kola Peninsula and in Scandinavia, Tuva, Krasnoiarsk Krai, the Saian Mountains, Canada, and elsewhere. When it occurs in significant accumulations, eudialyte is a source of zirconium. [29–1638–2]

EUGENOL (also 4-allyl-2-methoxyphenol), a yellowish liquid having the structural formula



Eugenol has the odor of cloves. It is soluble in alcohol and ether and slightly soluble in water. It has a melting point of 10.3°C, a boiling point of 252.7°C, and a density of 1.066 g/cm^3 at 20°C. Eugenol is extracted from essential oils, including clove oil, which has a eugenol content of up to 95 percent, and the oil of East Indian basil, which is approximately 70 percent eugenol. It can be synthesized from such compounds as guaiacol.

Eugenol is used as an aromatic substance in the manufacture of perfumes and vanillin. [29–1636–4]

EUGEOSYNCLINE, the inner, more mobile part of a geosynclinal system and the part permeated with products of magmatism, in contrast to the outer, less mobile miogeosynclinal zones that adjoin the platforms. Eugeosynclines are usually extended linear zones, stretching hundreds or thousands of kilometers. The lower parts of their stratigraphic cross sections are usually composed of ophiolites, and the upper parts, of detrital graywacke beds, flysch, and reef limestones, primarily associated with andesitic volcanic rocks. The layers are intricately folded, often forming imbricate structures and overthrust nappes; the latter may be shifted. The development of eugeosynclines ends with the formation of intricately constructed folded zones with a continental crust. High-temperature metamorphism develops parallel with deformation, in the course of which a granite-metamorphic layer gradually forms.

Examples of eugeosynclines are the Tagil'-Magnitogorsk Zone of the Urals and the Piedmont region of the Alps. Typical eugeosynclines first undergo an oceanic stage of development, with the formation of abyssal sediments and basic volcanic rocks. This is followed by the stage of island arcs and marginal seas. Thus, eugeosynclines emerge in place of former ocean basins (or marginal seas with an oceanic crust) and active transitional zones between the ocean and the continent, which were included in the folded belts of the continents during orogenic processes. An important group of minerals is found in eugeosynclines: ores of platinum, chromium, iron, and copper; complex ores and asbestos ores.

L. P. ZONENSHAIN [29–1636–5]

EUGLENA, a genus of microscopic motile single-celled organisms of the division Euglenophyta. The cell is spindle- or ribbon-shaped, with a pellicle in front, a single external flagellum, and a stigma next to the gullet. The ocellus is red. The chloroplasts are green and frequently complex in structure.

About 60 species of euglenas are known. They mainly inhabit shallow bodies of water, where they swim at any depth. Some species, such as *Euglena viridis*, can discard the flagellum and creep or, after taking on a spherical form, live immobile on the surface of the water, silt, or soil. Under unfavorable conditions they become transformed into spores. Nutrition is usually myxotrophic, or if there is a loss of chlorophyll, saprophytic. The organisms are distributed widely and sometimes cause the coloration of waters. *Euglena sanguinea*, which is rich in carotene, makes water red. Euglenas are used in laboratory experiments. [29–1637–1]

EUGLENOPHYTA, a division of microscopic algae usually consisting of a single free-swimming cell. Colonial forms are rare. The nucleus is clearly pronounced, and the green, rarely colorless, chloroplast may lack pyrenoids. The plastmatic cover, or periplast, of some species bears hard, iron-incrusted capsules. At the anterior end of the cell there is a gullet, through which one, two, or sometimes more flagella extend. The contracting vacuoles and stigma are located on the sides of the gullet. In creeping forms the flagellum is rudimentary. Reproduction is by means of longitudinal splitting. Under unfavorable conditions, some species discard their flagella and form protective spores (cysts). Nutrition is primarily phototrophic in green individuals and saprophytic and holozoic (according to the animal type) in colorless individuals. Parasitic species are few in number. The carbohydrate paramylum and oil serve as a food reserve.

There are about 60 genera, embracing more than 900 species, usually found in shallow reservoirs rich in organic matter. The USSR has 33 genera, with 429 species. The algae give water a green, red, or brown coloration when they grow abundantly. Many zoologists classify the Euglenophyta among the Protozoa.

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L. A. RUNDINA [29–1637–2]

EULER, LEONHARD. Born Apr. 4 (15), 1707, in Basel, Switzerland; died Sept. 7 (18), 1783, in St. Petersburg. Mathematician, physicist, and mechanics specialist.

Euler received his initial education from his father, Paul Euler, a village pastor of modest means who as a young man had studied mathematics under Jakob Bernoulli. From 1720 to 1724, L. Euler studied at the University of Basel, where he attended the mathematics lectures of Johann Bernoulli.

In late 1726, Euler was offered a position at the St. Petersburg Academy of Sciences, and in May 1727 he arrived in St. Petersburg. The academy, which had just been organized, provided him with favorable conditions for scientific work, and he immediately undertook research in mathematics and mechanics. During the 14 years of the first St. Petersburg period of his life, he prepared approximately 80 works for publication and published more than 50. He learned Russian in this period.

Euler took part in various activities of the academy. He gave courses at the Academy University, was a member of several commissions of technical experts, and worked on the compilation of maps of Russia. In addition to writing the popular *Einleitung*

in die Arithmetik (Introduction to Arithmetic; 1738–40; Russian translation, parts 1–2, 1740), he prepared, at the academy's request, *Scientia navalis* (Naval Science; parts 1–2, 1749), a basic work on the theory of shipbuilding and navigation.

In 1741, Euler accepted an invitation from Frederick II, the king of Prussia, to join the Berlin Academy of Sciences, which Frederick was planning to form from the academy founded by G. W. von Leibniz. In Berlin, Euler was appointed director of the academy's mathematics class and a member of the board. He ran the academy for several years after the death of its first president, P. L. de Maupertuis. In his 25 years in Berlin, Euler produced approximately 300 works, including several large monographs.

While living in Berlin, Euler continued to work intensively for the St. Petersburg Academy of Sciences, of which he remained an honorary member. He carried on an extensive correspondence dealing with scientific and organizational matters; in particular, he corresponded with M. V. Lomonosov, whom he highly esteemed. Euler edited the mathematics section of the Russian academy's journal, in which he published during this period nearly as many papers as in the *Mémoires* of the Berlin Academy of Sciences. He helped train Russian mathematicians; the future academicians S. K. Kotel'nikov, S. Ia. Rumovskii, and M. Sofronov were sent to Berlin to study under his direction. Euler greatly assisted the St. Petersburg Academy of Sciences by, for example, acquiring scientific literature and equipment and negotiating with candidates for positions at the academy.

On July 17 (28), 1766, Euler and his family returned to St. Petersburg. Despite his age and the nearly total blindness that befell him, he worked productively to the end of his life. In the 17 years of his second stay in St. Petersburg he wrote approximately 400 works, including a number of large books. Euler continued to be involved in organizational work at the academy. In 1776 he was a member of the commission of experts appointed to study I. P. Kulibin's design for a single-arch bridge across the Neva River; Euler was the only one on the commission to offer enthusiastic support for the project.

Euler's accomplishments as a scientist and organizer of scientific research won wide recognition during his lifetime. In addition to the St. Petersburg and Berlin academies, he was a member of such prominent scientific institutions as the Académie des Sciences in Paris and the Royal Society of London.

Euler was extraordinarily prolific. Approximately 550 of his books and papers were published during his lifetime. He produced a total of approximately 850 works. In 1909 the Swiss Society of Natural Sciences undertook the publication of his complete collected works. The edition, which was completed in 1975, consists of 72 volumes. Euler's immense scientific correspondence, which comprises approximately 3,000 letters, is also of considerable value; it has been published only in part.

The range of Euler's interests was unusually broad. In addition to all branches of the mathematics of his time, it included mechanics, elasticity theory, mathematical physics, optics, music theory, the theory of mechanisms, ballistics, naval science, and insurance. Approximately three-fifths of Euler's works pertain to mathematics, and the remaining two-fifths pertain chiefly to applications of mathematics.

Euler systematized his own findings and those of others in several classic monographs, which were written with remarkable clarity and provided with valuable examples. These monographs include *Mechanica, sive motus scientia analytice exposita* (Mechanics, or the Science of Motion Expounded Analytically; vols. 1–2, 1736); *Introductio in analysin infinitorum* (Introduction to the Analysis of Infinitesimals; vols. 1–2, 1748); *Institutiones calculi differentialis* (Principles of Differential Calculus; 1755); *Theoria motus corporum solidorum seu rigidorum* (Theory of the Motion of Solid or Rigid Bodies; 1765); *Vollständige Anleitung zur Algebra* (Complete Introduction to Algebra; first published in Russian translation, vols. 1–2, 1768–69), which was published in about 30 editions in six languages; and *Institutiones calculi integralis* (Principles of Integral Calculus; vols. 1–3, 1768–70; vol. 4, 1794). Euler's *Lettres à une princesse d'Allemagne sur quelques sujets de physique et de philosophie* (Letters to a German Princess on Various Matters of Physics and Philosophy; parts 1–3, 1768–74) was published in more than 40 editions in ten languages. Lucidly written, it enjoyed great popularity in the 18th century and was still read in the 19th century. Much of the material in Euler's monographs was subsequently incorporated into textbooks and study guides for higher educational institutions and, to some extent, for secondary schools.

It would be impossible to list all of Euler's theorems, methods and formulas, only a few of which are known in the literature by his name. Among the various mathematical entities or expressions named for him are Euler's constant, the Euler phi-function, Euler numbers, the Euler characteristic, Euler's integrals, and Euler angles.

In *Mechanica* mathematical analysis is applied for the first time to the dynamics of a point. The first volume of the work deals with the free motion of a point under the action of various forces, both in a vacuum and in a medium that offers resistance. The second volume treats of the motion of a point along a given curve or surface. The chapter on the motion of a point under the action of a central force was of great importance in the development of celestial mechanics. In 1744, Euler gave the first correct formulation of the principle of least action and provided the first examples of the principle's application. In *Theoria motus corporum solidorum seu rigidorum* he discussed the kinematics and dynamics of rigid bodies and gave the equations of their rotation about a fixed point, thereby laying the foundations of the theory of gyroscopes. Euler's theory of ships made a valuable contribution to the theory of stability. Among his important discoveries in celestial mechanics are his contributions to the theory of lunar motion. In continuum mechanics he derived the fundamental equations of the motion of an ideal fluid in Eulerian and Lagrangian variables and studied the oscillations of a gas in tubes.

In optics Euler gave in 1747 an equation for a biconvex lens and proposed a method of calculating the refractive index of a medium. An adherent of the wave theory of light, he believed that to different colors there correspond different wavelengths of light. He suggested techniques of eliminating chromatic aberration in lenses and, in the third part of *Dioptrica* (Dioptrics), gave methods of designing the optical assemblies of microscopes.

In a large series of works begun in 1748, Euler studied such problems as the vibration of strings, plates, and membranes. In general his works dealing with physics and mechanics stimulated the development of such fields as the theory of differential equations, approximate methods of analysis, special functions, and differential geometry. They contain many of his mathematical discoveries.

Euler's most important achievements as a mathematician were in the field of mathematical analysis. He laid the foundations of several areas of study that existed only in incipient form or were altogether absent in the infinitesimal calculus of I. Newton, Leibniz, Jakob Bernoulli, and Johann Bernoulli. For example, Euler was the first to introduce functions of a complex variable (*Introductio in analysin*, vol. 1) and to investigate the main elementary functions—that is, exponential, logarithmic, and trigonometric functions—of a complex variable. Of particular value was his derivation of formulas expressing relations between trigonometric functions and exponential functions. Euler's work in this area gave rise to the theory of functions of a complex variable.

Euler was the inventor of the calculus of variations, which he expounded in *Methodus inveniendi lineas curvas, maximi minimive proprietate gaudentes* (A Method of Finding Curves That Enjoy Some Maximum or Minimum Property; 1744). After the appearance of works on the subject by J. Lagrange, Euler further developed the calculus of variations in *Institutiones calculi integralis* and several papers. The method by which he derived in 1744 the necessary condition for the extremum of a functional (Euler's equation) was a prototype of the direct methods developed for the calculus of variations in the 20th century.

Euler created the theory of ordinary differential equations as an independent discipline and laid the foundations of the theory of partial differential equations. Here he made a tremendous number of discoveries. In addition to providing the classical method of solving linear equations with constant coefficients and the method of variation of arbitrary constants, he elucidated the main properties of the Riccati equation, developed the use of infinite series in integrating linear equations with variable coeffi-

cients, and established criteria for singular solutions. He also introduced the concept of an integrating factor, various approximate methods, and a number of procedures for solving partial differential equations. Many of his results are contained in *Institutiones calculi integralis*.

The differential and integral calculus in the narrow sense of the word were also enriched by Euler. In addition to the use of change of variables, his contributions include the proof of an important theorem on homogeneous functions, the introduction of the concept of the double integral, and the calculation of many special integrals. In *Institutiones calculi differentialis* he argued for the use of divergent infinite series and supplied his discussion with examples; he proposed generalized summation methods for series, thereby anticipating the ideas of the modern rigorous theory of divergent series developed at the turn of the 20th century. Moreover, Euler obtained a host of specific results in the theory of series. He discovered the Euler-Maclaurin summation formula, set forth the transformation of series that bears his name, determined the sums of an enormous number of series, and introduced into mathematics important new types of series, such as trigonometric series. His studies in the theory of continued fractions and other infinite processes may also be mentioned in this connection.

Euler was the founder of the theory of special functions. He was the first to treat the sine and cosine as functions rather than as line segments in a circle. He derived nearly all the classical expansions of elementary functions in infinite series and products. He originated the theory of the gamma function and investigated the properties of elliptic integrals, hyperbolic and cylindrical functions, the zeta function, some theta functions, the logarithmic integral, and important classes of special polynomials.

As P. L. Chebyshev notes, Euler was a pioneer in all the principal areas of the theory of numbers, to which more than 100 of his papers pertain. For example, he proved several assertions made by P. de Fermat (for example, Fermat's lesser theorem), developed the foundations of the theory of power residues and the theory of quadratic forms, discovered (but did not prove) the law of quadratic reciprocity (*see* QUADRATIC RESIDUE), and investigated a number of problems of Diophantine analysis. In his works on the expression of numbers as sums of other numbers and on the theory of primes, Euler was the first to use methods of analysis, thus becoming the founder of the analytic theory of numbers. In particular, he introduced the zeta function and proved a formula giving a relation between prime numbers and natural numbers [*see* EULER FORMULA: (3)].

Euler's contributions also were great in other areas of mathematics. In algebra he wrote papers on the solution by radicals of higher-degree equations, on equations in two variables, and on the sum of four squares [*see* EULER FORMULA: (4)]. Euler substantially advanced analytic geometry, especiallly with respect to quadric surfaces. In differential geometry he investigated in detail the properties of geodesics. He was the first to use natural equations of curves. His most important contribution in this area was that he laid the foundations of the theory of surfaces. He introduced the concept of principal directions at a point on a surface, proved the orthogonality of the principal directions, derived a formula for the curvature of any normal section, and initiated the study of developable surfaces. In a work published posthumously in 1862, he partially anticipated the studies of K. F. Gauss on the intrinsic geometry of surfaces. Euler also worked on some problems of topology and proved, for example, an important theorem on convex polyhedra.

As a mathematician Euler is often described as a brilliant calculator. He was in fact an unsurpassed master of formal computations and transformations. In his works many mathematical formulas and symbols took on their modern form; for example, he introduced the symbols e and π. Euler, however, was not just a calculator of exceptional power. He set forth a number of profound ideas that since his day have been given rigorous substantiation and that serve as models of deep insight into the objects of scientific inquiry.

P. S. de Laplace called Euler the teacher of the mathematicians of the second half of the 18th century. Euler's works provided starting points for investigations in various areas of mathematics by Laplace, Lagrange, G. Monge, A. M. Legendre, and Gauss and later by such mathematicians as A. Cauchy, M. V. Ostrogradskii, and P. L. Chebyshev. Russian mathematicians held his work in high regard. The members of the Chebyshev school viewed Euler as their intellectual predecessor because of his constant sense of the concrete and specific, his interest in concrete difficult problems requiring the development of new methods, and his desire to obtain the solutions of problems in the form of complete algorithms that would make it possible to find the answer to any required degree of accuracy.

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Adapted from EULER, LEONHARD in the 2nd edition of *Bol'shaia Sovetskaia Entsiklopediia* [29–1708–4]

EULER, ULF SVANTE VON. Born Feb. 7, 1905, in Stockholm. Swedish physiologist. Son of H. von Euler-Chelpin.

In 1929, von Euler graduated from the Karolinska Institute in Stockholm, where he served as an assistant professor in the pharmacology department in 1930 and became professor of physiology in 1939. In 1930 he worked in H. Dale's laboratory in London, where he discovered the presence of a biologically active polypeptide, substance P, in intestinal tissue. His main research is concerned with the physiology of adrenergic nerve endings. Von Euler discovered that norepinephrine is a neurotransmitter of the sympathetic nervous system. He investigated in detail its distribution in nerves and organs and its metabolism under a variety of physiological and pathological conditions. Von Euler also discovered and studied the function of prostaglandin (1936) and norepinephrine (1946). He found subcellular particles containing norepinephrine and elucidated the mechanisms by which they obtain, store, and release norepinephrine.

Von Euler is a member of the Royal Swedish Academy of Sciences, the Danish Academy of Sciences, the Leopoldina German Academy of Naturalists, and the Royal Society of London (1973). He won a Nobel Prize in 1970, together with B. Katz and J. Axelrod.

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L. G. MAGAZANIK [29–1712–1]

EULER ANGLES (or Eulerian angles), the angles ϕ, θ, and ψ that define the position of a rectangular Cartesian coordinate system $OXYZ$ with respect to another rectangular Cartesian coordinate system $Oxyz$ of the same orientation (see Figure 1).

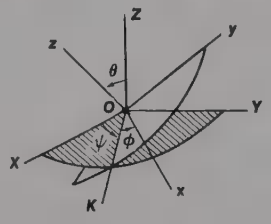

Figure 1

Let OK be an axis, called the line of nodes, that coincides with the line of intersection of the coordinate plane Oxy of the first system with the coordinate plane OXY of the second system and is directed so that the axes Oz, OZ, and OK form a trihedral of the same orientation. The Euler angle ϕ, or angle of spin, is the angle between the axes Ox and OK, which is measured in the plane Oxy from Ox in the direction of the shortest rotation from Ox to Oy. The Euler angle θ, or angle of nutation, is the angle between Oz and OZ; it does not exceed π. The Euler angle ψ, or angle of precession, is the angle between the axes OK and OX, which is measured in the plane OXY from OK in the direction of the shortest rotation from OX to OY. When $\theta = 0$ or π, the Euler angles are not defined.

The Euler angles were introduced by L. Euler in 1748 and are used extensively in the dynamics of solids—for example, in the theory of the gyroscope—and in celestial mechanics. [29–1718–1]

EULER CHARACTERISTIC. The Euler characteristic of a polyhedron is the number $\alpha_0 - \alpha_1 + \alpha_2$, where α_0 is the number of vertices, α_1 is the number of edges, and α_2 is the number of faces. According to Euler's theorem, if the polyhedron is convex or is homeomorphic to a convex polyhedron, then its Euler characteristic is 2. This fact was known to R. Descartes; L. Euler published a proof of the theorem in 1758.

The Euler characteristic of an arbitrary simplicial complex is the number

$$\sum_{k=0}^{n} (-1)^k \alpha_k$$

where n is the dimension of the complex, α_0 is the number of vertices, and α_1 is the number of edges. In general, k is the number of k-dimensional simplexes belonging to the complex. According to the Euler-Poincaré formula, the Euler characteristic is equal to

$$\sum_{k=0}^{n} (-1)^k \pi_k$$

where π_k is the k-dimensional Betti number of the complex. The topological invariance of the Euler characteristic follows from this fact.

In view of the topological invariance of the Euler characteristic, we speak of the Euler characteristic of a surface and of a polytope, by which we mean the Euler characteristic of any triangulation of the surface or polytope.

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EULER-CHELPIN, HANS KARL AUGUST SIMON VON. Born Feb. 15, 1873, in Augsburg, Germany; died Nov. 6, 1964, in Stockholm. Swedish biochemist. Member of the Royal Swedish Academy of Sciences. Descendant of L. Euler and father of U. Euler.

Euler-Chelpin graduated from the Munich Academy of Arts in 1893 and then studied chemistry and medicine at the universities of Berlin, Strasbourg, and Göttingen. He organized the Swedish Chemical Society and served as its president from 1908 to 1963. He was a professor at the University of Stockholm from 1906 to 1929. Beginning in 1929, he was director of the Institute of Organic Chemistry and the Institute of Vitamins.

Euler-Chelpin's works were devoted mainly to the mechanisms of various biochemical processes. Euler-Chelpin investigated the kinetics and fermentation mechanism of sugars. He observed that the rate of chemical reactions in living organisms is accelerated by enzymes and suggested calling the phenomenon biocatalysis. He also studied the structure and mechanism of action of vitamin A (with P. Karrer) and demonstrated that β-carotene is provitamin A and is present in eye pigment. He made substantial contributions to the biochemistry of tumors.

Euler-Chelpin received a Nobel Prize in 1929, with A. Harden. He was a foreign member of the Academy of Sciences of the USSR (1927).

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EULER-FOURIER FORMULAS, formulas for calculating the coefficients of the expansion of a function in a trigonometric series (Fourier series). The Euler-Fourier formulas are named after L. Euler, who provided their first derivation in 1777, and J. Fourier, who, beginning in 1811, systematically used trigonometric series in the study of problems of heat conduction. (*See* FOURIER COEFFICIENT and TRIGONOMETRIC SERIES.) [29–1717–1]

EULER-MACLAURIN SUMMATION FORMULA, a formula relating the partial sums of an infinite series to the integral and derivatives of the general term of the series:

$$\sum_{k=p}^{m-1} \phi(k) = \int_p^m \phi(t)\,dt + \sum_{\nu=1}^{n-1} \frac{B_\nu}{\nu!} \{\phi^{(\nu-1)}(m) - \phi^{(\nu-1)}(p)\} + R_n$$

where the B_ν are Bernoulli numbers and R_n is the remainder.

The formula is used for the approximate computation of definite integrals, for the investigation of the convergence of infinite series, for the computation of sums, and for the expansion of functions in Taylor's series. For example, if $m = 1$, $p = 0$, $n = 2m + 1$, and $\phi(x) = \cos(xt/2)$, the formula gives the following expression:

$$\frac{t}{2}\cot\frac{t}{2} = \sum_{\nu=0}^{m} (-1)^\nu \frac{t^{2\nu}}{(2\nu)!} B_2 + \frac{(-1)^{m+1} t^{2m+2}}{2\sin(t/2)} \int_0^1 \frac{B_{2m+1}(t)}{(2m+1)!} \sin\left(x - \frac{1}{2}\right)t\,dx$$

First introduced by L. Euler in 1738, the formula was discovered independently by C. Maclaurin in 1742. [29–1716–3]

EULER NUMBER, a similarity criterion used in the study of the motion of liquids or gases.

The Euler number Eu characterizes the relation between the pressure forces acting on an elementary volume of a liquid or gas and the inertia forces. It is defined by the formula

$$Eu = \frac{2(p_2 - p_1)}{\rho v^2}$$

(sometimes $2p/\rho v^2$), where p_2 and p_1 are the pressures at two characteristic points of the flow (or of a body moving in it), $\rho v^2/2$ is the velocity head, ρ is the density of the liquid or gas, and v is the fluid velocity (or the velocity of the body).

In the case of liquid flows with cavitation, the analogous criterion is called the cavitation number $\kappa = 2(p_0 - p_s)/\rho v^2$, where p_0 is the characteristic pressure and p_s is the saturation vapor pressure of the liquid.

For compressible gas flows the relation between the Euler number in the form $Eu = 2p/\rho v^2$ and two other similarity

criteria—the Mach number M and the ratio of the specific heats of the medium γ—is given by the equation $Eu = 2/\gamma M^2$, where $\gamma = c_p/c_v$ (c_p is the specific heat at constant pressure, and c_v is the specific heat at constant volume).

It should be noted that in the American literature two Euler numbers are often used. Euler number 1 equals the friction head divided by two times the velocity head, and Euler number 2 is equal to two times the Fanning friction factor.

The Euler number is named for L. Euler. [29–1716–2]

EULER NUMBERS, in mathematics, the integers E_n that are the coefficients of $t^n/n!$ in the expansion of the function $1/\cosh t$ in the power series

$$\frac{1}{\cosh t} = \sum_{n=0}^{\infty} E_n \frac{t^n}{n!}$$

These numbers, which were introduced by L. Euler in 1755, are related by the formula $(E + 1)^n + (E - 1)^n = 0$, $n = 1, 2, 3, \ldots$, $E_0 = 1$ (after raising to the power, E_k must be inserted for E^k). The following relations hold between Euler numbers and Bernoulli numbers:

$$E_{n-1} = \frac{(4B-1)^n - (4B-3)^n}{2n}$$

$$B_n = \frac{n(E+1)^{n-1}}{2^n(2^n-1)}$$

$$\left(B - \frac{1}{4}\right)^{2n+1} = \frac{2n+1}{4^{2n+1}} E_{2n}$$

Euler numbers are encountered in various formulas of mathematical analysis. [29–1716–1]

EULER PHI-FUNCTION. The Euler phi-function of the natural number a is the number $\phi(a)$ of natural numbers smaller than a and relatively prime to a:

$$\phi(a) = a\left(1 - \frac{1}{p_1}\right) \ldots \left(1 - \frac{1}{p_k}\right)$$

where $p_1, \ldots, p_k$ are the prime factors of a. The function was introduced by L. Euler in 1760 and 1761. If the numbers a and b are relatively prime, then $\phi(ab) = \phi(a)\phi(b)$. Euler's theorem states that if $m > 1$ and the greatest common divisor of a and m is 1 (that is, a and m are relatively prime), then the congruence $a^{\phi(m)} \equiv 1 \pmod{m}$ holds. Euler's phi-function is encountered in many problems of number theory. [29–1715–2]

EULER'S CONSTANT (or Mascheroni's constant), the limit

$$\lim_{n\to\infty} \left\{ \sum_{k=1}^{n} \frac{1}{k} - \ln n \right\} = C = 0.577215 \ldots$$

which was considered by L. Euler in 1740. Euler gave a number of representations for C in the form of series and integrals; for example,

$$C = \int_0^1 \left(\frac{1}{1-x} + \frac{1}{\ln x} \right) dx$$

$$1 - C = \sum_{n=2}^{\infty} \frac{1}{n} \{\zeta(n) - 1\}$$

where $\zeta(s)$ is the zeta function. Euler's constant is encountered in the theory of various classes of special functions, such as the gamma function. It remains unknown whether Euler's constant is an irrational number. [29–1713–4]

EULER'S EQUATION. (1) A differential equation of the form

$$(*) \qquad \sum_{k=0}^{n} a_k x^k y^{(k)} = f(x)$$

where $a_0, \ldots, a_n$ are constants. When $x > 0$, equation $(*)$ reduces, by the substitution $x = e^t$, to a linear differential equation with constant coefficients. Equation $(*)$ was studied by L. Euler in 1740. The equation

$$\sum_{k=0}^{n} A_k (ax + b)^k y^{(k)} = f(x)$$

reduces to it through the substitution $x' = ax + b$.

(2) A differential equation of the form

$$\frac{dx}{\sqrt{X}} + \frac{dy}{\sqrt{Y}} = 0$$

where $X(x) = a_0x^4 + a_1x^3 + a_2x^2 + a_3x + a_4$ and $Y(y) = a_0y^4 + a_1y^3 + a_2y^2 + a_3y + a_4$. Euler considered this equation in a number of works, the first of which dates from 1753. He showed that the general solution of the equation is a symmetric polynomial of degree 4 in x and y. This result provided the basis for the theory of elliptic integrals.

(3) A differential equation of the form

$$\frac{\partial F}{\partial y} - \frac{d}{dx}\left(\frac{\partial F}{\partial y'}\right) = 0$$

which is used in the calculus of variations to search for extrema of the integral

$$\int_a^b F(x, y, y')\, dx$$

The equation was derived by L. Euler in 1744. [29–1714–1]

EULER'S EQUATIONS. (1) In mechanics, dynamical and kinematical equations used in the study of the motion of a rigid body. The equations were introduced by L. Euler in 1765.

Euler's dynamical equations are differential equations of the motion of a body about a fixed point. They have the form

$$(1) \qquad \begin{aligned} I_x\dot{\omega}_x + (I_z - I_y)\,\omega_y\omega_z &= M_x \\ I_y\dot{\omega}_y + (I_x - I_z)\,\omega_z\omega_x &= M_y \\ I_z\dot{\omega}_z + (I_y - I_x)\,\omega_x\omega_y &= M_z \end{aligned}$$

where I_x, I_y, and I_z are the moments of inertia of the body about the principal axes of inertia (the origin of the frame of axes is the fixed point); ω_x, ω_y, and ω_z are the components of the instantaneous angular velocity of the body about the principal axes; M_x, M_y, and M_z are the corresponding moments of the forces acting on the body; and $\dot{\omega}_x$, $\dot{\omega}_y$, and $\dot{\omega}_z$ are the components of the angular acceleration.

Euler's kinematical equations give expressions for ω_x, ω_y, and ω_z in terms of the Euler angles ϕ, ψ, and θ. They have the form

$$(2) \qquad \begin{aligned} \omega_x &= \dot{\psi}\sin\theta\sin\phi + \dot{\theta}\cos\phi \\ \omega_y &= \dot{\psi}\sin\theta\cos\phi - \dot{\theta}\sin\phi \\ \omega_z &= \dot{\phi} + \dot{\psi}\cos\theta \end{aligned}$$

The system of equations (1) and (2) makes it possible to determine the moment of the forces acting on a body if the law governing the body's motion is known. Conversely, the system permits determination of the law governing the motion if the forces acting on the body are known.

(2) In hydromechanics, the differential equations of motion of an ideal fluid in Eulerian variables. Let the pressure p, the density ρ, the components of the fluid-particle velocities u, v, and w, and the components of the body force X, Y, and Z be regarded as functions of the three space coordinates x, y, and z and of time t (Eulerian variables). Then Euler's equations in rectangular Cartesian coordinates are

$$\begin{aligned} \frac{\partial u}{\partial t} + u\frac{\partial u}{\partial x} + v\frac{\partial u}{\partial y} + w\frac{\partial u}{\partial z} &= X - \frac{1}{\rho}\frac{\partial p}{\partial x} \\ \frac{\partial v}{\partial t} + u\frac{\partial v}{\partial x} + v\frac{\partial v}{\partial y} + w\frac{\partial v}{\partial z} &= Y - \frac{1}{\rho}\frac{\partial p}{\partial y} \\ \frac{\partial w}{\partial t} + u\frac{\partial w}{\partial x} + v\frac{\partial w}{\partial y} + w\frac{\partial w}{\partial z} &= Z - \frac{1}{\rho}\frac{\partial p}{\partial z} \end{aligned}$$

The solution of the general problem of hydromechanics in Eulerian variables reduces to determining u, v, w, p, and ρ as functions of x, y, z, and t if X, Y, and Z and the initial and boundary conditions are known. For this purpose, the equation of continuity in Eulerian variables

$$\frac{\partial \rho}{\partial t} + \frac{\partial(\rho u)}{\partial x} + \frac{\partial(\rho v)}{\partial x} + \frac{\partial(\rho w)}{\partial z} = 0$$

is appended to Euler's equations.

In the case of a barotropic fluid, whose density depends solely on pressure, the fifth equation is the equation of state $\rho = \phi(p)$; p is constant if the fluid is incompressible.

Euler's equations are used in solving various problems of hydromechanics.

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S. M. TARG [29–1714–2]

EULER'S FORMULA, any of several important formulas established by L. Euler.

(1) A formula giving the relation between the exponential function and trigonometric functions (1743):

$$e^{ix} = \cos x + i \sin x$$

Also known as Euler's formulas are the equations

$$\cos x = \frac{e^{ix} + e^{-ix}}{2}$$

$$\sin x = \frac{e^{ix} - e^{-ix}}{2i}$$

(2) A formula giving the expansion of the function $\sin x$ in an infinite product (1740):

$$\frac{\sin x}{x} = \prod_{n=1}^{\infty} \left(1 - \frac{x^2}{n^2\pi^2}\right)$$

(3) The formula

$$\sum_{n=1}^{\infty} \frac{1}{n^s} = \prod_{p} \frac{1}{1 - p^{-s}}$$

where $s = 1, 2, \ldots$ and p runs over all prime numbers.

(4) The formula

$$(a^2 + b^2 + c^2 + d^2)(p^2 + q^2 + r^2 + s^2) = x^2 + y^2 + z^2 + t^2$$

where

$$x = ap + bq + cr + ds$$

$$y = aq - bp \pm cs \mp dr$$

$$z = ar \mp bs - cp \pm dq$$

$$t = as \pm br \mp cq - dp$$

(5) The formula (1760)

$$\frac{1}{R} = \frac{\cos^2 \phi}{R_1} + \frac{\sin^2 \phi}{R_2}$$

Also known as the equation of Euler, it gives an expression for the curvature $1/R$ of a normal section of a surface in terms of the surface's principal curvatures $1/R_1$ and $1/R_2$ and the angle ϕ between one of the principal directions and the given direction.

Other well-known formulas associated with Euler include the Euler-Maclaurin summation formula and the Euler-Fourier formulas for the coefficients of expansions of functions in trigonometric series. [29–1715–1]

EULER'S INTEGRAL. The integral

$$(1) \qquad \mathrm{B}(a, b) = \int_0^1 x^{a-1}(1 - x)^{b-1}\, dx$$

is known as Euler's integral of the first kind or the beta function. It was studied by L. Euler in 1730 and 1731 and had been previously considered by I. Newton and J. Wallis.

The integral

$$(2) \qquad \Gamma(a) = \int_0^{\infty} x^{a-1} e^{-x}\, dx$$

is known as Euler's integral of the second kind or the gamma function. It was considered by Euler in 1729 and 1730 in a form equivalent to equation (2); equation (2) itself was given by Euler in 1781.

The name "Euler's integral" was introduced by A. Legendre. Such integrals make it possible to generalize to the case of continuously varying arguments the binomial coefficients C_m^n and the factorial $n!$: if a and b are natural numbers, then

$$\mathrm{B}(a, b) = \frac{1}{bC_{a+b-1}^{a-1}} \qquad \Gamma(a + 1) = a!$$

Integrals (1) and (2) converge absolutely if a and b are positive; they do not exist if a and b are negative. The following relations hold:

$$\mathrm{B}(a, b) = \mathrm{B}(b, a) \qquad \mathrm{B}(a, b) = \frac{\Gamma(a)\Gamma(b)}{\Gamma(a + b)}$$

The second relation expresses the beta function in terms of the gamma function. There are a number of relations between Euler's integrals, for different values of the argument, that generalize the corresponding relations between the binomial coefficients. Euler's integrals also may be considered for complex values of the arguments a and b. Euler's integrals are encountered in many problems of the theory of special functions; many definite integrals that do not have an elementary expression reduce to Euler's integrals.

The name "Euler's integral" is also sometimes applied to the integral

$$\int_0^1 u^{b-1}(1 - u)^{c-b-1}(1 - ux)^{-a}\, du = \frac{\Gamma(b)\Gamma(c - b)}{\Gamma(c)} F(a, b, c, x)$$

which expresses the hypergeometric function.

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[29–1717–3]

EULER SUBSTITUTIONS, substitutions used to reduce integrals of the form

$$\int R(x, y)\, dx$$

to integrals of rational functions, where $y = \sqrt{ax^2 + bx + c}$ and $R(x, y)$ is a rational function of x and y. The substitutions were proposed by L. Euler in 1768.

The first Euler substitution is

$$\sqrt{ax^2 + bx + c} = t - x\sqrt{a}$$

and is applicable if $a > 0$. The second Euler substitution is

$$\sqrt{ax^2 + bx + c} = xt + \sqrt{c}$$

and is applicable if $c > 0$. The third Euler substitution is

$$\sqrt{ax^2 + bx + c} = t(x - \lambda)$$

where λ is one of the roots of the trinomial $ax^2 + bx + c$; this substitution is applicable if the roots of the trinomial are real. In practice, Euler substitutions require cumbersome transformations, and various artificial procedures that simplify calculation are normally used instead of them.

Similar substitutions are made in number theory in the solution of indeterminate equations of second degree in rational numbers.

[29–1713–3]

EUPHAUSIACEA, an order of higher crustaceans. The body varies in length from 5 to 96 mm. Externally the animals resemble shrimp of the order Decapoda, differing from them in having gills that are not covered by a thoracic shield and that are located on the bases of the thoracic extremities. The biramous thoracic extremities are used only for swimming. The eyes are stalk-shaped; there are photophores on the eye stalks, as well as on the bases of several pairs of thoracic limbs and on the first four abdominal segments. The Euphausiacea are dioecious. Eggs are laid in the water. The larva leaves the egg during the nauplius stage, after which several more developmental stages follow; the cycle from egg to adult is completed in three or four months.

The order embraces approximately 90 known species, which are widely distributed in the world ocean, especially in subtropical and tropical regions. The animals reproduce in large numbers in some seas, where they are the source of food for various marine mammals and fishes. In the waters of Antarctica the accumulation of some species of whale is related to the mass reproduction of krill, including one member of the Euphausiacea, *Euphasia superba*. In the Barents Sea, the mass-reproducing species *Thysanoessa raschii* is a food source for herring, Eurasian perch, Atlantic cod, and other commercial fishes.

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A. V. IVANOV [29–1668–2]

EUPHEMISM, the replacement of coarse or offensive words and expressions with less offensive ones or of certain names with conventional designations. Euphemisms are the result of lexical taboos imposed by various prejudices, superstitions, and religious beliefs on the use of the names for specific objects and phenomena in life, thus necessitating other means of expression.

In the early stages of social development of many Indo-European peoples, the names of various animals were euphemisms. Thus, the Russian word *medved'* ("bear") is an artificially created compound meaning "honey-eater"; it replaced an earlier word, which was placed under taboo because of mythological beliefs. Among professional hunters the word *medved'* subsequently underwent a second taboo and was replaced with new euphemisms, such as *khoziain* ("master"), *mokhnach* ("hairy one"), and *lomaka* ("bone breaker"). When taboos are rooted in superstition and prejudice, euphemisms arise for the words for death and illnesses. Thus, Russian *umer* ("he died") is replaced with *otpravilsia k praotsam* ("he went to join his forefathers"), *otdal bogu dushu* ("he gave his soul to god"), or *prikazal dolgo zhit'* ("he ordered a long life").

In a civilized society one of the principal causes for the use of euphemisms is etiquette, which bans the use of coarse or indecent expressions. Thus, instead of saying "you are lying," one says "you are inventing things," "you are mistaken," or "you are not entirely correct." Physicians often use Latin names for illnesses or special medical terms: in Russian, "cancer" and "tbc" (both spelled with Latin letters) may be used for the standard Russian terms *rak* and *tuberkulez; smert'* ("death") may be replaced by *letal'nyi iskhod* ("fatal outcome"). In modern societies, euphemisms are also used to impose censorship on the revelation of military and state secrets. In such cases the proper names of countries, cities, and military units are replaced by letters and conventional designations, such as "N" and "Nth," or by descriptive expressions, such as "a neighboring power."

Some jargons, in addition to embellishments and euphemisms, also use reverse euphemisms, or dysphemisms, which involve the replacement of neutral expressions with coarser, more familiar, or more vulgar ones. Thus, Russian *dat' duba* (literally, "to give the oak"), *sygrat' v iashchik* (literally, "to play the box"), and *skopytit'sia* (literally, "to be knocked off one's feet") may be used for the neutral *umeret'* ("to die"). Such substitutions sometimes serve the purpose of disguising the meaning of conversations likely to be overheard.

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A. M. KUZNETSOV [29–1668–3]

EUPHONY, the organization of sound in artistic speech (primarily verse) based on the repetition of sounds; a synonym of phonics. In a narrower sense, the term "euphony" sometimes refers to articulatory and acoustic harmony in speech. A disharmonious succession of vowels at the boundary of two words is called a hiatus. [29–1669–1]

EUPHORIA, an elevated, joyful mood and feeling of satisfaction and well-being not consistent with objective circumstances. Individuals experiencing euphoria are usually optimistic and impervious to negative affects. Euphoria may be combined with an accelerated flow of thoughts and a tendency to vivid fantasizing, energetic but unproductive activity, and disinhibited desires. It may also be combined with slow thinking, passivity, inertness, and apathy.

Euphoria may be induced by small amounts of alcohol, morphine, and other narcotics, by hypoxia (for example, mountain sickness), and often by severe bodily disease. It may also be a symptom of organic brain disease, such as the growth of tumors or progressive paralysis. It may be combined with signs of feeblemindedness. [29–1732–1]

EUPHUISM, a florid, elegant style in English literature of the last third of the 16th century, consisting entirely of rhetorical turns of phrase and figures of speech; its guiding principle was a syntactic, lexical, and phonetic parallelism (J. Lyly's novel *Euphues*, the source of the term, the novels of R. Greene, and the early comedies of Shakespeare). Euphuism helped enrich the language of English literature and bring about its rapprochement with other European literatures. Karamzinism in Russian literature from 1790 to the 1810's is an analogous development.

In a broader sense, euphuism denotes a grandiloquent style replete with tropes, metaphors, and periphrases. [29–1669–3]

EURIPOS, a strait in the Aegean Sea, dividing the central part of the island of Evvoia from the mainland of Greece. It is approximately 8 km long and has a length of 40 m at its narrowest point, where it is crossed by a bridge. The strait has strong tidal currents. The seaport of Khalkis (Chalcis) is situated on the Evvoian side of the strait. [29–1664–3]

EUROPEAN BLACKBIRD (*Turdus merula*), a bird of the family Turdidae of the order Passeriformes. The body length is about 25 cm. The male has shiny black plumage and a yellow bill. The female and the young of both sexes are brown. The European blackbird is distributed in Europe, Northwest Africa, and Asia. In the USSR the bird is found from the western borders eastward to the Southern Urals; its range also includes the Caucasus and the mountains of Middle Asia. The bird lives in deciduous and mixed forests, as well as in orchards and parks. In Western Europe it is common in cities. The song of the male is very beautiful. The nests are on the ground near tree roots, on stumps, or on bushes. A clutch contains four to seven light blue speckled eggs, which are incubated by both parents for 13 or 14 days. The diet consists of insects, worms, mollusks, berries, and small fruits. [29–306–4]

EURYBATHIC ANIMAL, an aquatic animal capable of existing at various depths. Eurybathic animals include benthic animals whose area of distribution ranges over various vertical zones, as well as pelagic animals that make extensive vertical migrations. Eurybathic animals are contrasted with stenobathic animals. Many eurybathic animals are widely distributed and are sometimes even cosmopolitan. [29–1662–8]

EURYBIONT, an animal or plant organism capable of surviving under substantial changes of environmental conditions. For example, eurytherms inhabiting the ocean littoral survive regular dry periods at low tide, extreme heat in summer, and chilling and

sometimes even freezing in winter. Euryhaline animals inhabiting river estuaries tolerate substantial fluctuations in water salinity. A number of eurybathic animals inhabit areas with a broad range of hydrostatic pressure. Many terrestrial inhabitants of temperate latitudes are capable of surviving large seasonal fluctuations in temperature.

Some species have a higher survival capability because of their ability to tolerate unfavorable conditions in a state of anabiosis. These include many bacteria, the spores and seeds of many plants, adult perennial plants of cold and temperate latitudes, wintering buds of freshwater sponges and bryozoans, the eggs of branchiopods, adult arthropods of the phylum Tardigrada, and some rotifer. Hibernation fulfills a similar function for certain mammals. The oocysts of parasitic protozoans and the larvae and ova of certain nematodes tolerate extreme freezing and drying and are resistant to many toxins; all of these factors make it possible for them to retain their viability for a considerable time.

The larvae of some insects and crustaceans, such as dragonflies and land crabs, are aquatic, while the adults are terrestrial. Thus, the environmental conditions tolerated by a species vary greatly in different stages of the life cycle, although each stage tolerates a narrower range of conditions. This is also true of certain parasitic worms, which in different stages of their life cycle parasitize invertebrates, fishes, and mammals and live in the external environment.

Sometimes adult individuals can survive greater changes in environmental conditions than can the young of the same species, for example, certain aquatic invertebrates and fishes. Certain widely distributed species have various populations adapted to life in regions with various conditions; thus, the survival capability of a species as a whole is greater than that of a particular individual or of groups of organisms at a specific stage of development. Eurybionts are usually distributed far more widely than stenobionts.

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G. M. BELIAEV [29–1662–9]

EURYHALINE ANIMAL, an aquatic animal capable of tolerating substantial fluctuations in water salinity. The group includes many inhabitants of ocean littorals, river estuaries, brackish and ultrahaline waters, as well as migratory fishes. The opposite of euryhaline animals are stenohaline animals. [29–1663–1]

EURYPHAGY, the ability to consume varied vegetable and animal food, characteristic of humans and a number of animal species. Euryphagy is typical of several vertebrates, for example, the wild boar, Eurasian brown bear, and raven. Invertebrates characterized by europhagy include synanthropic species of cockroaches and termites. Euryphagy is an extreme degree of polyphagy. [29–1666–1]

EURYPTEROIDEA, a group of extinct aquatic arthropods of the class Merostomata that lived from the Ordovician through the Permian. The more or less spindle-shaped body measured 10–20 cm in length, although some, such as the genus *Pterygotus*, reached lengths of 1–1.8 m. The body was divided into a prosoma and an opisthosoma, which ended with a telson in the form of a spine or two lobes. On the prosoma there were simple and compound eyes and six pairs of extremities, of which the first, claw-shaped chelicerae, were piercing or prehensile and sometimes highly developed.

The Eurypteroidea embraced approximately 30 genera. They probably inhabited fresh or somewhat brackish waters and were predators. The study of the Eurypteroidea is important for an understanding of the evolution of arthropods, inasmuch as scorpions evidently descended from them during the Silurian, becoming the first arthropods to adapt successfully to life on dry land.

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[29–1664–4]

EURYSTOMUS, a genus of birds of the family Coraciidae, order Coraciiformes. The beak is short, very broad at the base, and slightly humped at the top. The legs are short. The plumage is thick and stiff, mostly muddy green, dark blue, or violet. Of the three species, two are found in tropical Africa and Madagascar, and one in South and East Asia, New Guinea, and Australia.

In the USSR there is one species, the oriental roller or dollarbird (*Eurystomus orientalis*), which is found in the southern part of Khabarovsk Krai and in Primor'e Krai. The body measures approximately 30 cm in length. The plumage is blackish green, with dark blue wings and tail and a light spot on the wings that is clearly visible when the bird is in flight. The beak and feet are red. The oriental roller, a migratory bird, lives in tall deciduous forests with glades, especially in floodplains. It nests in hollows high above the ground. There are four to six white eggs per clutch. The young are naked and blind when they hatch, as are all young of the order Coraciiformes. The birds feed on insects, which they catch by flying about the trees in flocks, especially at dusk, or by lying in wait for them while sitting on a dry branch or on a treetop. More rarely they hunt for food on trees or on the ground. Sometimes the birds can be pests by catching bees near apiaries. [29–1230–2]

EURYTHERM, an animal capable of tolerating substantial fluctuations in environmental temperature. Eurytherms include most terrestrial animals that inhabit temperate latitudes, as well as many representatives of marine littoral fauna. Stenothermal animals are the opposite of eurythermal animals. [29–1665–1]

EURYTOPIC ORGANISM, a plant or animal capable of living in extremely varied habitats. Eurytopic organisms have high ecological valence, as opposed to stenotopic organisms. Their areas of distribution are usually extensive. The Scotch pine, for example, grows on the most varied substrates, including sandy soils, clayey loams, chalk, rock, and sphagnum marshes. It tolerates low winter and high summer temperatures and is found beyond the polar circle and occasionally in the steppe zone. The common reed and couch grass are also eurytopic.

Eurytopic animals include the black-bellied hamster and the common vole, which inhabit steppes, fields, meadows, and forest margins, as well as the wolf, fox, and many others.

The degree to which a species is eurytopic may vary. Species populations in the center of an area of distribution are eurytopic, while at the margins they usually become stenotopic. For example, the common vole in the forest-steppe inhabits watersheds and ravines, meadows, and steppe areas, while in the semidesert it inhabits only river valleys. [29–1665–2]

EUSTACY (also eustatism or eustatic change), a slow worldwide change in the level of the world ocean and the seas linked with it. Eustatic movements were first identified by E. Suess in 1888. A distinction is made between movements of the shoreline as a result of the formation of marine basins, when real changes in the level of the ocean occur, and movements of the shoreline as a result of tectonic processes, which cause apparent changes in the level of the ocean. Such changes, which result in local transgressions and regressions and are caused by different tectonic forces, were termed deleveling changes, whereas broad transgressions and regressions caused by fluctuations in the level of the actual water shell were called hydrokinematic changes by F. Iu. Levinson-Lessing (1893). A. P. Pavlov called (1896) negative movements of the shoreline geocratic movements and advances by the sea hydrocratic movements.

One of the hypothetical factors responsible for eustacy is the change in the total volume of water in the ocean in the course of the geological history of the earth, a change occurring as a result of the evolution of the continents. During the initial stages of the development of the earth's crust, juvenile waters constituted the single most important factor in eustacy. At later stages, the importance of this factor lessened. The volume of water stabilized in the Proterozoic, according to A. P. Vinogradov, and has not changed significantly in the hydrosphere since the Paleozoic. Somewhat important are the processes of sediment accumulation and volcanic flows on the ocean floor (sedimento-eustacy) and the resulting rise in the level of the world ocean.

Beginning with the Paleozoic, the tectonic factor acquired great importance (tectono-eustacy), causing changes in the volume of marine and ocean basins and alteration of the relief and structure of the ocean floor and adjacent continents. It appears that the main changes in the level of the world ocean are linked to the development of the system of midoceanic ridges and with the phenomenon of sea-floor spreading.

Along with tectono-eustacy, the climatic factor acquired considerable importance in recent geological times, in the form of glacio-eustacy. During the glacial epochs, when water was concentrated on the continents in the form of ice sheets, the level of the world ocean dropped by about 110–140 m; after thawing, glacier waters again flowed into the world ocean, raising its level by approximately one-third of the original level. The decrease in temperature and the associated change in salinity affected water density, and consequently the level of the world ocean in the high latitudes differed several meters from the level in the equatorial regions. The formation of the lowest terrace, 3–5 m, is linked to these factors. Planetary factors, such as changes in the earth's speed of rotation and the shifting of the poles, have also somewhat affected the mechanism of eustacy.

The study of the processes of eustacy is very important for historical geology and for gaining an understanding of the formation of the shelf zones, with which the formation of various minerals is linked.

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N. I. NIKOLAEV [29–1666–3]

EUTECTIC, a liquid system that, at a given pressure, is in equilibrium with solid phases whose number is equal to the number of components of the system. The liquid system may be a solution or ■ melt. According to the phase rule, the solidification of a eutectic system occurs at constant temperature, as does the solidification of pure substances. Hence, upon solidification, a eutectic mixture of solid phases having the same composition is formed. For a given system, the melting point of the eutectic mixture is lower than the melting point of a mixture of any other composition.

The eutectic reaction is characteristic of both metallic and nonmetallic systems whose components are completely soluble in one another in the liquid state but are only partly soluble or insoluble in the solid state (*see* BINARY SYSTEMS and TERNARY SYSTEM). In the phase diagram of a binary eutectic system whose components are not soluble in one another in the solid state (see Figure 1), the liquidus lines T_AE and T_BE of the pure components A and B, respectively, intersect at E, which is called the eutectic point. At E, the liquid L is simultaneously saturated in both components.

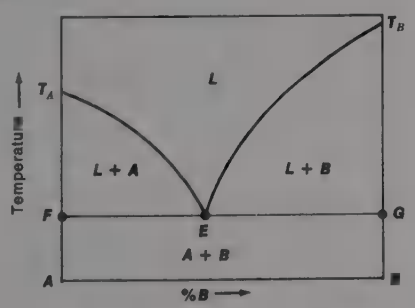

Figure 1. Phase diagram of ■ binary eutectic system whose components are not soluble in one another in the solid state: (*FEG*) eutectic-temperature line

In engineering, eutectics are widely used as, for example, casting alloys and solders. Cryohydrates, which are eutectic aqueous salt systems, are often used as freezing mixtures.

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G. V. INDENBAUM [29–1667–1]

EUTECTOID, a eutectic that forms when a solid solution cools. In a phase diagram, a eutectoid point corresponds to the equilibrium of ■ solid solution whose phases have dissociated; the number of phases is equal to the number of components. A eutectoid point is analogous to a eutectic point in the case of the solidification of a liquid solution. An example of a eutectoid is pearlite in steel. [29–1667–2]

EUTROPHIC PLANTS, plants that grow well only on fertile soils rich in humus and minerals. Eutrophic trees include the English oak (*Quercus robur*) and the European ash (*Fraxinus excelsior*). Also eutrophic are herbs in oak groves, for example, goutweed (*Aegopodium podagraria*), dog's mercury (*Mercurialis perennis*), and sweet woodruff (*Asperula odorata*). Vegetation of the chernozem steppe, rich meadows, and bottomland marshes is eutrophic, as are almost all cultivated crops. (*See also* OLIGOTROPHIC PLANTS and MESOTROPHIC PLANTS.) [29–1668–1]

EUWE, MAX. Born May 5, 1901, in Watergrafsmeer. Dutch chess player. International grand master (1950); international-class official (1951).

Euwe graduated from the University of Amsterdam in 1924. He has a doctorate in mathematics and has been a professor at the University of Tilburg since 1964. Euwe was repeatedly champion of the Netherlands from 1921 to 1960. He won first place and prizes at several major international tournaments from 1923 to 1958. He became world champion in 1935 after defeating A. A. Alekhin but lost the return match in 1937. In the 1940's and 1950's he was a challenger for the world championship. He took part in a tournament for the championship in 1948 and in a challengers' tournament in 1953. In 1970–79 Euwe was president of the International Chess Federation.

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EVACUATION. (1) The removal of wounded or sick personnel and prisoners of war as well as inoperative or superfluous equipment or captured matériel from combat areas to the rear.

(2) The withdrawal of troops from areas of military occupation, for military or political reasons or as the result of the conclusion of an agreement or a treaty.

(3) The removal of civilians, businesses, institutions, and property as well as valuables, such as works of art, from an area threatened by enemy attack or stricken by a natural disaster, such as a flood. [29–1632–2]

EVACUATION, MEDICAL, in the armed forces of the USSR, a series of measures taken by the military medical service to evacuate the wounded and sick from the field of battle or from a focus of mass destruction to medical facilities, called collecting stations, which provide interim medical treatment. The need for medical evacuation arises when conditions at the focus of destruction sharply limit the opportunities for immediate treatment, which is the most advisable from a medical point of view. Medical evacuation is an emergency procedure that affects the health of the evacuee, since it disturbs his rest and interrupts continuous medical care. As ■ result, medical evacuation is not conducted unnecessarily and is carried out with the utmost care.

Because its purpose is the timely provision of qualified and specialized medical care, medical evacuation involves the rapid transfer of the sick and injured to the evacuation stages where, according to the circumstances and the medical indications, pa-

tients will receive the most efficient treatment. Special medical transports and other available means, such as supply transports, are used for the evacuation.

Medical evacuation is closely linked to triage, which is the sorting of evacuees according to the medical indications and contraindications for evacuation, the type of transport to be used, the order of evacuation, and the destination. Coordination of transportation includes such measures as examining the evacuees before departure, adjusting bandages, and administering painkillers. When used to carry the injured and the sick, supply vehicles must be made warm and must be equipped with soft bedding and additional shock-absorbing devices. These and other modifications ensure relatively comfortable traveling accommodations for the evacuees.

Medical evacuation is a vital element not only of troop medical support, but also of the public assistance provided by the civil defense medical service. It is also used in natural disasters and in other catastrophes with large numbers of victims.

I. P. LIDOV [29–1632–3]

EVANGELISTA, CRISANTO. Born 1888 in Bulacan Province; died February 1942. Figure in the Philippine communist, working class, and national liberation movements. Founder of the Communist Party of the Philippines (CPP).

A typesetter by profession, Evangelista became secretary of the Printers' Union in 1906 and chairman of the union in 1918. In 1920 he led the first political strike of printers. He helped establish the Labor Party in 1924 and became one of its leaders; the activities of the party paved the way for the creation of the CPP in 1930. In 1927, Evangelista became vice-president of the Philippine Labor Congress—the country's largest trade union association, founded in 1913. In 1928 he headed the Philippine delegation to the Fourth Congress of the Red International of Trade Unions, which was held in Moscow. In 1929 he became general secretary of the Proletarian Union, a trade union that formed as a splinter group of the Labor Congress; from 1930 to 1933 he served as general secretary of the Central Committee of the CPP.

After spending the period from 1933 to 1936 in prison and exile for his revolutionary activities, Evangelista moved abroad. In 1938 he became chairman of the Central Committee of the CPP. Arrested by the Japanese police in January 1942, Evangelista died in prison.

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EVANS, ARTHUR JOHN. Born July 8, 1851, in Nash Mills, Hertfordshire; died July 11, 1941, in Youlbery, near Oxford. British archaeologist.

Between 1899 and 1930 (with interruptions), Evans conducted excavations on the island of Crete, where he discovered the remains of a palace at Knossos. He thoroughly investigated the new Bronze Age culture, studying the palace and farm complexes, works of art, and clay tablets with pictographic inscriptions and with inscriptions in linear script. He designated the heretofore unknown pre-Hellenic culture as the Minoan culture and proposed a periodization of it. Using archaeological data, Evans reconstructed the state structure, religion, and developmental stages of Cretan society.

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EVANS, EDITH. Born Feb. 8, 1888, in London; died Oct. 14, 1976, in Cranbrook, Kent. British actress. Evans made her stage debut in 1912. She played in London, including the Old Vic Theatre (from 1925 with interruptions), as well as in Stratford-upon-Avon and in New York City. Among her roles were Mrs. Millamant and Lady Wishfort in Congreve's *The Way of the World*, Lady Utterwood in Shaw's *Heartbreak House*, Mrs. Malaprop in Sheridan's *The Rivals*, the Nurse in Shakespeare's *Romeo and Juliet*, Ranevskaia in Chekhov's *The Cherry Orchard*, Arkadina in Chekhov's *The Seagull*, and Katerina Ivanovna in *Crime and Punishment* (based on Dostoevsky). Evans also acted in motion pictures. In 1958 she visited the USSR.

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EVANS, RONALD ELLWIN. Born Nov. 10, 1933, in St. Francis, Kan. US pilot and astronaut. Captain in the navy.

Evans graduated from the University of Kansas in 1956 with a bachelor's degree in electrical engineering. Upon completion of courses in the Reserve Officers' Training Corps, he became a naval pilot. He graduated from the Naval Postgraduate School in Monterey in 1964 with a master's degree in aeronautical engineering.

Evans joined the National Aeronautics and Space Administration astronaut corps in 1966. From Dec. 7 to Dec. 19, 1972, as pilot of the Apollo 17 command module, he completed a flight to the moon with E. Cernan and H. Schmitt. Over a period of 147 hr 48 min, Evans completed 75 lunar orbits, providing support for Cernan and Schmitt's mission on the surface of the moon. On the return leg of the flight—a distance of 300,000 km from the earth—Evans spent 67 min outside the spacecraft. The entire flight lasted 12 days 9 hr 51 min. [29–1634–1]

EVANSTON, a city in the northern USA, in the state of Illinois, on Lake Michigan. A suburb north of Chicago. Population, 76,000 (1975). Local industry includes printing, instrument-making, and the production of pharmaceuticals. Evanston has a university. [29–1634–4]

EVANSVILLE, a city in the USA, in the state of Indiana. Population, 138,000 (1975; with the surrounding suburbs, 290,000). Evansville is a port on the Ohio River and a rail and highway junction. Local industry, which employed 40,000 persons in 1975, includes machine building and metalworking (the manufacture of parts for motor vehicles, engines, refrigerators, and electrical equipment) as well as food processing and the production of chemicals and furniture. [29–1634–3]

EVAPOROGRAPHY, a method of producing images of objects by making use of the thermal, usually infrared, radiation of the objects themselves. It was proposed by the German physicist M. Czerny in 1929.

In evaporography, either a layer of volatile liquid evaporates from a darkened membrane in a vacuum chamber or, vice versa, the liquid on the membrane condenses from vapor previously introduced into the chamber (Figure 1). The object is projected onto the membrane by a lens, and the image in the form of a liquid relief corresponding to the differences in evaporation or condensation at various points on the membrane is either viewed directly in interference colors or is photographed. The spectral region in which evaporography may be used depends on the properties of the lens and other elements of the apparatus and on the selection of the dark coating of the membrane; in practice, it is possible to produce images in the infrared region up to wavelengths of about 10 micrometers.

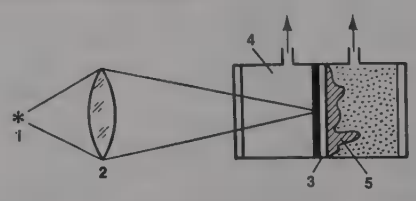

Figure 1. Diagram of the process for obtaining an image in evaporography: (1) object, (2) lens (usually infrared), (3) thin darkened membrane, (4) vacuum chamber, (5) liquid relief

Evaporography is primarily used for viewing and photographing in the dark, recording the infrared self-radiation of bodies,

the remote measurement of temperature and temperature distributions on the surface of an object (including applications in medical diagnosis), and the visualization of beams from infrared lasers.

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Optiko-mekhanicheskaia promyshlennost', 1962, no. 11, pp. 27–34; 1964, no. 9, pp. 11–13. A. L. KARTUZHANSKII [29–1635–2]

EVARNITSKII, DMITRII IVANOVICH (also D. I. Iavornyts'kyi). Born Oct. 25 (Nov. 6), 1855, in the village of Borisovka, in what is now Kharkov Oblast; died Aug. 5, 1940, in Dnepropetrovsk. Ukrainian historian, archaeologist, ethnographer, folklorist, and writer. Academician of the Academy of Sciences of the Ukrainian SSR (1929); member of the Moscow Archaeological Society.

Evarnitskii graduated from the University of Kharkov in 1881. He taught at Moscow University, the University of St. Petersburg, and the University of Ekaterinoslav (now Dnepropetrovsk); at the last of these he established a subdepartment of Ukrainian studies. From 1902 to 1932 he was director of the museum of local lore in Ekaterinoslav, now known as the Academician D. I. Evarnitskii Dnepropetrovsk Historical Museum.

Evarnitskii was one of the first scholars to study the history of the Zaporozh'e cossacks; he published a large number of documents and was the author of *A History of the Zaporozh'e Cossacks* (vols. 1–3, 1892–97). He also gathered extensive folkloric material, much of which was published in the collection *Little-Russian Folksongs Collected Between 1878 and 1905* (1906). His scholarly works describe everyday life; some of his works, written during the prerevolutionary period, exhibit nationalistic tendencies.

Evarnitskii's novellas include *Our Lot is God's Will* (1901), *Not for His Own Sins* (1907), and *To the Seminary! To the Seminary! To the Seminary!* (1908). Evarnitskii also wrote satirical short stories and poems.

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EVECTION, the greatest disparity—that is, deviation from motion according to Kepler's laws—in the moon's motion around the earth, caused by perturbation by the sun. Discovered by Hipparchus in the second century B.C., evection was detected by Ptolemy in the second century A.D. and was correctly explained by I. Newton. The change in the moon's longitude owing to evection reaches 1°16′26″ and varies with a period of approximately 31.8 mean solar days. The perturbing force that causes evection also changes the horizontal parallax of the moon periodically. [29–1639–3]

EVEN (also Lamut), the language of the Evens (Lamut). According to the 1970 census, Even is spoken by approximately 7,000 people along the coast of the Sea of Okhotsk and in neighboring regions. Together with Evenki and Negidal, it belongs to the northern group of the Manchu-Tungus languages. It has three dialect groups: eastern, western, and central. The eastern group includes the Ola dialect, on which the literary language is based.

Even is an agglutinative language in which grammatical relationships are expressed by the addition of suffixes to word stems. The Ola dialect distinguishes 18 consonants and up to 20 vowel phonemes, including i_a and i_e (phonemes that incorporate ■ glide whose articulation resembles that of the phoneme's primary, syllabic, element). Even exhibits palatal and labial vowel harmony. There are 13 nominal (noun) cases and a ramified system of possessive forms, which express personal, reflexive, and alienable possession.

Verbs are classified by conjugational features as verbs of action, verbs of state, and inchoative verbs. There are more than 15 aspects and six voices of the verb, as well as six participial forms, eight forms of adverbial participles, and negative and interrogative verbs. The attribute precedes the modified word and agrees with it in number and case. The vocabulary of the western dialects shows the influence of Yakut and Yukaghir, and the dialects of Kamchatka have undergone the influence of Koriak; Russian words began entering the Even language in the 17th century.

A Latin writing system was devised in 1931 and was used until 1936, when a Cyrillic alphabet was introduced.

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EVEN AND ODD FUNCTIONS, in mathematics. The function $y = f(x)$ is said to be even if its value does not change when the sign of the independent variable changes—that is, if $f(-x) = f(x)$. If, however, $f(-x) = -f(x)$, then the function $f(x)$ is said to be odd. For example, $y = \cos x$ and $y = x^2$ are even functions, and $y = \sin x$, $y = x^3$ are odd functions. The graph of an even function is symmetric with respect to the y-axis, and the graph of an odd function is symmetric with respect to the origin. [29–360–1]

EVENKI (formerly, Tungus), a people of Siberia. The Evenki today inhabit a territory bounded on the west by the left bank of the Enisei, on the north by the tundra between the Enisei and Lena rivers beyond the arctic circle, in the east by the southern coast of the Sea of Okhotsk, and on the south by the Amur River and the northern raions of the Buriat ASSR. According to the 1979 census, the Evenki number 27,500 in the USSR; some live in Northwest China. The Evenki speak Evenki (Tungus).

The Evenki originally inhabited Transbaikalia and the Baikal Region, from which they appear to have migrated early in the second millennium A.D. to the area they now inhabit. By the 17th century, when they were incorporated into the Russian state, they had divided into exogamous patrilineal clans; they were nomadic and engaged in hunting, reindeer herding, and sometimes fishing. Although they became members of the Orthodox Church in the early 17th century, the Evenki retained various forms of pre-Christian worship, such as shamanism.

In 1930, Evenki National Okrug was created in Krasnoiarsk Krai (*see* EVENKI AUTONOMOUS OKRUG). Under Soviet power, the culture and economy of the Evenki underwent dramatic changes. A writing system was created, and illiteracy was stamped out. Many nomadic Evenki made the transition to a settled way of life. Land cultivation, livestock raising, and fur farming are being developed on kolkhozes and sovkhozes, along with the traditional occupations.

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V. A. TUGOLUKOV [29–1640–2]

EVENKI (also Tungus), the language of the Evenki. According to the 1970 census, Evenki is spoken by 13,000 people in the USSR, mainly in Eastern Siberia—from the left bank of the Enisei to Sakhalin Island. There are approximately 9,000 speakers, including the Solon, in North China (Inner Mongolia and the Sinkiang-Uighur Autonomous Region) and Mongolia.

Evenki, together with Even and Negidal, belongs to the northern group of the Manchu-Tungus languages. It is divided into northern, southern, and eastern dialects and has, in addition, many subdialects, which are classified by phonetic features as the *ha*-subdialects, *se*-subdialects, and *še*-subdialects. The Solon subdialect is sometimes regarded as a separate language. Literary Evenki is based on the Nepa subdialect, called the Poligus subdialect since 1953, of the southern dialect.

Evenki has a complex, or "graded," law of qualitative and quantitative vowel harmony. It is an agglutinative language in which grammatical relations are expressed through the addition of suffixes to word stems. Evenki has a highly developed system of cases, verbal aspect and voice, and adverbial participles. The lexicon shows traces of close contacts with the Yakut and Buriat languages, and there are Russian loanwords. A Latin alphabet

was created in 1931, and a Cyrillic alphabet was introduced in 1937.

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E. A. KHELIMSKII [29–1645–1]

EVENKI AUTONOMOUS OKRUG (Evenkia), part of Krasnoiarsk Krai, RSFSR. Formed Dec. 10, 1930, and called Evenki National Okrug until 1977. Located in Eastern Siberia. Area, 767,000 sq km. Population, 15,000 (Jan. 1, 1977). Evenki Autonomous Okrug is divided into three raions. The administrative center is the urban-type settlement of Tura.

Natural features. Evenki Autonomous Okrug occupies the central part of the Central Siberian Plateau. The most elevated area is the Putorana Plateau, which reaches a maximum elevation of 1,701 m at Mount Kamen'. The greater part of the Tunguska Coalfield lies within the okrug, and the Nizhniaia Tunguska and Podkamennaia Tunguska regions contain deposits of iron ore, nonferrous metals, graphite, Iceland spar, petroleum, and natural gas.

The okrug has a distinctly continental climate. Winters in the okrug are long and harsh. The mean January temperature is −26.9°C in Vanavara, −36.8°C in Tura, and −37.2°C in Essei. Summers are short and warm, with a mean July temperature of 13.3°C in Essei, 15.5°C in Tura, and 16.6°C in Vanavara. Precipitation, which falls chiefly in summer, ranges from 300 mm per year in Essei to 500 mm per year in Kochumdek. The frost-free period ranges from 40 days in the north to 110 days in the south. There is extensive permafrost.

The principal rivers are right tributaries of the Enisei: the Nizhniaia Tunguska and Podkamennaia Tunguska. The Nizhniaia Tunguska flows for approximately 1,300 km within the okrug. Its principal tributaries are the left tributaries Ilimpeia, Nidym, Taimura, and Uchami and the right tributaries Kochechum, Vivi, and Tutonchana. The Podkamennaia Tunguska is more than 1,500 km long. Its principal tributaries are the right tributaries Tetere and Chunia and the left tributaries Vel'mo, Oskoba, Taiga, and Kamo. The Kureika River, which flows into the Enisei, rises in the okrug, as does the Kotui River and its tributary the Moiero. The most important of the okrug's numerous lakes are Essei, Vivi, Agata, Severnoe, and Niakshingda.

Mountain-forest podzolic soils predominate in the okrug. Mountain tundra soils are found in the northwest and sod-podzolic soils in the south. More than four-fifths (64 million hectares) of the okrug, most of which lies in the taiga subzone, is forest. Mixed dark coniferous forests of larch and spruce predominate in the south, in the Podkamennaia Tunguska region; light coniferous forests of larch, pine, and spruce grow in the interfluve of the Podkamennaia and Nizhniaia Tunguska rivers. In the Far North the taiga gives way to thin larch forests and moss-lichen tundra (one-tenth of the okrug).

Evenki Autonomous Okrug has a diverse fauna. Common fur-bearing animals include the sable, squirrel, and Siberian weasel. Other animals include the Eurasian brown bear, blue hare, wolverine, Siberian chipmunk, snow weasel, fox, wolf, reindeer, and moose; the muskrat has become acclimatized. Birds include the capercaillie, black grouse, hazel hen, and willow ptarmigan. The rivers and lakes are inhabited by such fish as sturgeon, taimen, sterlet, whitefish, broad whitefish, grayling, peled, burbot, pike, Eurasian perch (*Perca fluviatilis*), crucian carp, and cisco.

Population. According to the 1970 census, Russians make up more than 61 percent of the okrug's population, Evenki 25.2 percent, and Yakuts 6.6 percent. The average population density is 0.02 per sq km. The urban population, which constitutes 35 percent of the total population, is concentrated in the okrug's one urban-type settlement, Tura.

Historical survey. Early in the second millennium A.D. the Evenki settled the region they inhabit today. Their principal occupations were hunting, reindeer herding, and fishing; the most important game were such ungulates as wild deer and moose. Hunters used the bow and arrow and various homemade traps. In the first half of the 17th century the okrug was incorporated into Russia. This development was a historically progressive step: the Russians introduced the Evenki to firearms, and the indigenous population began using such foods as flour, tea, salt, and sugar. At the same time, the *iasak* (tribute) was imposed on the Evenki, and the people became subject to the rapacious policies of the tsarist government, which caused the death of a considerable part of the indigenous population.

The October Revolution of 1917 dramatically changed the life of the okrug's population. Kolchak's forces were driven out of Siberia in 1920. The Committee of the North, formed in 1924 under the All-Russian Central Executive Committee, rendered considerable assistance to the indigenous population.

In accordance with the Provisional Statute on Governing the Native Tribes and Peoples of the Northern Frontiers of the RSFSR, which was drafted by the Committee of the North, bodies of self-government were created for the peoples of the north: clan soviets, raion native councils, and raion native executive committees. Among the clan soviets formed in the okrug were the Murukta, Chirinda, Chapogir, and Pankagir clan soviets, all of which were subordinate to the Turukhansk raion executive committee.

In 1927, native raion executive committees were organized: the Ilimpeia, with headquarters at the Tura *kul'tbaza* (multipurpose cultural center), and the Baikit, with headquarters at the trading post of Baikit. In December 1930, Evenki National Okrug was formed, and the Evenki were granted equal political status with other peoples. In 1925 a decree of the Central Executive Committee of the USSR released the peoples of the north, including the Evenki, from national and local taxes, thereby greatly improving their economic position.

Collectivization of the Evenki's primitive economy began in the early 1930's: simple production associations were formed, which later were transformed into artels. Collectivization helped the indigenous population make the transition to a settled way of life. Land cultivation, animal husbandry, and fur farming, together with traditional occupations, underwent development at kolkhozes and sovkhozes.

Between 1930 and 1932, Soviet geologists discovered numerous deposits of coal, Iceland spar, building materials, and salt in the okrug, all of which provided a basis for industrial production. During the Great Patriotic War of 1941–45 the working people of the okrug increased the reindeer herd, the fish catch, and the fur output and collected a considerable amount of money and warm clothing for use in the country's defense. The Evenki serviceman Innokentii Petrovich Uvachan was posthumously awarded the title Hero of the Soviet Union.

During the postwar five-year plans, the Evenki people made important economic advances. The Evenki Autonomous Okrug was awarded the Order of the Red Banner of Labor in January 1971 and the Order of Friendship of Peoples in December 1972.

K. G. KUZAKOV

Economy. The principal branches of the economy of Evenkia are fur production and reindeer herding. The okrug, which accounts for 13 percent of the fur output of Krasnoiarsk Krai, produces sable, silver fox, ermine, squirrel, and muskrat furs. Hunting provides 55 percent, and cage fur farming 45 percent, of the furs produced. Silver foxes and blue arctic foxes are bred on fur farms.

The Evenki Autonomous Okrug has approximately one-third (45,000 as of Jan. 1, 1977) of the reindeer in Krasnoiarsk Krai and more than 1 million hectares of pastureland for the grazing of reindeer, primarily in the northern part of the okrug. In 1976 there were 11 sovkhozes, including four reindeer sovkhozes: Surinda, Tutonchany, Poligus, and Nidym. Dairy farming and the cultivation of potatoes and other vegetables are developing.

Industrial production is represented primarily by mining. Graphite is mined at the Noginskii deposit and shipped to Krasnoiarsk for processing. Iceland spar is extracted from deposits on the right bank of the Nizhniaia Tunguska and near the Nidym and Chambei rivers.

In 1975 the okrug had 2,200 km of waterways; the Nizhniaia Tunguska and Podkamennaia Tunguska rivers are navigable. The well-developed system of air transport connects the okrug

with various points, including Krasnoiarsk and numerous raion administrative centers. Reindeer are an important means of transport. S. T. BUDKOV

Education and cultural affairs. In the (1977–78) academic year 3,600 students were enrolled in the okrug's 31 general-education schools of all types, and 100 students attended the specialized secondary educational institution, a medical school. There are no higher educational institutions. In 1976, 1,500 children were enrolled in 27 preschool institutions, and there were 27 public libraries, with 169,000 copies of books and periodicals. An okrug museum of local lore is located in Tura, and there are three amateur theaters, in Tura, Baikit, and Vanavara. The okrug has 26 clubs, 28 motion-picture projection units, and three extracurricular institutions.

The okrug newspaper, *Sovetskaia Evenkiia*, has been published since 1933. Programs of All-Union Radio are transmitted, and krai and local radio programs are broadcast in Evenki and Russian for 11.5 hours daily. Programs of Central Television are relayed via the Orbita system for 12 hours daily.

Literature. Before the revolution the Evenki, then called the Tungus, had no writing system. Various genres of folklore were widespread among them. The first literary works came from Evenki writers among the students at the Leningrad Institute of the Peoples of the North in the late 1920's and early 1930's. A. M. Salatkin (1908–43) wrote the first collection of poems in the Evenki language—*The Taiga at Play* (1937)—and the epic folktale *Gegdalluken and Uglerikken* (1935). Soon there appeared the collection of poems *The Song of an Evenk* (1938), by A. N. Platonov (1912–39), and two works by G. Ia. Chinkov (1915–70): the collection of poetry *My Native Land* (1938) and the epic folktale *Garpanindia* (1939). N. Sakharov (1915–45), who fought in the Great Patriotic War of 1941–45 and died at Berlin, wrote poems about V. I. Lenin, the novella *Red Suglan* (1938), and stories about the new life among the Evenki.

A. Nemtushkin (born 1938) is the author of numerous literary sketches and the poetry collections *Morning on the Taiga* (1960) and *My Tokma* (1968). The poetry of such young writers as I. M. Udygir (born 1930), V. D. Lorgaktoev (born 1934), and S. N. Pikunov (born 1922) has been published in the national and local press. Many works by Russian and Soviet writers have been translated into Evenki, and the works of Evenki writers have been translated into various languages of the USSR.

M. G. VOSKOBOINIKOV

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EVEN LITERATURE, the literature of the Evens, or Lamut, a people living in Yakutia, in Magadan and Kamchatka oblasts, and in Khabarovsk Krai. Before Soviet power was established, Even literature existed only in the form of a rich oral tradition. In the early 1930's the first Even authors emerged among the students of the Leningrad Institute of the Peoples of the North. They were N. S. Tarabukin (1910–50), from Yakutia, and A. A. Cherkanov (born 1918), from Kamchatka. Tarabukin's collections, published in Even with a Russian parallel translation, include *Songs of the Taiga* (1936) and *The Flight of the Golden Girl* (1937); his autobiographical novella *My Childhood* (1936) also achieved popularity. Cherkanov is the author of the collection of poems *Hot Springs* (1937).

P. Lamutskii (real name, P. A. Stepanov [born 1920]), an expert on Yakut folklore, published collections of poems in the Yakut and Even languages, such as *Song of the Even* (1962) and *The Old Man's Children* (1970). Other noted writers in Yakutia include the Even poets D. E. Edukin (born 1931), V. S. Keimetinov (born 1936), and A. E. Nikulin (born 1937). The prominent Even poet V. D. Lebedev (born 1934) has written articles on language and folklore. Works by Even writers have been translated into various languages of the USSR.

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EVENS (also Lamut), a people of northern Siberia living in several areas of Magadan and Kamchatka oblasts and east of the Lena River in the northern regions of the Yakut ASSR. According to the 1979 census, the Evens number 12,300; they speak the Even language.

The Evens, in origin and culture, resemble the Evenki. In the past they engaged chiefly in reindeer raising and hunting; the coastal Evens fished and hunted seals. Although the Evens formally became members of the Orthodox Church in the 19th century, they retained various forms of their pre-Christian worship, such as shamanism.

In the Soviet period, fundamental changes took place in the economy, culture, and everyday life of the Evens. A writing system was created in the 1930's, and illiteracy was eliminated. Many nomadic Evens made the transition to a settled way of life. Kolkhozes were established for livestock raising, for farming, and land cultivation, in addition to the traditional occupations.

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EVENSK, an urban-type settlement and the administrative center of Severo-Evensk Raion, Magadan Oblast, RSFSR. Evensk is located on the shore of the Gizhiga Inlet of Shelikhov Gulf, 530 km northeast of Magadan. The settlement has a fish-processing plant. [29–1646–1]

EVENSMO, SIGURD. Born Feb. 14, 1912, in Hamar. Norwegian writer.

Evensmo took part in the resistance movement, which is the subject of his novel *The Fugitives* (1945; Russian translation, 1962). In 1942 he was imprisoned in a concentration camp, where he spent two years. Evensmo's realistic trilogy comprising *The Border* (1947), *The Bats* (1949), and *Homeward Bound* (1951) is a unique social history of Norway during the 1930's and 1940's. In his antiwar science-fiction novel *The Enigma of the Year Zero* (1957), he depicted the earth after an atomic catastrophe. In the screenplay for the film *The Africans* (1965) he criticized racial discrimination. Evensmo is the author of *The Grand Tivoli: The Norwegian Cinema Over the Past 70 Years* (1967), the first history of Norway's cinematography. In the book *Violence in Films* (1969), he attacked horror films. In collaboration with A. Brinchman he published *Norwegian Writers in War and Peace* (1968).

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G. N. KHRAPOVITSKAIA [29–1647–1]

EVERETT, a city in the western USA, in the state of Washington; a northern suburb of Seattle. Population, 51,000 (1975). Everett is a port on Puget Sound. Its industries include the wood

products, plywood, paper, canning, and aerospace industries. Other economic activities include fishing and the processing of seafood. [29–1648–2]

EVERGLADES NATIONAL PARK, a park in the southern USA, in the state of Florida. It was created in 1947. As of 1977, it had an area of 566,796 hectares. The park has subtropical forests and mangrove forests, and it supports a broad range of animal life. Among the species of rare birds found there are the Everglades kite and the wood ibis. The manatee, cougar, and alligator are among the animals that have found refuge in the park. [29–1647–3]

EVERNIA, the genus of lichens of the family Usneaceae. The soft bushy thallus consists of narrow cylindrical or oblate branching blades. The upper surface is greenish gray, and the lower surface is whitish. The lichens contain everninic acid, usnic acid, and other lichen acids. There are about 15 species, growing on the trunks and limbs of trees and, less commonly, in the soil. The USSR has about eight species. Some species—including the most common, *Evernia prunastri*—are used in the perfume and drug industries. [29–1648–4]

EVERS, IOGANN FILIPP GUSTAV (also Johann Philipp Gustav Evers). Born July 4, 1781, in Westphalia; died Nov. 8 (20), 1830, in Dorpat (now Tartu). Russian historian. Honored member of the St. Petersburg Academy of Sciences (1826; corresponding member, 1809).

The son of a peasant, Evers graduated from the University of Göttingen in 1803. In 1810 he became a professor of Russian geography, history, and statistics at the University of Dorpat. In 1816 he published his study *History of the Russians*, which was written in German. In 1818, Evers became the rector of the University of Dorpat. In 1826 he published his important work *Ancient Russian Law in Its Historical Development*.

Evers regarded society as developing from the family to the clan and then from the tribe to the absolute state. This view had some influence on the statist school in Russian historiography. Evers' political views were reactionary.

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M. P. PAVLOVA-SIL'VANSKAIA [29–1648–5]

EVERSMANN, EDUARD ALEKSANDROVICH. Born Jan. 23, 1794, in the village of Weringhausen, near Hagen, Westphalia, died Apr. 14, 1860, in Kazan. Russian naturalist. Corresponding member of the St. Petersburg Academy of Sciences (1842).

Eversmann was educated in Germany. He earned doctorates in philosophy and the liberal arts in Halle (1814) and in medicine and obstetrics in Dorpat (present-day Tartu, 1816).

In 1816, Eversmann moved to Russia and worked as a doctor in Zlatoust from 1818 to 1820. He later became interested in zoology and abandoned medicine. In 1828 he became professor of zoology and botany at the University of Kazan. As a member of the first Russian expeditions to Bukhara (1820–21) and Ustiurt (1825–26), Eversmann made collections of mammals, birds, and insects and described several new species.

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[29–1648–6]

EVERT, ALEKSEI ERMOLAEVICH. Born Feb. 20 (Mar. 4), 1857; died May 10, 1926, in Vereia. Russian general of the infantry (1911).

Evert graduated from the Alexander Military School in 1876 and the Academy of the General Staff in 1882. He fought in the Russo-Turkish War of 1877–78. During the Russo-Japanese War of 1904–05 he became quartermaster general of the field staff in the Far East in October 1904 and chief of the field staff of the First Manchurian Army in March 1905.

Between 1906 and 1908, Evert was chief of the Main Headquarters and then a corps commander, and between 1912 and 1914 he served as commander of the Irkutsk Military District and as appointed ataman of the Transbaikal Cossack Host. Evert was appointed commander of the Fourth Army in August 1914, replacing General A. E. Zal'ts, and fought in the battle of Galicia (1914). He became commander in chief of the armies of the Western Front in August 1915. His incompetence as a military leader and his extreme indecisiveness were particularly apparent during the front's summer offensive in 1916 along the Vil'na (Vilnius) axis and in the vicinity of Baranovichi. Evert retired in March 1917, after the February Revolution, and lived in Smolensk and then Vereia, where he engaged in beekeeping. [29–1649–1]

ÉVIAN AGREEMENTS, accords between the government of France and the Provisional Government of the Algerian Republic, which was formed during the National Democratic Revolution in Algeria.

Signed on Mar. 18, 1962, in the city of Évian-les-Bains, France, the Évian Agreements sealed the victory of the Algerian people in the national liberation war against French colonialism. The agreements provided for a cease-fire on the territory of Algeria, a referendum in Algeria on the question of self-determination, and, should independence be chosen, the full sovereignty of the future Algerian state in its domestic and foreign affairs.

The accords also stipulated that the property of Frenchmen living in Algeria could not be confiscated without just compensation. In exchange, France undertook to provide economic, financial, technical, and cultural aid to Algeria on the basis of bilateral agreements, which were signed later as an extension of the Évian Agreements. French companies retained the right to extract and export petroleum.

A special declaration on military matters contained France's pledge to complete the withdrawal of its troops from Algeria in three years. (They were in fact withdrawn by July 1964.) By July 1, 1967, France had closed its military bases in Algeria, except for the base at Mers el Kébir, which was closed in February 1968.

In the latter half of the 1970's France and Algeria recognized that the Évian Agreements no longer reflected the actual state of their relations.

PUBLICATIONS

Traités et conventions de l'Algérie, December 1963, no. 1, pp. 9–58.

[29–1649–2]

EVLİYA ÇELEBİ. Born Mar. 25, 1611, in Istanbul; died there in 1682 or 1683. Turkish traveler, geographer, and writer.

For approximately 50 years, including time spent on military campaigns, Evliya traveled about many countries in Asia, Africa, and Europe. He visited the Northern Caucasus, the Ukraine, Moldavia, and the Crimea, and he sailed along the Don, Volga, and Iaik (now Ural) rivers. His travel sketches and diaries, which he edited at the end of his life, formed a ten-volume work called the *Book of Travels* (also known as *Chronicle of a Traveler*). Part of the work was published for the first time in 1843. Eight volumes were printed in the Arabic alphabet between 1898 and 1928, and the last two volumes were published in the Latin alphabet between 1935 and 1938.

Evliya's work is the longest memoir in classical Turkish literature. It is an important document of his epoch and contains a large amount of information about history, geography, and culture. It also includes numerous stories and legends from various countries and peoples, including peoples in what is now the USSR.

WORKS

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[29–1652–1]

EVOLUTE AND INVOLUTE, concepts of differential geometry. The locus m of the centers of curvature of a plane curve l is called the evolute of l, and l is said to be an involute of m (see Figure 1).

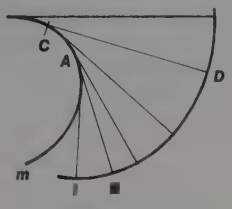

Figure 1

An involute l of a curve m is the curve described by the end B of the thread AB as it is unwound from m or wound on m. This construction of the involute makes clear the following properties of the evolute and involute: (1) The tangent CD at an arbitrary point C on the evolute is normal to the involute at the corresponding point D; consequently, an involute is an orthogonal trajectory of the tangents to the evolute. (2) Any orthogonal trajectory of the tangents to a curve m is an involute of m; m therefore has infinitely many involutes. (3) The difference between the radii of curvature AB and CD at the points B and D of an involute is equal to the length of the arc AC of the evolute. (4) The evolute is the envelope of the family of normals of an involute.

If a curve l is defined by the parametric equations $x = x(t)$ and $y = y(t)$, then the parametric equations of its evolute are

$$X = x + y' \frac{x'^2 + y'^2}{x''y' - y''x'}$$
$$Y = y + x' \frac{x'^2 + y'^2}{y''x' - x''y'}$$

An involute of a space curve is an orthogonal trajectory of the tangents of the curve.

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EVOLUTION, in the broad sense, a synonym for development; in the narrower sense, one of the principal types of development —a slow, gradual, quantitative, and qualitative change—in contrast to revolution. In evolution, each new state of the object has, in comparison with the previous state, a higher level of organization and differentiation of functions. The distinction is made between individual evolution (of a certain individual object) and general evolution (of nature or life). In the process of evolution an important role is played both by internal factors and by external conditions of the object's existence. Changes occurring in the course of evolution are diverse.

Dialectical materialism regards evolution and revolution as interconnected and reciprocally conditioned aspects of development and opposes the absolutization of one or the other.

[29–1661–2]

EVOLUTION, BIOLOGICAL, the historical development of organisms. Evolution is determined by hereditary variation, the struggle for existence, and natural and historical selection. It results in the adaptation of organisms to their environment, changes in the genetic composition of entire populations and individual species, the formation of species and the extinction of less adapted ones, and the transformation of ecosystems and of the biosphere as a whole. The term "evolution" was first used in biology by the Swiss naturalist and philosopher C. Bonnet (1762). The causes and regularities underlying evolution constitute the subject matter of the doctrine of evolution. [29–1662–1]

EVOLUTION, DOCTRINE OF (biology), the body of knowledge of the historical development (evolution) of living nature. The doctrine of evolution encompasses the analysis of the development of adaptation, the evolution of ontogeny (or the individual development of organisms), the factors shaping evolution, and the concrete paths of the historical development (phylogeny) of individual groups of organisms and of the organic world as a whole. Based on the theory of evolution, it is also concerned with the origin of life and the origin of man. (*See* ONTOGENY; PHYLOGENY; and ORIGIN OF LIFE.)

History. The earliest ideas about the development of life, as expounded in the works of Empedocles, Democritus, Lucretius, and other ancient Greek and Roman philosophers, were essentially brilliant conjectures unsupported by biological facts. In the 18th century, transformism, the doctrine of variability of animal and plant species, emerged in biology, in opposition to creationism, a doctrine based on the concept of divine creation and the immutability of species (*see* TRANSFORMISM and CREATIONISM). The leading transformists of the second half of the 18th century and first half of the 19th—G. de Buffon and E. G. Saint-Hilaire in France, E. Darwin in England, J. W. van Goethe in Germany, and K. F. Rul'e in Russia—substantiated species variability mainly by two facts: the existence of transitional forms between similar species and the unity of the structural plan of the organisms of the major groups of animals and plants. However, the transformists did not examine factors responsible for the changes in species.

The first attempt to formulate an integral theory of evolution was made by the French naturalist J. B. de Lamarck, who set forth his ideas about the motive forces of evolution in *Philosophie zoologique* (1809). Lamarck believed that the transition from the lower forms of life to the higher forms—gradation—occurs as a result of the immanent and universal striving of organisms for perfection. He ascribed the diversity of species at every level of organization to the gradation-modifying influence of the environment. According to his first "law," the use of organs leads to their progressive development, while disuse leads to their reduction. According to his second law, the results of use and disuse of organs when sufficiently prolonged become hereditarily fixed and are then transmitted from generation to generation independently of the environmental influences that initially produced them (*see* LAMARCKISM and ACQUIRED CHARACTER). Lamarck's laws were based on the erroneous assumption that nature strives for perfection and that favorably acquired characters are heritable.

The true factors responsible for evolution were disclosed by C. Darwin, who thereby formulated a scientifically based theory of evolution, set forth in the book *The Origin of Species by Means of Natural Selection; or, the Preservation of Favored Races in the Struggle for Life* (1859). The motive forces of evolution, according to Darwin (*see* DARWINISM), are as follows: indefinite variation, the hereditarily caused diversity of organisms in every population of any species; the struggle for existence, in the course of which the less adapted organisms die or are prevented from reproducing; and natural selection, the survival of better adapted individuals, as a result of which useful hereditary changes accumulate and new adaptations arise. Lamarckism and Darwinism are diametrically opposite in their interpretation of evolution. The former explains evolution by adaptation, while the latter explains adaptation by evolution. Other ideas exist in addition to Lamarckism that reject the importance of selection as the motive force of evolution (*see* AUTOGENESIS, MUTATIONISM, and NOMOGENESIS). Advances in biology soon confirmed the validity of Darwin's theory. Therefore, Darwinism and the doctrine of evolution are often used synonymously in modern biology. Also similar in meaning is the term synthetic theory of evolution, which emphasizes the synthesis of the main tenets of Darwin's theory and of genetics and certain generalizations on evolution from other branches of biology.

Modern doctrine of evolution. Advances in genetics helped clarify the mechanism of the origin of indefinite hereditary variation, which provides the material of evolution. This phenomenon is based on stable changes in inherited structures—mutations (see MUTATION). Mutation is not directed: newly occurring mutations do not fit the existing environmental conditions and generally dis-

rupt already existing adaptations. Mutation acts as the principal material of evolution for organisms without a formed cell nucleus. Combinative variation, the combining of genes in the course of sexual reproduction, is very important for organisms whose cells do have a formed nucleus.

A population is the elementary unit of evolution (*see* POPULATION). The comparative isolation of populations results in their reproductive isolation—the restricted interbreeding between individuals of different populations (*see* ISOLATION). Reproductive isolation guarantees the uniqueness of the gene pool —the genetic makeup of every population—and, consequently, the possibility of its evolving independently (*see* GENE POOL). The biological mixture of individuals constituting a population determined by combinative and mutational variation is manifested in the struggle for existence. Some individuals die, while others survive and reproduce. As a result of natural selection, the new mutations combine with the genes of already selected individuals, the phenotype alters, and new adaptations arise. Hence, selection is the principal motive force of evolution and the factor responsible for new adaptations, the transformation of organisms, and speciation.

Selection may be manifested in different forms: stabilizing selection guarantees the preservation of already formed adaptations under unchanged environmental conditions; directional selection leads to the formation of new adaptations; and disruptive selection gives rise to polymorphism when considerable changes occur in the habitat of a population. In the modern doctrine of evolution, the conception of the factors of evolution was enhanced by the identification of the population as the elementary unit of evolution, by the theory of isolation, and by the development of the theory of natural selection. Isolation as a factor responsible for increasing the diversity of living forms underlies modern thinking on speciation and species structure (*see* SPECIATION). Allopatric speciation, caused by the distribution of a species and by the geographic isolation of distant populations, has been studied in greatest detail thus far. Less attention has been focused on sympatric speciation, caused by ecological, chronological, or ethological (behavioral) isolation (*see* ALLOPATRIC DISTRIBUTION OF ORGANISMS and SYMPATRIC DISTRIBUTION OF ORGANISMS).

The evolutionary processes that occur within a species and culminate in speciation are often combined under the general term "microevolution" (*see* MICROEVOLUTION). Macroevolution is the historical development of groups of organisms (taxa) of categories above the level of species. The evolution of taxa higher than species is the result of speciation originating under the influence of natural selection. However, the use of different time scales (the evolution of major taxa encompasses many stages of speciation) and research methods (use of data from paleontology, comparative morphology, embryology, and other sciences) helps to reveal patterns that are not detectable in the study of microevolution. The most important objectives of macroevolution are to analyze the relationship between individual development and the historical development of organisms and to determine the regularities of phylogeny and the main directions of the evolutionary process.

In 1866 the German naturalist E. Haeckel formulated the biogenetic law, according to which the stages of phylogeny of a taxonomic group are recapitulated in ontogeny (*see* BIOGENETIC LAW). Mutations are reflected in the phenotype of the adult organism if they alter the processes of its ontogeny. Therefore, natural selection among adult individuals leads to the evolution of the processes of ontogeny—the interrelations between developing organs, which I. I. Shmal'gauzen called ontogenetic correlations. The reorganization of the system of ontogenetic correlations caused by directional selection gives rise to phylembryogeny, by means of which new traits of organisms are formed in the course of phylogeny. If the changes occur in the organ's final stage of development, the organs of the ancestors continue to evolve further (anaboly). Deviations in ontogeny may also occur in the intermediate stages, resulting in the restructuring of organs (deviation). Changes in the formation and development of the early rudiments may give rise to organs not present in the ancestors (archallaxis). However, the evolution of ontogenetic correlations under the influence of stabilizing selection results in the preservation of only those correlations that most reliably safeguard the processes of ontogeny. These correlations are the recapitulations —duplications of the phylogenetic states of the ancestors in the ontogeny of the offspring—and they confirm the biogenetic law.

The direction of phylogeny of every taxonomic group is determined by its actual relation to the environment in which the taxon and its organization are evolving. The divergence of traits that arises among two or more taxa with a common ancestor is due to differences in environmental factors. It begins at the population level, leads to an increase in the number of species, and continues at taxonomic levels above the level of species. The taxonomic diversity of living organisms is caused by divergent evolution. Parallel evolution, which is less common, occurs when primary divergent taxa remain under similar environmental conditions and develop similar adaptations based on a similar organization inherited from the common ancestor. Convergence occurs when unrelated taxa adapt to identical conditions. Biological progress can be achieved by a general rise in the level of organization responsible for adapting organisms to environmental conditions that are broader and more varied than the conditions under which their ancestors lived. Such changes, aromorphoses, rarely occur and must give way to allomorphoses—divergence and adaptation to more specific conditions in the new habitat (*see* AROMORPHOSIS and ALLOMORPHOSIS).

The formation of narrow adaptations in the phylogeny of a group results in specialization. Shmal'gauzen distinguished four main types of specialization—telomorphosis, hypomorphosis, hypermorphosis, and katamorphosis—which, although differing in the nature of the adaptations, all result in a slowing of the rate of evolution (*see* EVOLUTION, RATE OF) and a decrease in evolutionary flexibility as a result of the loss of multiple functions by the organs of specialized animals (*see* TELOMORPHOSIS; HYPOMORPHOSIS; HYPERMORPHOSIS; and KATAMORPHOSIS). If the environmental conditions remain stable, the specialized species can exist indefinitely. This explains the occurrence of "living fossils," such as the many mollusk and brachiopod species that have existed from the Cambrian to the present day. If the living conditions change abruptly, the specialized species die out, while the more adaptable ones manage to adapt to the changes.

The doctrine of evolution and especially its theoretical core, the theory of evolution, serve as an important scientific foundation of dialetical materialism and a basis for modern biological methods.

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A. S. SEVERTSOV [29–1657–1]

EVOLUTIONARY MORPHOLOGY AND ANIMAL ECOLOGY, INSTITUTE OF (full name, A. N. Severtsov Institute of Evolutionary Morphology and Animal Ecology of the Academy of Sciences of the USSR), the leading Soviet scientific research institution engaged in the study of the phenomena of the evolution-

ary process and animal ecology, as well as a center for research in morphology. Located in Moscow, it was established in 1967 on the basis of the Institute of Evolutionary Morphology (founded 1935). The laboratories of experimental zoology (founded 1893 by A. O. Kovalevskii) and evolutionary morphology (founded 1930 by A. N. Severtsov) were incorporated into the institute and were contributing factors in determining its fields of specialization.

The institute has (1977) 20 laboratories, including laboratories of soil zoology and experimental entomology, the morphology and ecology of higher vertebrates, problems of domesticating animals, radioecology, the ecology of communities of terrestrial invertebrates, the behavior of lower vertebrates, problems of fish orientation, bioacoustics, and bird orientation and navigation (with a tagging center). It has a number of research groups, including the Man and the Biosphere, historical ecology, and biocybernetics groups.

The institute administers the Glubokoe Ozero Biological Station (organized 1891; Ruza Raion, Moscow Oblast), the Kostroma Taiga Experiment Station (organized 1977; Manturovo Raion, Kostroma Oblast), Utrish Marine Station (organized 1977; Anapa Raion, Krasnodar Krai, RSFSR), the Varzob Mountain Station (organized 1977; Tadzhik SSR), the Mukachevo Experimental Facility (organized 1959; Transcarpathian Oblast, Ukrainian SSR), the Chernogolovka Experimental Facility (organized 1975; Noginsk Raion, Moscow Oblast), a vivarium, and an electron microscopy unit.

The institute conducts research in the evolution of the structure, organs, and tissues of animals, the evolution of ontogeny, intraspecific variation of animals, changes resulting from domestication, the phylogenetic basis of animal behavior and orientation, patterns of animal population dynamics and biomass, and the evolution of biogeocenoses.

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V. E. SOKOLOV and N. G. RUBAILOVA [29–1660–1]

EVOLUTIONARY PHYSIOLOGY, a branch of physiology that studies the various functions of animals in the formative stage and in the course of historical development. Evolutionary physiology investigates the evolution of functions, that is, the processes by which the functions are formed and change under the influence of external and internal factors. It also deals with functional evolution in an attempt to answer why new functional relations arise and develop in a particular way.

The emphasis on evolution in Russian physiology is linked with the research of I. M. Sechenov, N. E. Vvedenskii, and I. P. Pavlov. The term "evolutionary physiology" was coined by A. N. Severtsov in 1914. The person most responsible for the creation of Russian evolutionary physiology is L. A. Orbeli, who devised the scientific method for studying it, defined the main objectives, and outlined (in the 1920's) the direction in which it should develop.

Orbeli, A. G. Ginetsinskii, P. K. Anokhin, and others formulated a number of general principles of functional evolution: (1) in the course of development and increasing complexity of the level of organization and establishment of new relations in the organism, the old functional relations do not disappear without a trace but remain suppressed, masked by phylogenetically younger functions; (2) the controlling influence on the nervous system increases as the organism develops; and (3) the various functional systems mature at different times in the course of individual development (*see* HETEROCHRONISM).

The study of the evolution of the central nervous system (A. I. Karamian) was closely linked with the investigation of the formation and development of conditioned reflexes in animals (E. M. Kreps, L. G. Voronin, D. A. Biriukov). Comparative and developmental physiology have long been successfully developed in Britain, the United States, Denmark, Czechoslovakia, and other countries, but the standardization of research methods and the establishment of evolutionary physiology as the modern stage of physiology, based on the historical principle, are the accomplishment of Russian science.

Evolutionary physiology makes use of the findings and advances of general physiology, biochemistry, comparative morphology, genetics, and other sciences, as well as the research methods of comparative, developmental, and ecological physiology. Comparative physiology makes it possible to compare and clarify the characteristics and specific regularities of the development of physiological functions in animals belonging to different taxonomic groups. Research on functions in the embryonic and postnatal stages of ontogeny has made it possible to establish the mechanisms governing the emergence and development of functions. Evolutionary physiology also makes use of clinical data, comparing symptoms of diseases with phenomena observed in the ontogenetic or phylogenetic development of the organism. Linked to clinical research are special experimental techniques that enable scientists to disconnect organs and tissues artificially from the mechanisms that control them, as well as from the different levels of the controlling mechanisms themselves. The development of the evolutionary trend in physiology has made it possible to uncover new patterns in the functional evolution of the brain and various systems of the organism and to reveal common principles underlying the evolution of the structure and functions of the sense organs, the evolution of the musculoskeletal system, and the maintenance of homeostasis in an organism. An important objective of modern evolutionary physiology is to determine the adaptative changes that occur in functions and to study higher nervous activity in humans as it forms and develops.

In the USSR, research in evolutionary physiology is primarily conducted at the I. M. Sechenov Institute of Evolutionary Physiology and Biochemistry (Leningrad), the A. N. Severtsov Institute of Evolutionary Morphology and Animal Ecology (Moscow), the N. K. Kol'tsov Institute of Developmental Biology (Moscow), and other institutes administered by the Academy of Sciences of the USSR. All-Union conferences on evolutionary physiology and biochemistry have been held periodically since 1956. Research results are published in the *Zhurnal evoliutsionnoi biokhimii i fiziologii* (since 1965) and in other journals of physiology.

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E. M. KREPS [29–1655–1]

EVOLUTIONARY PHYSIOLOGY AND BIOCHEMISTRY, INSTITUTE OF (full name, I. M. Sechenov Institute of Evolutionary Physiology and Biochemistry of the Academy of Sciences of the USSR), the leading scientific research institution involved in the study of the physiological, biochemical, and structural foundations of the evolution of functions. It was organized in 1956 at the initiative of the academician L. A. Orbeli in Leningrad on the basis of the Laboratory of Evolutionary Physiology, established by Orbeli in 1954. It was called the I. M. Sechenov Institute of Evolutionary Physiology until 1964.

The institute has (1977) 23 laboratories under the departments of the following subject areas: the evolution of the central nervous system, comparative physiology and morphology of afferent systems, the development of autonomic functions, the evolution of cholinergic systems, and evolutionary biochemistry. The institute conducts research on the functional evolution of the central and autonomic nervous systems, the biochemical evolution of the brain, the evolution of the structure, function, and biochemistry of the receptor apparatus, the evolution of endocrine functions, the development of kidney function and water-salt metabolism, the functional and biochemical evolution of the contractile apparatus, the evolution of the neuron and neurosecretory system, the evolution of higher nervous activity in children, and evolutionary regularities in the pathology of the human nervous system.

The studies of the staff members are published primarily in the *Zhurnal evoliutsionnoi biokhimii i fiziologii.* [29–1661–1]

EVOLUTIONIST SCHOOL, in ethnology, a trend that emerged during the formative period of ethnology as a science (second half of the 19th century) under the influence of the doctrine of evolution. Its chief representatives were J. Lubbock, J. McLennan, E. Tylor, and J. Frazer in Great Britain, A. Bastian, W. Wundt, and J. Lippert in Germany, L. H. Morgan in the United States, and D. N. Anuchin, M. M. Kovalevskii, the Kharuzins, and L. Ia. Shternberg in Russia.

The evolutionists considered the universal law of social development to be the evolution of culture from lower forms to higher forms, from savagery to civilization. They combined the progressive idea of the cultural unity of the human race and the use of ethnographic data, as well as mythological, archaeological, and other historical sources, to reconstruct early history with the mistaken assertion of the total similarity of the historical development of different peoples. They viewed history as the sum of the independent evolutions of separate elements of culture and social structure. Most proceeded not from a materialist understanding of the general laws of human history but from the idealist thesis of the "psychic unity" of the human race and its "elementary ideas" (Bastian), which form the basis of every culture. Morgan came close to the materialist explanation of history by examining social progress in relation to the development of the means of existence.

The classics of Marxism used Morgan's works and the works of other evolutionists in formulating a truly scientific conception of prehistory. Beginning in the late 19th century, the main theses of the evolutionist school were revised in bourgeois ethnology (K. Starke and E. Westermarck). (*See* CULTURAL HISTORY, SCHOOL, OF, and FUNCTIONALISM.) In the mid-20th century, a trend has emerged in American ethnology that makes use of the principal theses of the evolutionist school and correlates them with the latest scientific findings (L. White, J. Steward's neo-evolutionism).

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V. M. BAKHTA [29–1656–1]

EVORON, a lake in the basin of the lower Amur River, in Khabarovsk Krai, RSFSR. Lake Evoron has an area of 194 sq km and a depth of 2–3 meters. It extends 30 km from north to south and has a maximum width of 12 km. The western and southern shores are elevated and forested, whereas the others are low-lying and swampy. Fed by snow and rain, the lake is at its highest level in the spring and early summer. It freezes over in late October or early November, and the ice breaks up in May. The Evur River flows into Lake Evoron, which is fished commercially.
[29–1662–4]

EVORSION, erosion caused by vortices and eddies formed by falling streams of water, leading to the formation of potholes.
[29–1662–3]

EVVOIA (also Euboea), an island in the Aegean Sea, off the shore of the Balkan Peninsula, with which the island is connected by a bridge. Evvoia belongs to Greece. Together with its small offshore islands, it has an area of 3,908 sq km, and it measures 170 km from northwest to southeast. As of 1971, it had a population of 165,400. Elevations reach 1,743 m in the Dirphys, and karst is well developed. Evvoia has Mediterranean shrubs and forests. Agriculture includes animal husbandry and the cultivation of subtropical crops. There are magnesite deposits at Limne. The capital of the island is the city of Khalkis (Chalcis).
[29–1636–2]

EWALD, JOHANNES. Born Nov. 18, 1743, in Copenhagen; died there Mar. 17, 1781. Danish writer.

In his early works Ewald followed the examples of French classicism, for example, his tragedy *Adam and Eve* (1769). He later turned to themes drawn from Scandinavian mythology and history. Ewald's dramas *Rolf Krage* (1770) and *Balder's Death* (1775) prepared the way for the romantic national drama. The heroes of his tragedy *The Fishermen* (1779) are simple working men. Ewald wrote an autobiographical narrative *The Life and Opinions of Johannes Ewald* (1774–78). In his unfinished philosophical novel *The History of Mr. Panthakak* (begun 1771), he harshly criticized the concept of Enlightenment optimism. He also published odes and cantatas, as well as lyric poems. Ewald's song "King Christian Stood by the Lofty Mast" became Denmark's national anthem.

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[29–1633–1]

EWE (self-designation, *Ewegbe*), a people related to the Fon. The Ewe inhabit southeastern Ghana and southern Togo. According to a 1975 estimate, they number 2.55 million; they speak a Kwa language. Ancient beliefs involving ancestor and nature worship are widespread among the Ewe, although some profess Islam or Christianity. Before European colonization in the 19th century, land cultivation, handicrafts, trade, art, and folklore had reached a high level of development. In modern Ewe society, capitalist relations are combined with vestiges of clan and feudal relations. The Ewe engage primarily in land cultivation, their chief crops being maize, yams, cassava, and sweet potatoes; cocoa beans, oil-palm products, and cotton are produced for export.

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[29–1639–1]

EWE, the language of the Ewe people, spoken in southeastern Ghana and in southern Togo and Benin (Dahomey). According to a 1972 estimate, there are approximately 2 million speakers of Ewe, which is a Kwa language, of the Niger-Kordofanian language family. Ewe comprises three dialect groups: the western, central, and eastern. The western is made up of Anglo (Awuna) and the "interior" dialects; the central is made up of Wachi, Adja, and Gen; and the eastern is made up of Gun, Fon, and Mahi.

Ewe is distinguished by a rich vowel system: it has seven vowels, five of which have nasalized pairs. All vowels have three degrees of length, and there are numerous diphthongs. Consonants include the bicentral labiovelars *gb* and *kp*, and there is an opposition between bilabial and labiovelar *f* and *v*. Ewe has a dental and retroflex *d* and clusters of obstruents and resonants. Lexically distinctive tones exhibit phonological opposition.

Ewe is an isolating language. Simple words are mainly monosyllabic, and composition and reduplication are used extensively. There are derivational prefixes. The person and number of the verb are expressed by subject pronouns; aspect and tense, by special markers and by reduplication. The attribute precedes the word it modifies.

A Latin alphabet was devised in the late 19th century. Ewe literature is published mainly in the Anglo dialect.

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V. IA. PORKHOMOVSKII [29–1639–2]

EXA-, a prefix used to form the names of units of measure equal to 10^{18} of the original unit. It was adopted in 1975 by the 15th General Conference on Weights and Measures. The symbol is E.
[29–1890–2]

EXACUM, a genus of annual or perennial herbaceous plants of the family Gentianaceae. The flowers are white, lilac, dark blue,

or purple-violet; the inflorescence is a panicle. The fruit is a two-valved globose capsule. There are about 35 mainly tropical species, growing in India, East Asia, the Malay Archipelago, and the island of Socotra. Some ornamental species are raised in conservatories. Popular ornamentals include *E. affine*, which has numerous lilac flowers with yellow anthers, and *E. zeylanicum*, which has large azure flowers. [29–1753–4]

EXALTADOS, the members of a party of left-wing liberals in Spain during the revolution of 1820–23; also known as the New Liberals or the Liberals of 1820.

The *exaltados* included bourgeois and petit bourgeois urban elements, as well as certain officers, officials, and nobles. Their leaders were Flores de Estrado, Moreno Herra, Romero Alpuente, and R. Riego y Nuñez. Many of the *exaltados* were Masons. The extreme left-wing elements of the party broke away from the *exaltados* and formed the independent group known as the Comuneros.

The *exaltados* formed a government on Aug. 5, 1822. In May 1823 they achieved the passage of a law they had proposed to abolish seignorial rights, but they were unable to carry out the law because of intervention by France. The government of the *exaltados*, together with part of the Cortes and King Ferdinand VII, whom the *exaltados* held captive, moved to the Isla de León, where it surrendered on Sept. 30, 1823. After the outbreak of the revolution of 1834–43, many of the former *exaltados* joined the Progressive Party. L. V. PONOMAREVA [29–1890–3]

EXALTATION, an excited, rapturous state; in physiology, a transient period of heightened sensitivity of nerve and muscle tissues that gives way to a period of lowered, subnormal sensitivity. [29–1751–2]

EXAMINATION (Russian, *ekzamen*), in the USSR, a comprehensive survey of the knowledge of a student or of a person graduating from or entering an educational institution. Unlike tests (*zachety*), examinations—both oral and written—are always graded.

After the October Revolution of 1917 the system of examinations that existed in Russia was abolished. The following examinations were made compulsory in the 1930's: annual promotion examinations in general-education schools, beginning in fourth grade; admission, or entrance, examinations for higher and specialized secondary educational institutions; and semester final and state graduation examinations in higher and specialized secondary educational institutions.

In 1944 graduation examinations were instituted for students of incomplete secondary and secondary schools. According to the Statute on the Secondary General-Education School of 1970, the procedure for administering examinations in secondary general-education schools is determined by the ministries of education (or public education) of the Union republics. Compulsory graduation examinations are given in the eighth and 10th (or 11th) grades. Students who pass them receive a certificate of completion of an eight-year school or a certificate of secondary education. Promotion examinations may be instituted for the fourth through seventh grades and the ninth (or 10th) grade by the ministry of education (or public education) of a Union republic. There may be no more than three such examinations per grade. The certificate of completion of an eight-year school and the certificate of secondary education may also be received through the system of extramural education.

In higher and specialized secondary educational institutions, the time and procedure for administering competitive entrance examinations, semester finals, and state graduation examinations are determined by the Ministry of Higher and Secondary Specialized Education of the USSR according to the type of school. Students who have passed all tests are permitted to take the semester final examinations, and students who have passed all the semester finals may take the graduation examinations.

At many institutions of higher learning and at many technicums, defense of a diploma project or diploma thesis replaces state examinations in special disciplines. Vocational-technical schools and vocational courses give qualifying examinations for certain ratings, or ranks, in various lines of work. In addition to qualifying examinations, secondary vocational-technical schools also give graduation examinations in general-education subjects.

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EXANTHEM, VESICULAR, an acute viral disease of swine, characterized by fever and the formation of numerous vesicles on the skin. Swine of all ages are susceptible to the causative agent of the disease. The source of the agent is diseased swine. Infection occurs through contact with diseased animals or through fodder contaminated with their excretions.

Symptoms include elevated body temperature, decreased appetite, salivation, and the appearance of numerous vesicles on the oral mucosa, snout, and udders. The vesicles open, exposing a tender surface. If the extremities are affected, there is edema and lameness. In piglets there may be pneumonia, inflammation of the intestinal tract, and death. Treatment consists in the application of disinfectant and astringent solutions to affected areas. Preventive measures include the observance of sanitary conditions while transporting swine and trading in swine or pork. [29–1752–4]

EXARATION, the glacial destruction of the rocks that make up the bed of the glacier and the removal of the broken material (detached masses, boulders, pebbles, sand, clay, and so on) by a moving glacier. Exaration brings about the formation of glacial troughs, lake basins, sheepback rocks (roches moutonnées), glacial scarrings, and striations. In the course of destruction, the rocks are smoothed, ground, and polished. [29–1753–1]

EXARCHATE, a governorate in Byzantium from the late sixth to the late seventh century. The early exarchates were established in the western Byzantine Empire in lands retaken from the barbarians, the first exarchates being those of Ravenna and Carthage. Since the special circumstances attending such regions required the creation of a militarized and centralized government, exarchs headed not only the military forces but also the civil administration. The exarchate is sometimes regarded by Byzantine scholars as the prototype of the theme. [29–1753–3]

EXCAVATION, the process of removing rock or earth from a solid, broken, or unconsolidated layer by means of an excavator, bulldozer, scraper, or similar machine. In earthwork practice, the term "excavation" may also include the entire work cycle, that is, digging, transportation, and dumping of the earth with excavators.

Soft, loose, and dense rock is usually excavated directly from the solid formation by successive removal of layers of ground; rock that has been broken up beforehand is excavated from piles or loosened layers. Three types of excavation are distinguished according to the mutual position of the face and the horizon on which the machine is working: the face may be above or below the machine horizon, or a combination of the two arrangements may be used. Because digging is the principal component of the process of excavation, it is conventional to describe the process with respect to the specific resistance to digging. This quantity is affected by the physicomechanical properties of the rock or earth, the type of excavating machine used, the design and dimensions of the working member, and the procedure followed in working the face.

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IU. D. BUIANOV [29–1902–1]

EXCAVATOR, the principal type of machine designed to dig solid, soft rock or earth or fragmented hard rock and to load the ma-

terial into hauling units, such as motor vehicles and railroad cars, or deposit it in spoil banks. In the USSR, excavators handle approximately 35 percent of the earthwork in construction and more than 80 percent of the open-pit mining excavations; the total annual volume of excavations in the USSR (1976) is 15 billion cu m.

In the USSR excavators are divided into two groups according to the principle of operation: single-bucket excavators (power shovels) with discontinuous, or cyclic, action and multibucket excavators with continuous action. In the first group, all the major operations in a cycle are performed in a fixed sequence; in the second group they occur simultaneously.

Single-bucket excavators. The operating cycle of the widely used class of single-bucket excavators includes cutting or digging the ground as the bucket is simultaneously filled, moving the full bucket to the unloading point, unloading the bucket, and returning the bucket to the face. Depending on the power and the type of excavator and on the working conditions, the duration of the cycle ranges from 12 to 80 sec. The output of a single-bucket excavator with a bucket capacity of 1 cu m ranges from 100,000 to 350,000 cu m per year, or from 80 to 180 cu m/hr. Such machines are used for excavating any type of earth, including very hard and inhomogeneous earth containing large, solid inclusions. When used to work softer earth, they can be equipped with buckets of larger capacity. Hard rock and frozen earth are broken up (usually by blasting) before the excavators are used.

Single-bucket excavators are classified according to running gear as crawler-mounted, wheeled, walking, rail, floating, and combination rubber-tire-crawler types. They may be driven by a single engine or feature composite and/or individual drives for all operating equipment. The power unit may be an internal-combustion engine (diesel engines or sometimes carburetor or producer-gas engines) with electric, hydraulic, pneumatic, or combination-type motors. Single-bucket excavators may also be classified according to the type of control—manual, hydraulic, pneumatic, electrical, and composite types—and according to the type of operating equipment used—a bucket with a hinge and slide connection to the boom (forward dipper), a bucket with a hinge connection to the boom (backhoe), and a bucket with a flexible connection to the boom (dragline, clamshell, and other types). The most common type is the forward dipper (Figure 1,a); it may have any power rating and a bucket capacity up to 153 cu m (*see* POWER SHOVEL). Forward dippers designed to load the excavated material into hauling units or deposit it in spoil dumps are best suited to working mineral deposits and digging foundation pits, mainly in hard rock and rocky earth as well as in solid soils of average hardness.

The backhoe (Figure 1,b) is used to dig narrow trenches 0.7–1.5 m wide and up to 8 m deep, especially trenches with vertical walls (for laying sewer systems, oil pipelines, and foundation structures in hard and rocky earth) and small foundation pits.

The operating equipment of a dragline (Figure 1,c) comprises a boom and a bucket, which is suspended from the boom by means of hoisting and hauling (dragline) cables. The unit usually removes earth from a level below that on which it rests. Buckets of various capacities are used—more than 10 cu m for rocks that have been broken up beforehand. The duration of a cycle is usually 10 to 20 percent longer than that of a forward dipper. Approximately 40 percent of all excavators are operated with dragline equipment. Those that move in steps are called walking draglines.

Clamshell equipment (Figure 1,d) is used for loading operations, digging foundation pits with vertical walls, and working underwater. Plow units (Figure 1,e) are suitable for grading operations, removing pavements, and the like. Some excavator models designed mainly for construction work (with bucket capacities up to 5 cu m) are provided with various interchangeable equipment for earth removal, assembly, hoisting and conveying, loading and unloading, pile-driving and drilling operations, felling timber and uprooting stumps, and so on. They are usually called general-purpose excavators, universal excavators, or convertible shovels, because they are employed in many types of earth-moving and construction work. If the number of interchangeable equipment units is no more than three (for example, a shovel, dragline, and crane), they are known as semiuniversal excavators.

Excavators equipped with a hydraulic drive are widely used; they are suitable for use with all types of operating equipment. The equipment is hinged to a rotating platform and moved by means of hydraulic cylinders driven by high-pressure (10–40 megapascals) pumps. In this case hydraulic motors are usually used to transmit rotation (to turn and move). This type of single-bucket excavator is manufactured with buckets having small (up to 1.8 cu m), medium (2–3 cu m), and large (3.2–6 cu m) capacities; models with bucket capacities of 12–20 cu m are now being put into production in the USSR, primarily equipped with backhoes. The specific power ranges from 133 to 213 kilowatts per cubic meter of bucket, depending on the operating conditions (soft or hard earth).

Single-bucket excavators may be classified according to purpose as construction, open-pit, combination construction and open-pit, and stripping excavators; there are also tunnel, floating, and other types. Construction excavators are the most common single-bucket type (approximately 60 percent worldwide); there are about 200 models produced by more than 80 domestic and foreign factories. They include general-purpose, light-duty excavators with bucket capacities of 0.05–1.8 cu m, crane lifting capacities of 0.7–45 tons, and weights of 1.5–65 tons; semiuniversal, medium-duty excavators with bucket capacities of 2–3 cu m, crane lifting capacities of 60–80 tons, and weights of 72–105 tons; and semiuniversal, heavy-duty excavators with bucket capacities of 3.25–6 cu m, crane lifting capacities of 100–150 tons, and weights of 115–210 tons. The specific weight per cubic meter of bucket capacity for working hard earth is 33–36 tons for such excavators. For the most efficient use, the excavators are equipped with buckets having a capacity of 25–60

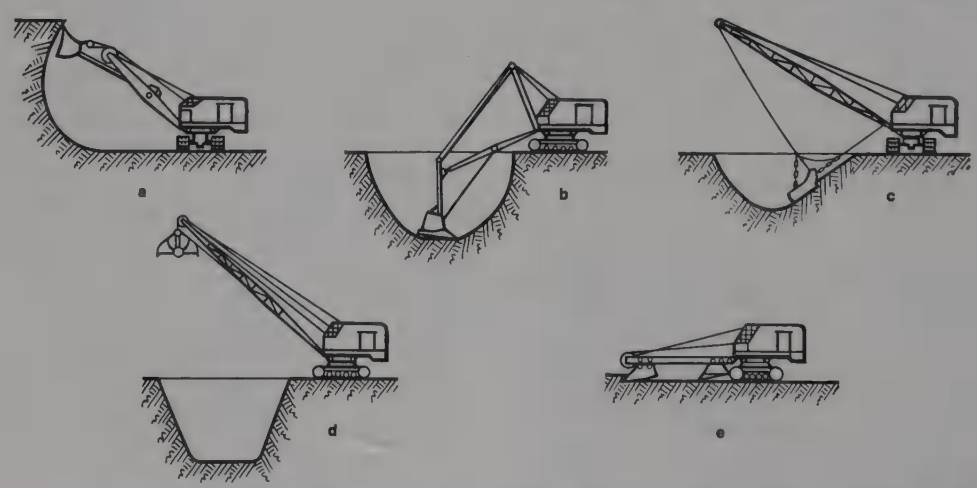

Figure 1. Diagrams of general-purpose excavators with interchangeable operating equipment: (a) forward dipper, (b) backhoe, (c) dragline, (d) clamshell, (e) plow unit

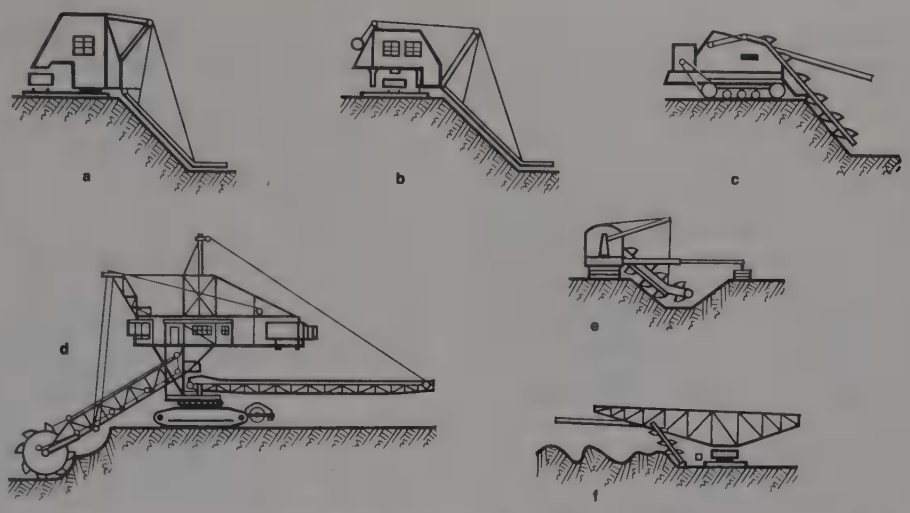

Figure 2. Diagrams of multibucket excavators: (a) nonrevolving chain type on rail mounting with side dumping, (b) single-gantry, nonrevolving chain type on rail mounting with side dumping, (c) revolving chain type on crawler mounting, (d) wheel type, (e) ladder-type trencher, (f) chain-type stripper

percent greater for working soft earth and 20–25 percent smaller for very hard earth. Light-duty machines often have interchangeable crawler and rubber-tire running gear and a single-motor drive. Hydraulic excavators may have individual or composite drives.

Open-pit excavators are usually made with shovel equipment and only rarely with interchangeable dragline and crane equipment. They are notable for the high power of the working equipment, high operating forces and speeds, and a short operating cycle, which are responsible for high output (compared with other excavators of the same size) when used to load hauling units, particularly when working hard earth. Medium-duty excavators with bucket capacities of 2–4 cu m and heavy-duty excavators with capacities of 5–20 cu m and weights of 76–900 tons are designed for open-pit operations, especially with hard rock and earth that have already been blasted, and for loading large dump trucks. They are manufactured both as semiuniversal excavators and as special shovels with standard and extra-long operating eqiupment for overhead loading of hauling units located on the edge of a working face or excavation. They are equipped with crawler running gear and electric power equipment with individual drives for the operating equipment powered by an engine-driven generator. The specific power of the driving engine is 60 to 80 kilowatts per cubic meter of shovel capacity, the pressure exerted on the ground is 0.15–0.25 megapascals, and the speed is 0.6–1.5 km/hr. Hydraulic open-pit excavators have shovel capacities up to 8–9 cu m, and models with capacities of 12–20 cu m are under development.

Combination construction and open-pit excavators of medium and high power are designed mainly for the open-pit mining of nonmetallic building materials. In design they are midway between construction and open-pit excavators.

Stripping excavators are usually equipped with shovels for shifting the stripped earth from open pits to spoil dumps. Those with shovel capacities up to 15 cu m are also used to load hauling units located on the edge of the face. Bucket capacities range from 6 to 153 cu m, and the units weigh from 700 to 12,700 tons. The running gear of heavy-duty models consists of four paired crawler treads. The power equipment is the same as for open-pit excavators. The specific weight ranges from 45 to 90 tons per cubic meter of bucket capacity, and the speed is 0.3–0.5 km/hr. Besides power shovels, stripping operations may also call for the use of walking draglines with booms up to 100 m long, buckets with capacities of 5–168 cu m, and weights up to 14,000 tons. They are the principal equipment used for mining mineral deposits without haulage systems. In 1977 one of the world's largest walking draglines was put into service in the USSR; it has a boom 100 m long and a bucket capacity of 100 cu m.

Tunnel and mine excavators are used underground in excavations having a large cross section to drive tunnels, construct the chambers of underground structures, and excavate minerals. Bucket capacities are from 0.75 to 1 cu m, and weights range from 16 to 30 tons.

Multibucket excavators. Multibucket excavators consist of operating equipment (buckets, an articulated bucket frame, and a boom), a metal superstructure to which the operating equipment is secured, drive mechanisms (power equipment), controls, a platform on which all the subassemblies and units are mounted, and running gear (the lower frame and engine). The running gear may be of the crawler (for any weight), rubber-tire (units up to 30–40 tons), rail, walking, or rail-walking types; the last two are suitable for any weight and for movement over soft earth. During operation, a multibucket excavator digs, scoops, transports, and unloads earth into an arterial conveyor or cars.

Multibucket excavators are divided into two basic categories depending on whether the operating equipment is of the chain or wheel type. In chain excavators with from 12 to 40 buckets, the buckets are attached to an endless chain that moves along rollers in guides on the bucket frame. Most models can provide an accurate final configuration for the banks of excavations and are therefore used in profiling operations (Figures 2,a and 2,b). In wheel excavators the operating member is a wheel having from six to 12 (sometimes up to 24) buckets (Figure 2,d). Earth is emptied out of the wheel buckets directly onto a conveyor located on a rotating boom or through a feeder; it is then transferred to an unloading conveyor. The total distance the earth is transported may be as much as 150 m, the digging height may reach 50 m, and the digging depth may range to 25 m. The wheel is almost completely freed from the task of transporting the earth, so that the excavation rate can be increased to 3–4.4 m/sec instead of the 0.4–1.2 m/sec of chain machines. Light-duty models with buckets having capacities ranging from 25 to 150 liters (*l*) can be used in open pits for excavating nonmetallic building materials; those of medium power with buckets of 200–450 *l* capacity are used for large construction projects; and heavy-duty models with buckets of 500–4,500 *l* capacity are used in large open pits. Wheel excavators are also used for the stockpiling and unloading of large volumes of materials at rates up to 12,500 cu m/hr or more. The excavator weight per liter of bucket capacity ranges from 0.9 to 1.5 tons; the average productivity ranges from 1.8 to 2.5 cu m/hr per liter of bucket capacity.

A distinction is made between multibucket excavators having buckets that move transversely with respect to the movement of the excavator, those with buckets that move longitudinally, and revolving excavators. Transverse excavators (Figure 2) are mainly chain types that move while operating in a direction perpendicular to the plane of motion of the buckets. They are able to excavate overhead and underneath, and they are mounted on rail or crawler running gear. Longitudinal excavators may be chain or wheel types that move while operating in a direction parallel to or

coincident with the plane of motion of the buckets; they thus serve as trenchers. Such machines are usually of low power, with weights up to 75 tons, and are mounted on crawler or rubber-tire running gear. They are designed for digging trenches 0.35–2 m (rarely 3 m) wide with depths from 1.2–2 m (for wheel excavators) to 8 m (for chain excavators). They are also manufactured as units to be mounted on tractors, rubber-tire prime movers, and trucks. Revolving multibucket excavators are of the chain type, with a bucket frame mounted on a rotating platform that turns on a supporting circle; they usually have crawler running gear (Figure 2,c). Provision for 360° rotation increases the weight of an excavator by 30–40 percent. The bucket capacity may reach 3,600 *l*. Such excavators are used to work dummy roads and to excavate two buckets alternately from one horizon by an upper and a lower face.

Multibucket excavators are most productive for concentrated open-pit operations and earthwork in soft, medium, and uniformly hard earth, especially when the transverse contours of the faces are constant or vary little and slopes of the excavation are regular. Light-duty excavators with bucket capacities up to 150 *l* can operate with any type of hauling unit; medium-duty and heavy-duty machines operate with railroad and conveyor haulage.

In addition to stripping operations in open pits, multibucket excavators are used for land reclamation and spoil dumping. In land reclamation, chain machines are usually used to excavate transversely; they are notable for the low specific pressure exerted on the ground (approximately 3×10^4 pascals) and are designed to dig banked trenches and small channels (Figure 2,e). They can excavate to a depth of 2.5 m and dig channels up to 12 m wide. The bucket capacity ranges from 25 to 75 *l*, and the excavators weigh from 12 to 20 tons. The specific power is approximately one kilowatt per liter of bucket capacity, and the productivity ranges from 1.5 to 3 cu m/hr per ton of weight (the higher value applies to the small models). Machines that excavate longitudinally are occasionally used with special equipment. Stripping shovels (Figure 2,f) with wheel or chain operating equipment and a cantilever dumping conveyor are used to handle large-volume spoil-dumping operations when the overburden in open-pit mines is excavated with multibucket excavators. They pile the loose earth of the overburden onto upper spoil banks to a height of 25 m or onto lower spoil banks to a height of 50 m.

History. The idea of creating an earth-moving machine is attributed to Leonardo da Vinci, who proposed a design for a dragline excavator in the early 1500's. The first steam dredger was built at the Izhora Factory under the direction of A. A. Béthencourt in the 1810's, and a single-bucket, nonrevolving excavator was patented in 1835 by W. S. Otis (USA). Single-bucket excavators came into general use in the late 1800's with the expansion of railroad construction. The first electric excavators appeared in 1910, and full-revolving, crawler-mounted excavators with internal-combustion engines appeared in 1912 (with diesel engines in 1916). Full-revolving, medium-power excavators with large operating equipment, mounted on railroad chassis, were first used for open-pit mining in the 1920's. In Russia the production of single-bucket excavators began in 1901 at the Putilov Factory (now the Leningrad Kirov Factory). Excavator production was organized in the USSR in 1931. In 1947 the Urals Heavy Machine-building Plant became the first in the world to begin series production of open-pit excavators with bucket capacities of 3–5 cu m; in 1958 the plant manufactured a walking dragline excavator with a bucket capacity of 25 cu m and a boom 100 m long. In 1965 the Novokramatorskii Machine-building Plant manufactured a power shovel with a 35–cu m bucket for working hard earth. A walking dragline with a bucket capacity of 100 cu m and a boom length of 100 m was fabricated at the Urals Heavy Machine-building Plant in 1975. In 1976 the same plant also readied production for a heavy-duty open-pit power shovel with a bucket capacity of 20 cu m, designed to work hard earth.

The manufacture of excavators abroad is concentrated in the USA (Marion Power Shovel Company, Inc., Bucyrus-Erie Company, and Harnischfeger Corporation), Great Britain, the Federal Republic of Germany, the German Democratic Republic, France, Japan, the Polish People's Republic, the Czechoslovak Socialist Republic, and other countries. In 1968 the Bucyrus-Erie Company fabricated a walking dragline with a bucket capacity of 168 cu m for working soft earth, and the Marion Power Shovel Company manufactured a power shovel with a bucket capacity of 153 cu m.

The multibucket excavator designed for use on land was invented in France by M. Couvreux in 1860 and was used in the construction of the Suez Canal. By the end of the 1800's multibucket excavators were widely used in Germany for the open-pit mining of brown coal. In Russia the production of multibucket excavators was initiated at the Putilov Factory in 1901. In 1921 excavators appeared in Germany with bucket capacities of 525 *l*; in 1933, with capacities of 1,200 *l*; in 1939, with capacities of 1,500 *l*; and in 1941, with capacities of 2,000 *l*. In 1958 a wheel excavator with a bucket capacity of 3,600 *l* was put into operation in the Federal Republic of Germany. In 1967 the Novokramatorskii Machine-building Plant began delivery of high-power wheel excavators with a production capacity of 3,000 cu m/hr, and in 1973, models with a production capacity of 5,000 cu m/hr.

Future development. The principal development trend in the manufacture of excavators is to increase productivity through the use of machines with greater unit power. The makeup of the excavator fleet is changing with the introduction of hydraulic types. The proportion of alloy steels used is being increased to 35–40 percent of the total excavator weight in light-duty excavator designs, 40–50 percent in medium-duty designs, and 70–80 percent in heavy-duty designs. The duration of the operating cycle is being reduced by increasing the speed of the individual operating movements. Rotary excavators are being designed for working rock with a specific excavating resistance up to 16×10^6 pascals. New trenchers with a productivity of 2,500–3,000 cu m/hr are designed to work earth with a specific excavating resistance of 0.8×10^7–1.0×10^7 pascals; they can dig trenches 2–2.5 m wide and as much as 3 m deep at a rate of 400–500 m/hr, which is 10–20 times faster and 5–6 times more economical than existing excavators of the same class are capable of. So-called "baby" excavators weighing 300–800 kg are now widely used. An automatic control system is being developed for continuous-action excavators; it regulates all the parameters that determine the progress of the operating cycle. Systems are being designed on this basis with self-optimizing algorithms for working the foot of banks and entire faces. Automatic control systems are being created to handle all the machines of a continuously operating complex—spoil dumpers, conveyors, and gantries.

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EXCITON, a quasiparticle that represents an electronic excitation in a dielectric or a semiconductor. Excitons propagate through a crystal and are not associated with the transfer of electric charge or of mass. The concept of the exciton was introduced in 1931 by Ia. I. Frenkel' (Frenkel), who hypothesized that photoconductivity does not occur in dielectrics upon the absorption of light because the energy absorbed is expended on the formation of excitons rather than the production of charge carriers.

In molecular crystals, an exciton is an elementary excitation of the electron system of an individual molecule. Such elementary excitations are known as Frenkel excitons. Owing to molecular interaction, a Frenkel exciton propagates through a crystal as a wave. Frenkel excitons are manifested in the absorption and emission spectra of molecular crystals (*see* SPECTROSCOPY, CRYSTAL). If a unit cell of such a crystal contains several mole-

cules, molecular interaction results in the splitting of exciton lines. This effect, called Davydov splitting, is associated with the possible transfer of a Frenkel exciton from one group of molecules to another group within the unit cell. Davydov splitting has been observed experimentally in a number of molecular crystals, such as naphthalene, anthracene, and benzene.

In semiconductors, an exciton is a hydrogen-like bound state consisting of a conduction electron and a hole. Such bound states are referred to as Mott-Wannier excitons. The binding energies $\mathcal{E}^*$ and effective radii a^* of Mott-Wannier excitons may be estimated on the basis of N. Bohr's equations for the hydrogen atom if two circumstances are taken into account. First, the effective mass m_e of a conduction electron and the effective mass m_h of a hole differ from the mass m_0 of a free electron. Second, the Coulomb interaction between an electron and a hole in a crystal is reduced by the permittivity ϵ of the medium. Therefore,

$$\mathcal{E}^* = \frac{m^* e^4}{2\epsilon^2 \hbar^2} = \frac{m^*}{m_0 \epsilon^2} \times 13.6 \text{ electron volts (eV)}$$

$$a^* = \frac{\epsilon \hbar^2}{m^* e^2} = \frac{\epsilon m_0}{m^*} \times 5 \times 10^{-9} \text{ cm} \quad (1)$$

where $m^* = (m_e m_h)/(m_e + m_h)$, $\hbar$ is Planck's constant, and e is the charge of the electron.

Equations (1) do not take into account the effect of the complex band structure of a crystal or the interaction of electrons and holes with phonons. However, allowance for these factors does not change the order of magnitude of $\mathcal{E}^*$ and a^*. For Ge, Si, and III-V and II-VI semiconductors, $m^* \sim 0.1\ m_0$ and $\epsilon \sim 10$, yielding $\mathcal{E}^* \sim 10^{-2}$ eV and $a^* \sim 10^{-6}$ cm. Thus, the binding energies of Mott-Wannier excitons are many times lower than the binding energy of the electron and the proton in a hydrogen atom, and the radii of such excitons are many times larger than the interatomic distances in a crystal. The high values of a^* indicate that an exciton in a semiconductor crystal is a macroscopic formation; hence, the crystal structure determines only the parameters m^* and $\mathcal{E}^*$. Therefore, a Mott-Wannier exciton may be regarded as a quasiatom that moves in a vacuum. The distortions of the crystal structure that are caused by a single exciton or by even a large number of excitons are negligibly small. In alkali halide and inert-gas crystals, $\mathcal{E}^* \sim 0.1$–1 eV, $a^* \sim 10^{-7}$–10^{-8} cm, and the formation of an exciton is accompanied by the deformation of a unit cell.

Mott-Wannier excitons are clearly apparent in the absorption spectra of semiconductors as narrow lines that are shifted below the optical absorption edge by a quantity equal to $\mathcal{E}^*$. The hydrogen-like spectrum of such excitons was first observed in the absorption spectrum of Cu_2O and later in other semiconductors. Excitons are also manifested in luminescence spectra, photoconductivity, the Stark effect, and the Zeeman effect. The lifetime of excitons is short; the electron and the hole that constitute an exciton can recombine, emitting a photon. For example, the lifetime of an exciton in Ge is of the order of 10^{-5} sec. An exciton may decay upon colliding with lattice defects.

When excitons interact with photons having frequencies $\omega = \mathcal{E}^*/\hbar$, new quasiparticles called polaritons are formed. Polaritons are mixed exciton-photon states. Their properties, such as their dispersion relation, differ considerably from the properties of both excitons and photons. Polaritons play an important role in the processes by which electronic excitation energy is transferred in a crystal and are responsible for various effects, such as peculiar features in the optical spectra of semiconductors in the exciton-band region.

At low densities, excitons behave in a crystal like a quasiparticle gas. At high densities, the interaction of excitons becomes substantial. For example, a bound state consisting of two excitons may be formed; such a bound state is called an exciton molecule, or a biexciton. However, in contrast to the hydrogen molecule, the dissociation energy of a biexciton is much lower than its binding energy, since the effective masses of electrons and holes in semiconductors are of the same order of magnitude.

If the density of excitons is increased, the distance between the quasiparticles may become of the order of their radius, leading to their collapse. The collapse may be accompanied by the formation of droplets of an electron-hole plasma. The formation of electron-hole droplets in such semiconductors as Ge and Si is manifested in the appearance of a new broad luminescence line that is shifted toward lower photon energies. Electron-hole droplets have a number of interesting properties, including a high concentration of electrons and holes at a low density (averaged over volume) and a high mobility in nonuniform fields.

At low exciton densities, an exciton, which consists of two fermions (a conduction electron and a hole), may be regarded as a boson. Consequently, Bose-Einstein condensation of excitons is possible; that is, a large number of excitons may accumulate in the lowest-lying energy level. Bose-Einstein condensation of excitons may lead to unattenuated energy fluxes in a crystal. However, in contrast to superfluid helium or a superconductor, a superfluid flux of excitons cannot exist for an arbitrarily long time. Such an exciton flux can exist only for the lifetime of the excitons.

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A. P. SILIN [29–1892–3]

EXCITRON, a controlled mercury-arc rectifier (in the Soviet Union, usually multianode) with a cathode spot that, once initiated, is maintained continuously by an excitation anode. Excitrons are used in equipment such as high-power rectifiers. [29–1894–1]

EXCURSION, a visit to some noteworthy place or site, such as a cultural monument, museum, or enterprise; a form and method of acquiring knowledge.

Excursions are generally conducted in groups led by a guide. They may be classified according to purpose as scientific, cultural-educational, and educational excursions; in addition to field trips carried out as part of a vocational guidance program, educational excursions include trips to industrial facilities for learning purposes and trips for the purpose of sharing experience and knowledge with others in one's field of work. Excursions may also be distinguished according to their subject, that is, the nature of the place or sight visited. A third way of classifying excursions is based on whether the object of the excursion is located in its natural setting or is in a museum-like environment. Finally, excursions may be distinguished according to the composition of the excursion group; for example, the members of the group may be of the same age or profession, or they may be tourists or students.

Excursions originated in the late 18th and early 19th centuries as a teaching method for improving students' independent study habits through the development of powers of observation. They were introduced into the educational process by progressive teachers in Western Europe and Russia who were opposed to scholasticism in pedagogy. In the 19th century excursions gradually became an intrinsic part of the educational process for schoolchildren. The Central Excursion Commission was established in Moscow in 1910 to provide excursion services to schoolchildren and teachers. In the same year the book *School Excursions: Their Significance and Organization*, edited by B. E. Raikov and G. N. Boch, was published; it dealt with the basic methodology of excursions.

Cultural-educational excursions developed alongside educational excursions in the late 19th and early 20th centuries, and special excursion organizations were established. The organization Excursions Through Russia was founded in 1907 as part of the Russian Society of Tourists. The magazine *Ekskursionnyi vestnik* was published in Moscow from 1914 to 1916, and the magazine *Russkii ekskursant* in Yaroslavl from 1914 to 1917.

The Soviet government's first decrees on schools treated excursions as a necessary element in the educational process. The Central Bureau of School Excursions was established in Moscow in 1918. In the late 1920's and early 1930's cultural-educational ex-

cursions became a component of tourism. The joint-stock company Soviet Tourist was founded in 1928 and was reorganized in 1930 as the All-Union Voluntary Society for Proletarian Tourism and Excursions. In the 1930's excursion tour stations of the People's Commissariat for Education were opened in several cities, including, in 1932, the Central Station in Moscow. In 1936 the Central Executive Committee of the USSR entrusted the All-Union Central Council of Trade Unions (VTsSPS) and its member organizations with the development of tourism and excursions.

After the Great Patriotic War of 1941–45 there was an increase in the activities of the tourist and excursion institutions and organizations of the VTsSPS in all Union and autonomous republics, krais, and oblasts. In large cities tourism councils were established that consisted of representatives of state and public organizations providing tourist and excursion services for working people. A new stage in the development of excursions was inaugurated in 1969 by the decree of the Central Committee of the CPSU, the Council of Ministers of the USSR, and the VTsSPS On Measures for the Further Development of National Tourism and Excursions. The number of excursionists increased from 35 million in 1970 to 152 million in 1977. In this period excursion organizations were opened in 600 cities; they offered a total of more than 15,500 excursions in such fields as industry, history, natural history, architecture, art, and literature.

According to an estimate made in 1977, the average annual number of guides employed by the trade unions' system of excursion services is approximately 35,000. In 1977 there were 1,200 museums, art galleries, and exhibitions providing scientific, cultural, and educational excursion services on a large scale; they were visited by approximately 120 million people a year. The Central Lenin Museum in Moscow and its branches enjoy the greatest popularity, with more than 6 million visitors each year.

The USSR has a high index of excursion participation, that is, a high number of visits to excursion sites per capita; in 1975 there were more than 1,200 visits per 1,000 members of the population. Specialized excursion services for schoolchildren are offered by the Children's Excursion Tour Stations of the Ministry of Education of the USSR; in 1977 there were more than 200 such stations, and about 8 million schoolchildren took part in excursions. Soviet schools make wide use of excursions in the educational process. The schools provide subject excursions, or excursions related to subjects in the curriculum; industrial excursions, which V. I. Lenin regarded as one of the ways to solve problems of general and polytechnic education; combined excursions, which combine different subjects of study; and cultural-educational excursions.

The excursion method is used in programs for the vocational guidance of youth, in systems for improving the skills of workers and exchanging experience and knowledge concerning new techniques and methods of work, and in the production of educational films and television programs.

In the developed countries, excursions have become an integral part of traveling and one of the purposes of travel, and excursion tourism has been developed as a means of learning about the world. The excursion as a recreational activity is of great social value, since it fulfills several functions at the same time: it facilitates interpersonal contact, the acquisition of knowledge, and improvement of health. The necessity of providing services for excursionists on a mass scale has led to the appearance of specialized institutions, such as excursion bureaus; specialized workers, such as guides and methodologists; and specialized means of transportation, including modifications of buses and riverboats.

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P. S. PASECHNYI and V. M. KRIVOSHEEV [29–1902–7]

EXECUTIVE COMMITTEE RANGE, a section of a massif on Marie Byrd Land in Western Antarctica. The range extends from 76°20′ to 77°20′ S lat. It is composed of basalts. Individual mountain peaks rise above the ice sheet, which has a thickness of approximately 1,000 m in the region; the range reaches a maximum elevation of 4,181 m at Mount Sidley. Executive Committee Range was discovered in 1940 by an American expedition under the leadership of R. Byrd. It was named in honor of the Executive Committee of the Antarctic Service of the USA. [29–1674–2]

EXEKIAS. Greek potter and vase painter of the third quarter of the sixth century B.C. Exekias was the most outstanding representative of the late black figure style. His works include painted amphorae, for example, *Achilles in Battle With Penthesilea and Memnon With a Negro* and *Hercules Fighting the Nemean Lion* (both housed in the Antiquities Collection, Berlin), as well as *Ajax With the Body of Achilles* (Glyptothek, Munich). He also made kylikes, including the Nike kylix (Louvre, Paris) and *Dionysos Crossing the Sea* (Glyptothek, Munich). [29–1891–4]

EXEQUATUR, in international law:

(1) An authorization for a consular officer to perform his functions in his consular district in the state to which he is accredited. The exequatur is issued by the competent bodies of the country of destination when the officer presents his consular commission; it is issued in the form of a special document or sometimes a special notation made on the commission. In accordance with Soviet legislation, exequaturs are issued by the Ministry of Foreign Affairs of the USSR.

(2) An authorization for the compulsory execution in a given country of a judgment pronounced by a court in another country. The exequatur takes the form of a legal order by which a court acknowledges the legal force of a foreign court's decision and extends the effect of the ruling to the territory of its own state. This type of exequatur is usually implemented by appellate courts.

Soviet legislation permits the recognition and execution of foreign court and arbitration judgments that are legally valid, do not conflict with Soviet sovereignty, and do not threaten the security of the USSR. It is required, however, that the USSR have concluded an appropriate agreement with the corresponding government or that the given legal area be governed by an international convention. The judgments must be presented to the Soviet court within three years from the time they are pronounced.

Exequaturs are not used in international legal relations between socialist countries. When necessary, decisions of foreign courts are carried out on the basis of agreements of legal assistance. [29–1753–7]

EXERCICE, a group of practice exercises in ballet that helps dancers develop muscles and ligaments and that promotes coordination of movements. The practice exercises are performed at the *barre* (a bar attached to a wall with brackets) and in the center. The daily *exercice* consists of the same elements. [29–1755–2]

EXERGY, a term used in thermodynamics to designate the maximum work a system can perform on moving from a given state to equilibrium with its surroundings. The work done by a system in a particular thermodynamic process is maximal only if the process is an equilibrium process. [29–1891–5]

EXETER, a city and borough in southwestern England. Port on the River Exe. Seat of Devon County. Population, 93,300 (1976). Exeter has enterprises of the machine-building and food-processing industries. The city has a university.

Exeter is located on the site of a Celtic settlement. Traces of regular Roman street layout remain; however, the historical part of the city, located within the standing portions of a wall dating to the Middle Ages, presents a picture of unplanned growth. Structures of architectural interest include the ruins of the late Romanesque castle on Rougemont Hill (begun 1068), a 12th-century guildhall combining the Romanesque and Gothic styles (rebuilt

14th and 16th centuries), and a Gothic cathedral in the decorated style (originally a Romanesque church; rebuilt 1275–1375). The Royal Albert Memorial Museum, with archaeological collections of pottery and bronzes, is located in Exeter.

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EXHAUSTER, an obsolete name for a fan, usually a centrifugal fan, that creates a suction and is designed to remove dust, flue gases, and other harmful impurities from the air of production areas. Exhausters are also used in pneumatic conveying systems for the removal of the waste materials generated in certain industrial processes. [29–1890–5]

EXHUMATION, the removal of a corpse from a burial site. According to Soviet law, a body may be exhumed at the request of an investigator, who must state the purpose of doing so: an investigatory view (or a second investigatory view) of the body, identification of the deceased by an acquaintance or an expert, or presentation of the body for primary, additional, or follow-up forensic expertise (medical, biological, or toxicological). The most frequent reason for exhumation is to examine a body that should have been subjected to forensic medical expertise owing to the circumstances of death but that was buried without an autopsy.

Witnesses, a forensic medical expert, and, if necessary, another specialist, such as a health inspector, are present at an exhumation. The investigator prepares a protocol of the exhumation, which includes photographs of the grave, gravestone, coffin, and corpse. [29–1891–2]

EXINE (also exosporium), in seed plants, the outer layer of the wall of pollen grains (microspores). In many plants the outside of the exine has nodules or reticular enlargements, which form specific patterns characteristic of a particular species and are therefore often used to identify the species to which a pollen grain belongs. [29–1755–4]

EXISTENTIALISM, or existential philosophy, an irrationalist current in contemporary bourgeois philosophy that emerged on the eve of World War I in Russia (L. Shestov and N. A. Berdiaev), after World War I in Germany (M. Heidegger, K. Jaspers, and M. Buber), and during World War II in France (J.-P. Sartre, G. Marcel, M. Merleau-Ponty, A. Camus, and S. de Beauvoir). Existentialism gained further currency throughout Europe during the 1940's and 1950's, and in the USA during the 1960's.

In Italy, the best-known existential thinkers are E. Castelli, N. Abbagnano, and E. Paci; in Spain, J. Ortega y Gasset was close to existentialism; and in the USA, the existential philosophy was popularized by W. Lowrie, W. Barrett, and J. Edie. Certain religious-philosophical currents are closely related to existentialism—specifically, French personalism, as represented by E. Mounier, M. Nédoncelle, and J. Lacroix, and the dialectical theology of K. Barth, P. Tillich, and R. Bultmann. B. Pascal, S. Kierkegaard, M. de Unamuno, F. M. Dostoevsky, and F. Nietzsche are regarded as the precursors of existentialism by its adherents. The philosophy of life and the phenomenology of E. Husserl were influential in the development of existentialism.

Diverging from traditional rationalist philosophy and science, in which mediation is considered the basic principle of thought, existentialism seeks to comprehend being as a kind of unmediated and undivided unity of subject and object. Primordial and authentic being is identified with experience, which is interpreted in existentialism as the subjective experience of "being-in-the-world." The existentialist regards being as an unmediated given, or as human existence—which, in his judgment, cannot be known by scientific or even by philosophical means.

In order to describe the structure of existence, many of the existentialists, such as Heidegger, Sartre, and Merleau-Ponty, resort to the phenomenological method of Husserl; they consider the structure of consciousness to be constituted of its orientation toward the other—that is, its intentionality. Existence is "open"; it is directed toward the other, which becomes its center of attraction. According to Heidegger and Sartre, existence is being, which is directed toward nothing and is aware of its own finiteness. Thus, Heidegger's description of the structure of existence amounts to a description of the various modes of human existence—such as concern, dread, resolution, and conscience—which are defined by death and which represent various means of contact with nothingness, movement toward or flight from nothingness, or other type of relation to it. Thus, too, it is at moments of extreme shock, which Jaspers calls boundary situations, that existence reveals itself to man as the root of his being.

Existentialism defines existence by its finiteness; the latter is interpreted as temporality, whose reference point is represented by death. In contrast to physical time, which is pure quantity, or an endless series of passing moments, existential time is qualitative, finite, and nonrepeatable; for Heidegger and Jaspers, it represents fate. Existential time is inseparable from that which constitutes the essence of existence, including birth, love, repentance, and death. What the existentialists emphasize in the phenomenon of time is the decisive significance of the future; viewing the future in conjunction with such existential concepts as "resolution," "project," and "hope," they stress the personal-historical (rather than the impersonal-cosmic) nature of time and affirm its connection to human activity and to men's strivings, efforts, and expectations.

In existentialism, the historicity of human existence is reflected in its always being in a given situation—a situation into which it is "thrown" and with which it is forced to reckon. The individual's membership in a particular nation or caste and his being endowed with such specific qualities as biological and psychological traits—all these circumstances are empirical manifestations of the fundamentally situational nature of existence, or of its "being-in-the-world." The temporality, historicity, and situational nature of existence are modes of its finiteness.

Another important existential concept is transcendence, or "being beyond." The different types of philosophical reasoning that distinguish the various exponents of existentialism depend on the particular interpretation of the transcendent and of the very act of transcending. Jaspers, Marcel, and the late Heidegger acknowledge the reality of the transcendent; the predominant element in their philosophy is the symbolic, or even (in Heidegger) the mythic-poetic—in that the transcendent is unknowable and can only be "alluded to." This may be contrasted to the critical doctrine of Sartre and Camus, who set themselves the goal of demonstrating the illusory nature of transcendence.

Existentialism rejects both the rationalist tradition of the Enlightenment, which reduces freedom to the recognition of necessity, and the humanist-naturalist tradition, for which freedom consists in discovering man's natural inclinations and liberating his "essential" forces. For the existentialist, freedom is existence itself, and existence is freedom. Inasmuch as the structure of existence is expressed in "movement-toward" (that is, movement toward something that is not one's own existence), or transcendence, the existentialist's definition of freedom depends on his interpretation of transcendence. For Marcel and Jaspers, this means that freedom can be found in god alone. For Sartre, on the other hand, inasmuch as to be free means to be oneself, "man is doomed to be free." In existentialism, freedom represents a heavy burden; man, insofar as he is an individual being, must bear that burden. He can renounce his freedom, can cease being himself, and can become "like all," but only at the cost of repudiating himself as a person.

For Heidegger, the world in which man is immersed is called "they" (in German, *man*); it is an impersonal world where everything is anonymous, where there are no subjects of actions but only objects of actions, and where everyone, including man in relation to himself, is "other"; it is a world in which no one decides anything and therefore no one is responsible for anything. For Berdiaev, this world is called "the world of objectification," and its attributes are "(1) the alienation of the object from the subject; (2) the absorption of the uniquely individual and personal by the general, impersonal, and universal; (3) the dominant role of necessity and of determinability from without, entailing the suppression and shutting out of freedom; and (4) the adjustment to the massive scale of the world and history, accommodation to

the average man, and socialization of man and of man's opinions, resulting in the destruction of originality" (*Opyt eskhatologicheskoi metafisiki*, Paris, 1949, p. 63).

Contacts between individuals in this objectified world are not genuine; they merely underscore each person's isolation. According to Camus, we are confronted with nothingness, which makes human life senseless and absurd; the gap between individuals cannot be bridged, and genuine intercourse between them is impossible. Both Sartre and Camus see falsity and hypocrisy in all forms of personal intercourse—such as love and friendship—sanctified by traditional religion and morality. Sartre's characteristic passion for exposing distorted and transmuted forms of consciousness, or "bad faith," turns in essence into the demand for acceptance of the reality of consciousness as detached from others and from itself. Camus acknowledges only one mode of genuine intercourse—namely, the unity of individuals in revolt against the "absurd" world and against the finiteness, mortality, imperfection, and senselessness of human existence. Ecstasy may unite one individual with another, but in essence this is the ecstasy of destruction, or rebellion, engendered in "absurd" man by despair.

Marcel proposes a different solution to the problem of human intercourse. In his view, the disconnectedness of individuals is due to the fact that the being of objects is taken to be the only possible being. But genuine being, or transcendence, is not the being of objects; rather, it is personal being, and consequently the authentic relationship to being is dialogue. Being, according to Marcel, is not "it" but "thou"; therefore the prototype of man's relation to being is his relation to another person, as witnessed by god. Transcendence is the act by means of which man goes beyond the limits of his locked-in egoistic self. Love is transcendence—breaking through to the other, be the other human or divine; insofar as this breakthrough cannot be understood by means of reason, Marcel assigns it to the sphere of "mystery."

Genuine human intercourse is not the only way of breaking through the objectified world, or the world of the "they"; according to the existentialists, such breakthroughs also take place in the sphere of artistic and philosophical creativity. Both genuine communication and creativity, however, carry within themselves a tragic flaw: the world of objectivity constantly threatens to destroy existential communication. For this reason, according to Jaspers, everything in the world is ultimately subject to destruction by virtue of the very finiteness of existence, and man must therefore learn to live and love with the constant awareness that everything he loves is fragile and finite, not excluding love itself. But the deeply hidden pain resulting from such awareness imparts a particular purity and spirituality to man's affections. Berdiaev's eschatological doctrine is based on this awareness of the fragility of any form of authentic existence.

The predominant mood in existentialism is one of dissatisfaction and searching; the existentialist seeks to negate and go beyond what has been attained. The tragic and generally pessimistic slant of this philosophy testifies to the state of crisis of contemporary bourgeois society and the extreme forms of alienation prevailing therein; existentialism may therefore be called the philosophy of crisis.

The various exponents of existentialism differ in their sociopolitical positions. Thus, Sartre and Camus were members of the resistance movement; beginning in the late 1960's, Sartre's position was marked by extreme left radicalism and extremism. Camus's and Sartre's ideas were particularly influential in shaping the sociopolitical program of the new left movement. Jaspers and Marcel were liberals in their political orientation, while the sociopolitical views of Heidegger—in his time a Nazi collaborator—are markedly conservative in nature.

Existentialism reflected the spiritual state of bourgeois society and laid bare its ills and contradictions; it was unable, however, to propose a way out of the situation.

The ideas and themes of existentialism have been treated in Western European, American, and Japanese contemporary literature; their influence can be traced not only in the literary works of the existentialist philosophers themselves—Sartre, Camus, Marcel, and de Beauvoir—but also in the work of such writers as A. Malraux, J. Anouilh, E. Hemingway, N. Mailer, J. Baldwin, I. Murdoch, W. Golding, and Abe Kobo.

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P. P. GAIDENKO [29–1755–5]

EXKUSEIA, a form of privilege in Byzantium between the tenth and 15th centuries.

Exkuseia released the owner of privileged landholdings and the peasants living on them from state taxes (usually extraordinary taxes) and removed the lands from the jurisdiction of state officials, such as tax collectors, theme judges, and military officials. In Byzantium oppressive taxes were the most important means of exploiting the rural population, and *exkuseia* created a type of landowning with special privileges; the state, however, retained supreme jurisdiction over the property and could limit or withdraw the privilege. From the 13th to 15th centuries, those people to whom *exkuseia* had been granted had the right to collect legal duties.

Exkuseia could take other forms as well, such as releasing the recipients of the privilege from taxes on the condition that they perform certain tasks; imperial gunsmiths and state postal workers received this type of privilege. Another form of *exkuseia* released ships from the payment of trade duties.

Many Byzantine scholars—including the Russian researchers K. N. Uspenskii and P. A. Iakovenko and the Yugoslav historian G. Ostrogorskii (Ostrogorski)—regard *exkuseia* as identical to the Western European institution of immunity. The two institutions certainly fulfilled the same social function—the development of privileged landowning.

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EXOBIOLOGY, an experimental scientific discipline concerned with the search for and investigation of extraterrestrial life forms. Exobiology is primarily interested in the determination of the limits of the study of the mechanisms of survival of terrestrial organisms under extreme environmental conditions, the elucidation of pathways of abiogenic synthesis of the most important bio-organic compounds and the stages of prebiological evolution, and the establishment of criteria for the existence and development of automated methods of discovering life on other planets by means of automated biological laboratories.

It has been established that many terrestrial microorganisms or their spores can retain their viability at low temperatures (below −70°C), in a vacuum (as low as 10^{-7} to 10^{-10} mm Hg), and at low air humidities (1–2 percent). The abiogenic synthesis of amino acids, lipids, nucleotides, sugars, and other biologically important substances has been effected by the action of ultraviolet rays on simple compounds, such as water, ammonia, carbon

monoxide, and methane. This has made it possible to advance the concept in exobiology of the possibility of life on other planets, first and foremost on Mars, which is constructed on a carbon-organic aqueous base. In the search for extraterrestrial life, exobiology uses various methods and devices to identify complex organic compounds, including gas chromatography, mass spectrometry, and optical instruments that record the absorption spectra and luminescence of substances from extraterrestrial soils. Functional methods are used to determine active metabolism by recording parameters of growth, reproduction, and gas exchange of microorganisms during incubation of soil specimens on combined nutrient media of complex composition. Only the combined use of various methods according to a single program in the automated biological laboratory can eventually bring success.

In 1976 the space probe Viking (USA), with an automated laboratory on board, successfully landed on Mars. However, the first exobiological experiment on Mars provided no evidence of life on the planet. Further experiments may be carried out both by means of automated biological laboratories and by the direct study of soil samples brought from Mars to the earth. Similar investigations carried out on lunar soil specimens indicate the absence of life on the moon in the past and present.

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A. B. RUBIN [29–1759–2]

EXOCRINE GLAND, in animals and humans, a gland that secretes the substances it forms through ducts onto the surface of the body or of mucous membranes or into a cavity. Exocrine glands include the sebaceous, salivary, sweat, mammary, lacrimal, and musk glands, as well as the liver, glands of the gastrointestinal tract, and other glands that release secretions into the alimentary canal. [29–1761–6]

EXOGAMY, the practice of marrying only outside one's own group, as prescribed by law or custom in the age of the primitive communal system. The ban could apply to marriages within one's family group (such as the clan or phratry) or, more rarely, to marriages within one's regional group or community. The prohibition against such marriages was retained in later times.

There are numerous theories concerning the origin of exogamy; the theories basically fall into three groups. Some researchers, including L. H. Morgan, believe the practice arose from the need to avoid the possibly harmful consequences of marriages between blood relatives. Others, including E. Tylor, A. M. Zolotarev, and C. Levi-Strauss, regard it as an attempt to expand social contacts and initiate relations with other groups. Still others, including S. P. Tolstov and Iu. I. Semenov, regard it as a means of establishing social peace within a group, since sexual relations and the conflicts that accompany them are thus carried beyond the confines of the group.

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Pervobytnoe obshchestvo: Osnovnye problemy razvitiia. Moscow, 1975.
[29–1759–3]

EXOGASTRULATION, an experimentally induced disturbance of the process of gastrulation in animal embryos, effected, for example, by the removal of the egg membranes or a change in the pH of the medium. Exogastrulation consists in a change in the direction of morphogenetic movements of cells and cell layers of the embryo. In amphibians, for example, the material of the chordomesoderm and the endoderm, which normally goes inside the embryo, moves to the outside and has no contact with the exoderm over almost its entire surface. In the subsequent development of the exogastrulated embryo, the nervous tissue in the ectoderm does not become differentiated. An atypical epidermis is formed, while the material of the chordomesoderm and the entoderm undergoes differentiation.

Exogastrulation demonstrates the necessity of contact between the chordomesoderm and the ectoderm for induction of the rudiment of the nervous system. It also shows that various morphogenetic movements must be coordinated for the normal course of gastrulation. [29–1760–1]

EXOGENOUS, in botany, a term referring to the development of lateral organs in the peripheral cell layers of the main axis of a particular plant organ. Examples of exogenous organs are the leaves that develop in the form of external nodes on the growing point of shoots, root hairs (which are lateral growths of root integuments), and some epidermal growths (trichotomes) of a plant's aboveground organs. [29–1761–2]

EXOGENOUS NUTRITION, the process whereby substances entering the body from the environment are assimilated. Ingested food is broken down into comparatively simple chemical compounds, which are absorbed and then used to build tissues and organs and to regulate functions. The chemical compounds provide the energy needed for life processes. [29–1760–2]

EXOGENOUS PROCESS, a geological process caused by sources of energy exterior to the earth's surface, chiefly solar radiation, in combination with the force of gravity.

Exogenous processes occur at or near the surface of the earth's crust and are the mechanical and physicochemical interactions of the crust with the hydrosphere and atmosphere. They include weathering and the geological action of wind (eolian processes, deflation), flowing surface and groundwaters (erosion, denudation), lakes and swamps, the waters of the seas and oceans (abrasion), and glaciers (exaration). The most important manifestations of exogenous processes on the earth's surface are the disintegration of rocks and chemical transformation of their constituent minerals (physical, chemical, and organic weathering), the removal and transport of the resulting loosened and soluble products by water, wind, and glaciers, and the deposition (accumulation) of these products in the form of sediments on land or at the bottom of water basins and their gradual transformation into sedimentary rocks (sedimentogenesis, diagenesis, catagenesis).

Exogenous processes, together with endogenous processes, contribute to the shaping of the earth's relief and the formation of sedimentary rocks and associated ore deposits. Thus, for example, ores of aluminum (bauxites), iron, nickel, and other minerals form under conditions of weathering and sedimentation. The selective deposition of minerals by flowing waters results in the formation of gold and diamond placers. Combustible minerals form under conditions favorable to the accumulation of organic matter and sedimentary strata rich in such matter.

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Obshchaia geologiia. Moscow, 1974.
G. P. GORSHKOV and E. V. SHANTSER [29–1761–1]

EXOPEPTIDASE, an enzyme of the hydrolase class. Exopeptidases catalyze the splitting of amino acid residues from an amine or carboxyl end of a protein or peptide molecule. The two main kinds are aminopeptidases and carboxypeptidases. [29–1762–1]

EXOPHTHALMOS, protrusion of the eyeball. Exophthalmos is most commonly caused by diffuse toxic goiter. It may also be caused by a tumor in the eyeball or adjacent regions, trauma of the eyeball, thrombosis of the orbital veins, and inflammatory diseases. If pronounced, exophthalmos may be accompanied by limited mobility of the eyeball and impairment of vision. Therapy is based on the cause of the condition. [29–1763–4]

EXOSOMATIC ORGAN (also ectosomatic organ), a concept introduced into animal morphology by the Soviet zoologist A. N. Severtsov to designate organs whose functions are directly linked with the external (in relation to the living organism) environment. Exosomatic organs include the skin and its appendages

(feathers, hairs, scales), sense organs, and the intestinal canal and its glands.

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EXOSPHERE, the outer and most rarefied layer of the atmosphere, where the mean free path of the particles is so large that they can be dispersed (diffused) into interplanetary space. The mass of the "air" in the exosphere is close to 10^{-10} times the mass of the atmosphere. Light gases, such as H and He, are the most quickly dispersed.

The exosphere begins at altitudes of 450 to 800 km, and its upper boundary is several thousand km above the earth's surface, where the concentration of particles is the same as in interplanetary space. The exosphere consists of ionized gases (plasma), and the ratio of charged particles to neutral particles is close to unity where it begins; in the upper half of the exosphere, the air is almost completely ionized. The lower and middle parts of the exosphere are composed mainly of O and N atoms; with increasing altitude, the relative concentration of light gases, especially ionized hydrogen, grows rapidly. The gas kinetic temperature of the exosphere, which increases somewhat with altitude, is 1500° to 3000° K. An increase in solar activity warms the exosphere and increases its thickness. The magnetic field of the earth, which has an intensity of 0.3 oersted in the lower part of the exosphere and 10^{-2} to 10^{-3} oersted at its upper boundary, strongly affects the physical processes within it. The radiation belts of the earth are located for the most part in the exosphere.

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Akasofu, S. I., and S. Chapmen. *Solnechno-zemnaia fizika*, part 1. Moscow, 1974. (Translated from English.)
S. M. SHMETER [29–1762–5]

EXOSTOSIS, a benign bony or bony-cartilaginous growth on the surface of a bone in the form of a linear or round mass. Exostoses develop mainly in males during childhood and adolescence, on the femur, tibia, humerus, and other bones. They cease to enlarge when bone growth ends. They usually do not cause complaints. However, fairly large exostoses compress muscles and nerve trunks, causing pain and hampering movement. The principal means of diagnosing exostoses is by X ray.

Exostoses are removed surgically if symptoms are pronounced or if the exostoses suddenly begin to grow rapidly in adults. Individuals suffering from exostoses are kept under clinical observation. [29–1762–4]

EXOTHERMIC REACTION, a chemical reaction in which heat is given off. Examples of exothermic reactions are combustion, neutralization, and most of the reactions involving the formation of chemical compounds from elements. The amount of heat liberated during an exothermic reaction depends on the type of reaction, the mass and nature of the reagents, the phase of the products and reactants, and the specific conditions under which the reaction occurs (for instance, temperature and pressure). The heat of reaction of an exothermic reaction is equal in absolute value but opposite in sign to that of the corresponding endothermic reaction. [29–1763–1]

EXTENDED-DAY SCHOOLS AND GROUPS, general-education schools, or groups within such schools, in which students spend the entire day (ten hours).

Extended-day schools first appeared in 1919 in Petrograd and other large cities of the USSR to increase the pedagogical supervision of children; owing to economic constraints, however, they did not undergo further development. After the Great Patriotic War of 1941–45, separate extended-day groups were established at general-education schools to give families more help in raising their children. The groups were given legal status in 1956 (for Moscow and Leningrad, 1955).

In the period since 1962, as eight-year education has become nearly universal and the system of universal secondary education has been implemented, extended-day schools have been established, at which at least 80 percent of the students must be on the extended-day program. Where the percentage is less, students are enrolled for an extended day in extended-day groups at conventional general-education schools.

Extended-day schools and groups offer a wide range of activities beyond the usual classes; children engage in Pioneer and Komsomol activities, socially useful work, games, sports, and independent projects. The extended-day program may comprise separate grades, or it may involve groups made up of students from various grades. In accordance with sound medical and pedagogical practice, the children study, work, and rest in turn; as part of the program they prepare their homework while at school. The children leave for home when their parents return from work. In some cases, parents are completely or partially released from the requirement of paying for the three meals a day their children receive at extended-day schools or groups.

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EXTRAORDINARY ALL-RUSSIAN CONGRESS OF SOVIETS OF PEASANTS' DEPUTIES, a congress held from Nov. 11 (24) to Nov. 25 (Dec. 8), 1917, in Petrograd. The first session was attended by approximately 260 voting delegates. The session of November 18 (December 1) was attended by 330 delegates, among whom were 195 Left Socialist Revolutionaries (Left SR's), 37 Bolsheviks, and 65 right-wing Socialist Revolutionaries and centrists. The number of delegates increased at subsequent sessions. Delegates from provincial, district, and *volost* (small rural district) soviets of peasants' deputies and from front, army, corps, and division peasant committees were present at the congress. Points on the agenda included the agrarian question, the food-supply problem, and the consolidation of Soviet power.

On all major issues the congress supported the positions of the Second All-Russian Congress of Workers' and Soldiers' Deputies, held from October 25 (November 7) to October 27 (November 9) of the same year. After approving the policies of the Council of People's Commissars, the delegates voted their support for the participation of the Left SR's in the Soviet government. Taking the floor three times (twice on the agrarian question), V. I. Lenin stressed that an accord with the Left SR's was possible only within the framework of a socialist platform. On the agrarian question the congress adopted the Left SR resolution, which called for leveling of land tenure.

The goals of the socialist revolution required the amalgamation of soviets of workers', soldiers', and peasants' deputies. The congress adopted a resolution approving the convocation of the Second All-Russian Congress of Soviets of Peasants' Deputies, which was held from November 26 (December 9) to December 10 (23). As a result, the provisional Executive Committee of the soviets of peasants' deputies, elected by the extraordinary congress, merged with the All-Russian Central Executive Committee. On November 15 (28), a joint session of the All-Russian Central Executive Committee, the Petrograd Soviet of Workers' and Soldiers' Deputies, and the Extraordinary All-Russian Congress of Soviets of Peasants' Deputies was held in the Smol'nyi. The session approved the decrees of the Second All-Russian Congress of Soviets on peace and on land and the All-Russian Central Executive Committee's decree of Nov. 14 (27), 1917, on workers' control.

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M. A. KHANIN [29–693–1]

EXTRAORDINARY AND INCREASED SECURITY (Russian, *chrezvychainaia i usilennaia okhrana*), a set of measures used by the tsarist government in its struggle against the revolutionary and social movement in Russia between 1881 and 1917. The measures were introduced during the revolutionary situation of the late 1870's and early 1880's by the Statute on Measures for the Protection of State Order and Public Tranquility of Aug. 14, 1881.

A state of increased security could be introduced by governors-general or by the minister of the interior for a period of one year in localities where public tranquility had been disturbed by "offenses against the existing state order." The administrative authorities of such localities were given the right to disband assemblies, exile suspicious individuals, transfer criminal cases to military courts, and conduct searches.

In localities where the population had been "brought into a state of alarm," the Committee of Ministers (from 1906, the Council of Ministers) could proclaim a state of extraordinary security for a period of six months, thereby giving the governors-general the additional right to dismiss elected or appointed officials, suspend the publication of periodicals, close educational institutions, and create special paramilitary squads for the suppression of disorders.

The extraordinary and increased security introduced as a temporary measure in 1881 was maintained until February 1917.

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F. A. PETROV [29–690–3]

EXTRAORDINARY BUDGET (Russian, *chrezvychainyi biudzhet*), part of the state budget in Russia in the late 19th and early 20th centuries. From 1894 the state budget of tsarist Russia comprised an ordinary budget and an extraordinary budget. The revenues of the latter were made up of receipts from the sale of government property and loan payments by railroad companies. Disbursements from the extraordinary budget went toward railroad construction and equipment and toward expenditures necessitated by natural disasters, wars, and the prepayment of loans. The extraordinary budget was abolished in May 1919. [29–692–1]

EXTRAORDINARY EIGHTH CONGRESS OF SOVIETS OF THE USSR, a congress held in Moscow from Nov. 25 to Dec. 5, 1936. The congress was attended by 2,016 voting delegates, 42 percent of whom were industrial workers, 40 percent, peasants, and 18 percent, nonindustrial workers. Communist Party members made up 72 percent of the delegates, and 63 nationalities were represented.

The congress was convened to consider and ratify a draft of the new constitution of the USSR. The draft was submitted by the Constitutional Commission of the Central Executive Committee of the USSR, which had been elected on Feb. 6, 1935, on the basis of a resolution of the Seventh Congress of Soviets of the USSR. After being approved by the Presidium of the Central Executive Committee of the USSR on June 11, 1936, the draft had been published for national discussion, which had lasted five months.

In a report given at the congress, J. V. Stalin presented an analysis of the radical changes that had occurred in the sociopolitical life of the country between 1924, when the first constitution of the USSR was adopted, and 1936. He declared that the complete dominance of the socialist economic system had been established (by 1937 the instruments and means of production under socialist ownership constituted 98 percent of the country's production assets). The exploitation of man by man had been eliminated, he asserted, since massive collectivization had done away with the kulaks, the last remaining exploiting class. Thus, the class structure of society had changed. Moreover, the social nature of the working class, of the peasantry, and of the intelligentsia had taken a new form, and sociopolitical and ideological unity of the Soviet people had been achieved. Stalin asserted that the strengthened friendship among the peoples of the USSR signified the unquestionable victory of the Leninist nationalities policy. All of these changes were reflected in the draft of the new constitution.

After approving and adopting the draft as the basis for a final text, the congress set up the Editorial Commission, which consisted of 220 members and was chaired by Stalin. The Commission was formed to study the corrections and additions that had been introduced both in the course of the national discussion and at the congress itself. On Dec. 5, 1936, the congress unanimously ratified the final text submitted by the Editorial Commission. The constitution remained in effect until a new one was adopted in 1977.

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[29–692–2]

EXTRAORDINARY FOURTH ALL-RUSSIAN CONGRESS OF SOVIETS OF WORKERS', PEASANTS', SOLDIERS', AND COSSACKS' DEPUTIES, a congress held from Mar. 14 to Mar. 16, 1918, in Moscow. The congress was attended by 1,232 voting delegates, among whom were 795 Bolsheviks, 284 Left Socialist Revolutionaries (Left SR's), and 21 Mensheviks. The agenda included ratification of the Brest-Litovsk Treaty, on which V. I. Lenin presented a report and B. D. Kamkov, a member of the Left SR faction, delivered an additional report; relocation of the seat of government; and the election of the All-Russian Central Executive Committee.

After G. V. Chicherin apprised the congress of the peace treaty signed with Germany in Brest-Litovsk on March 3, Lenin took the floor to explain that ratification of the treaty was the only way to secure the respite needed to preserve and consolidate the achievements of the October Revolution. A continuation of the war with German imperialism threatened destruction of Soviet power. Representatives of the petit bourgeois parties—Kamkov, the Menshevik L. Martov, the communist anarchist A. Iu. Ge, and the SR Maximalist N. I. Ryvkin—opposed ratification. In a roll-call vote after Lenin's and Kamkov's final speeches, 784 delegates voted for ratification of the treaty, 261 voted against it, 84 delegates did not vote for various reasons, and the rest, including Left Communists, abstained. After the vote, the Left SR's announced their withdrawal from the Council of People's Commissars.

After ratifying the treaty, the congress affirmed the need "to spare no efforts in restoring and increasing the defense capability of our country" and declared itself in favor of Soviet assistance to the international socialist movement. The Ukrainian Central Executive Committee of Soviets and delegates from Soviet organizations of the Ukraine issued a declaration approving the ratification of the treaty. The congress ratified the decision adopted by the All-Russian Central Executive Committee in late February 1918 to move the seat of government of the Soviet republic from Petrograd to Moscow. A new All-Russian Central Executive Committee consisting of 207 members was elected.

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[29–694–1]

EXTRAORDINARY SEVENTEENTH ALL-RUSSIAN CONGRESS OF SOVIETS, a congress held in Moscow from Jan. 15 to Jan. 21, 1937. The congress was attended by 1,338 delegates and represented 43 nationalities. Industrial workers made up 47.6 percent of the delegates, peasants, 16 percent, and nonindustrial workers, 36.4 percent.

The congress was convened to consider and ratify the new constitution of the RSFSR; the draft of the constitution had been drawn up in accordance with the Constitution of the USSR, which had been ratified by the Extraordinary Eighth Congress of Soviets of the USSR. The need for the RSFSR to adopt a new constitution stemmed from the economic and social changes that had taken place in the republic and in the Soviet Union as a whole. Such changes included the elimination of the exploiting classes, the enhancement of the moral and political unity of Soviet society, and the strengthening of friendship and cooperation among the peoples of the USSR.

M. I. Kalinin delivered a report on the draft of the new constitution. Under his chairmanship an editorial commission of 164 members examined amendments and additions to the draft and worked out a final text, which was ratified as the new constitution on Jan. 21, 1937. The congress adopted a resolution enjoining the All-Russian Central Executive Committee, elected at the Sixteenth All-Russian Congress of Soviets, to draft and ratify an election statute based on the new constitution and to establish a timetable for elections to the Supreme Soviet of the RSFSR.

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[29–693–2]

EXTRAORDINARY SIXTH ALL-RUSSIAN CONGRESS OF SOVIETS OF WORKERS', PEASANTS', COSSACKS', AND RED ARMY DEPUTIES, a congress held from Nov. 6 to Nov. 9, 1918, in Moscow. The congress was attended by 1,296 delegates, of whom 963 were voting delegates. Of the voting delegates, 946 were Communists, 16 were members of other parties, and one was an unaffiliated delegate.

The agenda of the congress included elections to the All-Russian Central Executive Committee and a series of reports. V. I. Lenin delivered two of the reports, one dealing with the anniversary of the revolution and the other with the international situation. L. D. Trotsky spoke on military affairs; G. E. Zinoviev reported on building Soviet power in the central region of the country, on committees of the poor (*kombedy*), and on local soviets; and D. I. Kurskii spoke on the observance of socialist legality.

In his reports, Lenin summed up the principal achievements of the first year of Soviet power and outlined a program for Soviet domestic and foreign policy. The congress noted in its resolution On the International Situation that the international bourgeoisie was consolidating forces to suppress the growing revolutionary movement in capitalist countries and to stifle Soviet power in Russia. The resolution stressed the need to devote serious attention to strengthening the Red Army.

The congress approved proposing peace negotiations to the states waging war against Russia—the USA, Great Britain, France, Italy, and Japan. It saluted "all workers, peasants, and soldiers around the world who are fighting for peace and socialism, and their leaders," and it commended the Red Army and, for taking the city of Izhevsk, the Red Army soldiers and commanders of the Second Army of the Eastern Front. At the suggestion of the congress of committees of the poor of Severnaia Oblast, the delegates adopted the decree On the Organization of Model Regiments of Rural Poor. These regiments would draw from among "the most steadfast and reliable defenders of workers' and peasants' power."

With an eye to consolidating Soviet power, the congress adopted the decree On Amnesty, which released political prisoners who represented no danger to the Soviet republic. In the decree On Building Soviet Power in the Central Region, on Committees of the Poor, and on Local Soviets, the congress summarized the work of the committees of the poor and commissioned them to conduct new elections in all *volost* (small rural district) and village soviets. In the decree On Revolutionary Legality, the delegates called on all citizens of the republic, all bodies of Soviet power, and all public officials to observe the laws of the Soviet state strictly. The congress elected a new All-Russian Central Executive Committee, which consisted of 207 members and 39 candidate members.

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[29–695–1]

EYADÉMA, GNASSINGBE (also Etienne Eyadéma). Born 1935 in Pya, Lama Kara District. State figure of Togo; general (1967).

From 1953 to 1962, Eyadéma served in the French Army in Indochina, Algeria, Niger, and Dahomey (since 1975, Benin). In January 1963 he took part in the military coup d'etat that overthrew President Olympio. In 1965 he became a lieutenant colonel and was appointed chief of staff of the Togolese armed forces. Eyadéma headed a new military coup d'etat in January 1967. Since April 1967 he has been president, head of the government, and minister of defense. Eyadéma is the chairman of the ruling and only party in the country, the Togolese Popular Rally (founded 1969). [29–1697–1]

EYRE, EDWARD JOHN. Born Aug. 5, 1815, in Hornsea, Yorkshire; died Nov. 30, 1901, near the city of Tavistock. British explorer of Australia.

In 1839, Eyre explored the Flinders Ranges and the valley of the Murray River, discovered Lake Torrens and Lake Eyre, and explored the Eyre Peninsula. In 1840 and 1841, he made a journey along the southern coast of Australia. The lake and peninsula named after Eyre are located in South Australia.

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[29–1728–1]

EYRE, the largest closed lake in southern Australia. Lake Eyre is located in a depression 12 m below sea level in an arid, desertlike region. It is filled with water only during the summer, when creeks flow into it periodically until it attains an area of 15,000 sq km and a depth of as much as 20 m. At other times it is a salt marsh. The lake was named in honor of E. J. Eyre. [29–1728–3]

EYRE, a peninsula in southern Australia between the Great Australian Bight and Spencer Gulf. Plains and depressions predominate, the maximum elevation being 200 m. The vegetation consists of thickets of brush eucalyptus and heaths. In the north the Gawler Ranges rise to a maximum elevation of 496 m. Sheep are

raised on the peninsula, and iron is extracted at the Iron Knob and Iron Monarch mines. The promontory was named in honor of E. J. Eyre. [29–1728–2]

EYSKENS, GASTON. Born Apr. 1, 1905, in Lierre, Antwerp Province. Belgian state and political figure; doctor of economic, political, and social sciences.

Eyskens studied at the University of Louvain and Columbia University. He became a professor at the University of Louvain in 1931. In 1939, Eyskens was elected to Parliament, where he was one of the leaders of the Christian Social Party. In 1945 and again from 1947 to 1949, he served as minister of finance; during the second term he served concurrently as deputy prime minister. He was prime minister in 1949 and 1950, from 1958 to 1961, and from 1968 to 1972. Eyskens served as minister of economic affairs in 1950 and as minister of finance in 1965 and 1966. [29–1729–6]

EZANA, king of the Aksumite Kingdom from about A.D. 325 to not later than 375. During Ezana's rule, the Aksumite Kingdom underwent major economic, political, and cultural development. Christianity began to spread in Aksum during the period.

REFERENCE

Kobishchanov, Iu. M. *Aksum*. Moscow, 1966. [29–1693–4]

EŽERĖLIS, an urban-type settlement in Kaunas Raion, Lithuanian SSR, 25 km west of Kaunas. The settlement has an enterprise for the processing of peat. [29–1693–3]

EZERO, an ancient multilevel settlement near the village of the same name in southeastern Bulgaria. Ezero was studied between 1952 and 1958 by V. Mikov and between 1961 and 1970 by the joint Bulgarian-Soviet expedition headed by G. Georgiev and N. Ia. Merpert. The cultural levels date from the Neolithic and Aeneolithic periods and the early Bronze Age (beginning of the fifth to the end of the third millennium B.C.).

The early Bronze Age level yielded the remains of 13 successive settlements surrounded by stone walls. The walls of the rectangular dwellings (10 × 4 m) were built of piles intertwined with branches and were coated with clay; within the dwellings were hearths and stoves with arches. Flint tools included sickle blades, knives, and end scrapers. Also discovered were axes, adzes, hammers, pestles, and saddlequerns made of bone, awls and hoes made of bone and antler, adzes, chisels, knives, and needles made of copper and bronze, and stone and clay casting molds. In addition, polished pottery with geometric designs was found, including pithos-like jars for storing grain, bowls, pitchers, and straight-walled pots. The population engaged in farming (barley and wheat) and stock raising (cows, sheep, goats, and hogs).

The finds in Ezero made it possible to identify the Bronze Age archaeological culture in southeastern Bulgaria (third millennium B.C.). The culture developed under the influence of the Baden culture and was linked with the Aegean and Anatolian cultures.

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EZOP, a mountain range on the border between Khabarovsk Krai and Amur Oblast, RSFSR. The range has a length of 150 km and a maximum elevation of 1,906 m. The mountains are composed of granites and volcanogenic rocks. Up to an elevation of 1,200 m, the slopes are covered primarily by larch forests. [29–1695–2]

EZRA (also Esdras). Dates of birth and death unknown. A descendant of the Zadokites, high priests of the Temple in Jerusalem. Reformer of Judaism.

In the mid-fifth century B.C., Ezra arrived in Jerusalem at the head of a group of Jews returning from the Babylonian exile. He made changes in the ritual and appears to have carried out the first codification of the Pentateuch. In other reforms, Ezra prohibited marriages between Jews and those who had not converted to Judaism, and all Jews were obliged to learn the basic tenets of Judaism. It has been suggested that Ezra introduced a square Aramaic script, which gradually supplanted the Canaanite (Paleo-European) script. [29–1696–4]

FAMILY MEMBER, in jurisprudence, a person who has the rights and bears the duties that are based on family relations.

Soviet legislation does not provide a set definition of a family member. The norms of various branches of Soviet law, proceeding from the purposes of legal regulation and the nature of the relations regulated, give legal weight to various circumstances that determine the character of the relationship a person has with a family. These circumstances include kinship, dependence, joint residence with other family members, and the maintenance of a common household.

Legislation dealing with marriage and the family establishes the personal and property rights and duties of family members; the right to receive support payments is among these rights. Civil legislation determines the rights and duties of family members regarding, for example, inheritance and housing. Legislation on labor and social insurance covers the rights of family members to receive financial support or a pension in case of the loss or incapacitation of the breadwinner. Kolkhoz legislation establishes the mutual rights and obligations of family members with respect to the joint property of the family or kolkhoz household.

In certain circumstances, people enjoy various benefits or privileges, as established by law, by virtue of being members of a given family. For example, a person is entitled to receive a moving allowance if a member of his family is being transferred to a new place of work. In accordance with Article 34 of the Law on Universal Military Obligation of Oct. 12, 1967, a person enjoys the right to delay a call to active military service for reasons concerning members of his family. [29–669–1]

FEELER (or feeler gauge), a gauge that is used to inspect gaps between surfaces. A feeler is a thin strip with a specified thickness in the range from 0.02 to 1 mm. Feelers are usually manufactured as sets of strips of various thicknesses housed in a single case (Figure 1). The strips may be used individually or in various combinations. [29–1619–3]

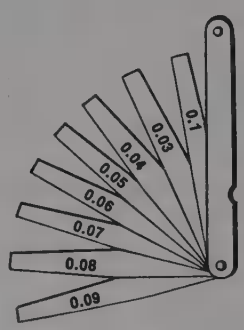

Figure 1. Feelers in a case

FEELING, in psychology, a peculiar type of emotional sensation distinctly object oriented in nature and comparatively stable. Feelings in this sense are related to a person's perception of some object, concrete or abstract, for example, a feeling of love for a human being or for the motherland. As a stable emotional attitude toward an object, feelings may not correspond to a person's emotional reaction to that object at a given moment. Human feelings are influenced by culture and history. Specific sign systems, including social symbols, ceremonial rites, and ritual acts, play an important part in the formation of feelings. [29–725–1]

FERROUS METALLURGY, a branch of heavy industry encompassing a group of interrelated subdivisions: ferrous metallurgy proper (blast-furnace production, steel production, rolling); pipe, tubing, and hardware production; mining, concentration, and sintering of ore materials; production of coke by-products; production of ferroalloys and refractory materials; mining of

non-ore materials for the industry; and secondary treatment of iron and steel. The industry's most important products are hot-rolled and cold-rolled products, steel pipe and tubing, and hardware.

Ferrous metallurgy is the basis for the development of most branches of the national economy. Despite the rapid growth in the output of the chemical industry, of nonferrous metallurgy, and of the building materials industry, iron and steel remain the primary building materials used in machine building and construction. In 1976 they accounted for more than 96 percent of the total volume of materials used by the leading branches of machine building in the USSR. Ferrous metallurgy consumes approximately 20 percent of the fuel and power resources of the USSR.

For several thousand years the development of human society has been inseparably linked with the use of iron as the major material for the production of the instruments of labor. V. I. Lenin called iron one of the bases of civilization and a primary product of modern industry (*Poln. sobr. soch.*, 5th ed., vol. 23, p. 377).

The production of iron in Russia has been known since antiquity. Iron ore was first smelted in low hearths and later (from circa the ninth century) in special bloomeries with blasting by means of hand bellows. The factory production of pig iron and iron began in the period 1632–37, when the first factory with a blast furnace for the production of up to 120 poods (approximately 1,965.5 kg) of pig iron per day was established near Tula. About 150,000 poods (2.457 million kg) of pig iron were produced in 1700. By the first quarter of the 18th century, iron production had increased by a factor of 5, and Russia led world production, maintaining its position until the beginning of the 19th century. However, the rate of growth of ferrous metallurgy subsequently decreased; by 1913, Russia was only the fifth largest producer in the world, accounting for 5.3 percent of the world production of iron and steel.

As a result of the Civil War and Military Intervention of 1918–20, steel production in the USSR in 1920 was only 4.5 percent of the 1913 level; by 1928, however, production had recovered to the prerevolutionary level. In the period of the five-year plans prior to World War II, old metallurgical enterprises were reconstructed, and new ones were built. A coal and metals base was created from the Ural Region and the Kuznetsk Coal Basin. Soviet ferrous metallurgy put into operation giant enterprises: the Magnitogorsk and Kuznetsk metallurgical combines, the Krivoi Rog and New Tagil metallurgical works, and the metallurgical plants Zaporozhstal' and Azovstal'. New open-hearth facilities were constructed at the Dzerzhinskii, Makeevka, Krasnyi Oktiabr', and Zlatoust plants.

Table 1. Production of pig iron, steel, iron and steel rolled stock, and steel pipe and tubing in the USSR
(million tons)

	1928	1940	1960	1970	1976
Pig iron	3.3	14.9	46.8	85.9	105.4
Steel	4.3	18.3	65.3	115.9	144.8
Finished rolled stock	3.2	11.4	43.7	80.6	101.4
Steel pipe	0.2	1.0	5.8	12.4	16.8

During World War II, the fascist German invaders destroyed plants yielding about 60 percent of the total steel production in the USSR. Iron and steel for the war effort were supplied by plants in the Urals and Siberia, where steel production was increased by a factor of 1.5. Plants were constructed in Kazakhstan and Uzbekistan, Soviet republics that previously did not have their own ferrous metallurgy.

The destroyed plants were restored very rapidly after the war. Between the 1950's and the 1970's, large new enterprises were constructed: the Orsk-Khalilovo and Karaganda metallurgical combines; the Cherepovets Metallurgical Plant and the Western Siberian Metallurgical Works; and a series of large mining and ore-enrichment combines and plants producing pipe, ferroalloys, hardware, and refractory materials. The modernization of obsolescent installations permitted a significant increase in their efficiency. In addition to considerable increases in production volumes, quality was improved and the range of metal products expanded. The manufacture of advanced types of iron and steel products developed rapidly, yielding a great effect on the national economy. Such products included rolled sheet stock, cold-rolled sheets, cold-rolled transformer steel, bent sections, high-precision shaped sections, low-alloy steel, high-strength pipe, iron powders, and cermets. Quality improvements in metal production and the extension and development of the product range provided the national economy with a saving of more than 2 million tons of iron and steel between 1971 and 1975.

The USSR occupies first place in the world in the manufacture of the most important products of ferrous metallurgy (steel, pig iron, iron ore, steel pipe and tubing, coke, and refractory materials). Production growth between 1928 and 1976 is shown in Table 1. As a result of the regular increase in production volumes, per capita steel production increased significantly from 305 kg in 1960 to 564 kg in 1976.

Iron and steel are produced in several economic regions of the RSFSR (Central, Central Chernozem, Ural, Volga, Western Siberia, Eastern Siberia, the Northwest, and the Far East) and the Ukraine (Donets-Dnieper Economic Region), as well as in Kazakhstan, Transcaucasia, Middle Asia, and the Baltic republics.

Ferrous metallurgy is characterized by a high level of production concentration, which is related to increases in the unit capacities of individual installations. Use is made of blast furnaces with working capacities of 5,000 cu m (Krivoi Rog Metallurgical Works), oxygen converters with capacities of 300–350 tons, model 3600 thick-sheet rolling mills, model 2000 continuous wide-band hot-rolling mills with a capacity of 6 million tons per year, and model 1700 five-stand cold-rolling mills with a capacity of more than 1 million tons per year. Iron ore enterprises with a capacity of 30 million tons of crude ore per year and large pipe-rolling and hardware factories are also in operation.

Enterprises of ferrous metallurgy typically feature various forms of integrated production. About 80 percent of steel production is at plants with complete metallurgical processing, combining blast-furnace, steel-smelting, and rolling operations. A number of enterprises and combines also have facilities for iron ore production, in addition to iron and steel manufacturing. Ferrous metallurgy is a branch of industry with a high level of specialization. More than 85 percent of steel pipe and tubing and 90 percent of commercial iron ore are produced at specialized plants.

The USSR has all the necessary resources for the development of ferrous metallurgy, including iron and alloy metal ores, fuel, and power resources; it occupies first place in reserves and volume of mined iron ore and mined commercial coal. The volume of iron ore extracted is sufficient to meet all the needs of Soviet ferrous metallurgy and to export significant amounts of ore concentrate, mainly to the member countries of the Council for Mutual Economic Assistance (COMECON). The USSR is also the leading producer and exporter of manganese and chromium ores. The major reserves of iron ore are found in the basin of the Kursk Magnetic Anomaly, the Krivoi Rog Iron Ore Basin, Kazakhstan, the Urals, Siberia, and the Kola Peninsula (*see* IRON INDUSTRY).

The fuel base for ferrous metallurgy consists of deposits of coking coals found mainly in the Donets, Karaganda, and Pechora basins and deposits of natural gas in European Russia, Siberia, and Middle Asia.

Soviet ferrous metallurgy has a high engineering potential. Significant progress has been achieved in production engineering in individual subbranches and production divisions in the industry. The mining of iron ore is conducted primarily with advanced open-pit techniques, and smokeless charging and dry-process coke quenching have been introduced into coke production (*see* BY-PRODUCT COKE INDUSTRY). In blast-furnace production, 97 percent of the pig iron produced in 1976 was made in furnaces with high gas pressure, and 84 percent was produced by means of natural gas blasting. In steel production, smelting in basic oxygen and electric furnaces is increasing, and steel refining under vacuum, with synthetic slags, and with inert gases outside the furnace has been introduced. Other innovations include remelting with electroslag, vacuum induction, and electron-beam techniques and through the use of arc vacuum and plasma furnaces. The use of continuous steel casting is increasing, and heat treatment of metal products and methods of nondestructive automatic control

are being used effectively in rolling operations. In pipe and tubing production, the technology for manufacturing welded pipe of large diameter and seamless pipe is being improved (*see* TUBE ROLLING and PIPE AND TUBING INDUSTRY). Automated production lines are being introduced in hardware manufacture, and industrial methods for the direct reduction of iron ore are under development. Work is being conducted on the creation of an automated system for industry management.

Much attention is being devoted in the industry to the mechanization and automation of production processes, improvements in the organization of production and labor, and questions of socialist competition. During the ninth five-year plan (1971–75), virtually all increases in production volume in ferrous metallurgy were achieved as a result of increased labor productivity, that is, without an increase in the number of workers.

Table 2. Steel production in the COMECON countries
(million tons)

	1960	1970	1976
Bulgaria	0.3	1.8	2.5
Cuba	—	0.1	0.3
Czechoslovakia	6.8	11.5	14.7
German Democratic Republic	3.8	5.1	6.7
Hungary	1.9	3.1	3.7
Poland	6.7	11.8	15.6
Rumania	1.8	6.5	10.7

Ferrous metallurgy is also developing successfully in other socialist countries. As a result of an increase in production volumes, the contribution of the COMECON countries to world steel production (together with the USSR) increased from 24.9 percent in 1960 to 28.8 percent in 1976. Data on steel production in the COMECON countries are given in Table 2.

In 1976, Czechoslovakia produced 9.5 million tons of pig iron; Poland, 7.9 million tons; Rumania, 7.4 million tons; and the German Democratic Republic, 2.5 million tons. In 1975, Czechoslovakia produced 10.0 million tons of iron and steel rolled stock; Poland, 11.1 million tons; Rumania, 6.8 million tons; and the German Democratic Republic, 5.2 million tons.

The socialist countries are actively cooperating with the developing countries in efforts to establish and expand ferrous metallurgy. By 1977, with the assistance of the USSR, metallurgical works were constructed in many countries, including India, Egypt, and Iran, with annual production capacities of 7.2 million tons of pig iron, 5.3 million tons of steel, 4.1 million tons of rolled stock, and 6.7 million tons of mined iron ore. Metallurgical production complexes with capacities of 11–14 million tons of steel and rolled stock are in the planning stage or under construction.

In the capitalist countries, ferrous metallurgy is most developed in the USA and Japan. The Federal Republic of Germany (FRG), Great Britain, France, and Italy are also large producers of iron and steel (see Table 3).

Table 3. Steel production in the industrially developed capitalist countries
(million tons)

	1960	1970	1976
USA	92.1	122.0	120.0
Japan	22.1	93.3	107.0
Federal Republic of Germany	34.1	45.0	42.4
Great Britain	24.7	28.3	22.7
France	17.3	23.8	23.0
Italy	8.2	17.3	23.3

In 1976, Japan produced 86.0 million tons of pig iron; the USA, 79.8 million tons; and the FRG, 32.3 million tons. In 1975, Japan produced 86.3 million tons of iron and steel rolled stock; the USA, 72.5 million tons; and the FRG, 33.0 million tons.

Ferrous metallurgy in the capitalist countries is characterized by a high degree of monopolization of production. Thus, five companies account for 80 percent of the steel production in Japan and about 60 percent in the USA. Six companies account for more than 75 percent of the steel production in the FRG. Two companies account for 65 percent of the steel production in France, and one company in Great Britain accounts for more than 85 percent of the country's steel production (*see* IRON AND STEEL MONOPOLIES).

World steel production totaled 192 million tons in 1950, 463 million tons in 1965, and 690 million tons in 1976. The number of steel-producing countries increased from approximately 50 in 1965 to 65 in 1976. Characteristic of the development of ferrous metallurgy is the rapid increase in the scale of the world market for iron and steel: exports of iron and steel products from producer countries more than doubled between 1965 and 1976.

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I. P. KAZANETS [29–234–3]

FERROUS METALLURGY, INSTITUTE OF (full name, I. P. Bardin Central Scientific Research Institute of Ferrous Metallurgy; TsNIIchermet), an institute under the administration of the Ministry of Ferrous Metallurgy of the USSR.

The Institute of Ferrous Metallurgy was founded in 1944 on the initiative of I. P. Bardin, after whom it was named in 1960. The world's largest research organization in ferrous metallurgy, it has six specialized subdivisions: the Institute of New Metallurgical Technology, the Institute of Precision Alloys, the Institute of Quality Steels, the Institute of Metal Science and Metal Physics, the Institute of the Economics of Ferrous Metallurgy, and the Institute of Standard Samples. TsNIIchermet also includes an experimental plant and departments dealing with, for example, standardization and coordination.

The institute has developed new techniques applicable to such processes as the basic oxygen process and continuous steel casting and has created new steels, alloys, and composites. Fundamental aspects of the theory of metallurgical processes are studied at the institute, which confers the degrees of doctor of sciences and candidate of sciences. TsNIIchermet publishes 12 specialized industrial journals. It was awarded the Order of the Red Banner of Labor in 1969. [29–287–3]

FICARIA (lesser celandine), a genus of plants of the family Ranunculaceae. The genus is related to the genus *Ranunculus*, in which it is frequently included. The plants are perennial herbs with tuberous root sections. The stem is usually reduced, and the leaves are entire and mainly fleshy. The flowers are solitary, with yellow or golden petals. The fruit is a multiple nut with small swollen achenes. There are eight to ten species (or three to five species, with several subspecies). The plants are native to Eurasia. The USSR has five or six species. *F. verna* grows in the European USSR, Western Siberia, the Caucasus, and to a lesser extent, Middle Asia; the plant occurs in humid places, primarily in meadow-forest regions. [29–647–2]

FILLER, a pasty substance used in painting and varnishing to produce a smooth surface before the surface coat is applied. In addition to film-forming materials, fillers contain extenders such as chalk, talc, and barite as well as pigments such as zinc white and ocher. Fillers may have a varnish, drying-oil, or natural-adhesive base. Since the content of film-forming materials in a filler is 5–12 times lower than that of pigment or extender, fillers do not provide for a sure adhesion of the covering coats to the surface. For this reason, a filler is usually applied over a layer of primer.

A thick filler is applied with a putty knife or a piece of rubber. A filler thinned with small amounts of solvent may be applied with a pneumatic spray gun. The thickness of a layer of filler may

reach 300 μ; when a filler is used to fill holes or to seal a joint or a riveted or welded seam, however, several layers with a total thickness of up to 1 mm may be required. The dried-up layer of filler must be sanded well with an abrasive paper. Varnish-based fillers are used mainly in the machine-building industry; fillers with a natural-adhesive or drying-oil base are used primarily in the construction industry.

REFERENCE
Entsiklopediia polimerov, vol. 3. Moscow, 1977. [29–1390–2]

FINE, a monetary exaction; a means of applying financial pressure in certain cases, and in accordance with a certain procedure, established by law.

Under Soviet civil law, the fine is a type of penalty for nonfulfillment or improper fulfillment of a contract obligation. The amount of the fine is either a fixed sum or a set percentage of the value of the obligation; it is determined at the time the contract is drawn up as a means of ensuring the proper fulfillment of the contract. The fine establishes liability for violating the contract. The fine must be paid only when the party that failed to fulfill its obligation is at fault, although fines are recovered regardless of fault in exceptional cases, as provided by the contract or by law; for example, fines are exacted when the plan for rail transport of goods is violated. The fine is widely used by socialist organizations as an effective means of applying pressure to a contracting party that violates its agreement to provide supplies, to transport goods, or to perform other services.

In Soviet criminal law, the fine is used as a primary and supplementary measure of punishment for certain crimes, as provided by the Basic Principles of Criminal Legislation of the USSR and of the Union republics and the criminal codes of the Union republics. A court may also impose a fine as a way of substituting a milder punishment for the unserved part of a sentence. A fine may be imposed as a supplementary punishment in cases of conditional conviction.

The amount of the fine is established by the court and depends on both the seriousness of the crime and the financial situation of the guilty party. If it should be impossible to exact a fine, the court may convert the fine to a sentence of correctional labor without deprivation of freedom; in such cases, one month of correctional labor is substituted for each ten rubles of the fine, but the sentence cannot exceed one year. The court is not permitted to convert a fine to a sentence of deprivation of freedom or vice versa. The procedure for the payment of a fine is determined at the time of sentencing.

Under Soviet administrative law, fines are imposed on persons guilty of administrative violations. The grounds and procedure for the imposition of fines, the amounts of fines, and the state agencies and officials empowered to impose them are determined by the legislation of the USSR and the Union republics. As a rule, an administrative fine that is imposed on an ordinary citizen should not exceed ten rubles, and one imposed on an official should not be greater than 50 rubles; in certain cases specified by law, however, the limits may be raised to 50 and 100 rubles, respectively. In exceptional cases that pertain to the fulfillment of obligations under international treaties of the USSR, or necessitate an increased administrative liability, still greater fines, specified by legislative acts of the USSR, may be imposed (Basic Principles of Civil Legislation of the USSR and the Union Republics, art. 14). An administrative fine may be imposed only on a citizen or official. Such fines may be imposed by people's judges (in such cases as petty hooliganism); by administrative commissions attached to the executive committees of soviets of raions, cities, settlements, and villages (in such cases as violation of public order and the regulations of public amenities); by the militia; and by authorized agencies and officials that are responsible for such areas of public protection as fire safety, sanitation, and quarantine of animals.

An administrative fine of up to 30 rubles may be imposed on parents or guardians of minors by commissions on juvenile affairs if the parent or guardian mistreats the child, willfully neglects obligations for the proper upbringing of the child, or brings a minor into a state of drunkenness. A parent or guardian may also be fined if a law is violated by the child.

An order imposing a fine may be appealed by the person concerned or by the aggrieved person to a higher administrative agency or a people's court in raions and cities within ten days from the date the order is ruled. The submission of an appeal suspends the procedure for collecting the fine until the appeal is considered. A fine must be paid not later than 15 days from the delivery of the order; in case an appeal or a protest has been submitted, it is to be paid not later than 15 days from the delivery of a notice dismissing the appeal or the protest. A fine that has not been paid within the specified time is collected by enforcement measures from the wages of the offender on the order of the agency or the official that imposed the fine. In those cases in which the offender is unemployed, the fine is recovered by levying execution on his property by an officer of the court in compliance with the rules specified by law.

Under Soviet procedural law, courts may impose fines of specific amounts in certain cases, as provided by procedural legislation. These cases include the nonfulfillment of procedural obligations by a party to a proceeding and disorderly conduct in court.

As a measure of social influence, a fine may be applied in certain situations by a comrades' court. [29–1492–1]

FIRECLAY, refractory clay or kaolinite, which when roasted loses plasticity, the chemically bound water is removed, and a certain degree of sintering occurs. The Russian term for "fireclay"—*shamot*—is also applied sometimes to certain other initial materials used in the production of refractories, roasted to obtain pelletized powders (often in a clay mixture) and to stabilize the properties of the material (high-alumina, corundum, and zircon fireclays).

Fireclay is obtained by roasting—in rotary, shaft, or other furnaces at temperatures of, for the most part, 1300°–1500°C—the raw material, which is in the form of natural pieces or briquettes prepared in belt, roller, and other presses. The degree of sintering of fireclay is characterized by water absorption, which is usually between 2–3 and 8–10 percent, but can be as high as 20–25 percent for "low-roasted" fireclay. After fragmentation and grinding, fireclay is used as a component (to reduce plasticity and shrinkage during drying and roasting) of bulk fireclays in molding articles (or correspondingly, high-alumina and other refractory materials). It is also used in the production of mortars and bulk gunite and as an aggregate in refractory concrete. In the mid-20th century, fireclay came to be used in sculpture, primarily for small statuettes.

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Khimicheskaia tekhnologiia keramiki i ogneuporov. Moscow, 1972. [29–824–2]

FIRECLAY REFRACTORY, the most common type of aluminosilicate refractory product. Fireclay refractories contain 28–45 percent Al_2O_3. They are made from refractory clays and kaolins cut by the addition of fireclay or, sometimes, nonplastic clay rocks and quartz. They are used in blast, reheating, and roasting furnaces; they are also used in pouring steel and in other operations.

REFERENCE
Khimicheskaia tekhnologiia keramiki i ogneuporov. Moscow, 1972. [29–825–1]

FOCAL-PLANE SHUTTER, a camera shutter positioned near the focal plane of the lens, consisting of two opaque blinds that form a slit of variable width or a single blind with a slit cut in it. [29–1486–2]

FORD RANGES (also Edsel Ford Ranges), mountains in the northwestern part of Marie Byrd Land in western Antarctica between 140° and 149° W long. The mountains are composed of metamorphized terrigenous and carbonate deposits, as well as granodiorites and granite. The greater part is covered by glacial ice. Individual peaks, which are divided by deep depressions with valley glaciers, rise above the glacial surface to a maximum elevation of 1,370 m at Mt. Avers. They were discovered in 1929 by an

American expedition led by R. Byrd. They were named in honor of Edsel Ford, who provided financial support for the expedition. [29–1690–1]

FOREMEN'S SCHOOLS AND CLASSES, in the USSR, schools and classes in which workers may receive instruction without leaving their jobs. In addition to providing a general education, the foremen's schools enable students to receive advanced training and increase their technical knowledge. Skilled workers and foremen with practical experience who do not have a complete secondary education attend these schools and classes.

Foremen's schools, which were first established in 1962 at large enterprises and cover the ninth through 11th grades, are set up when there are at least 100 potential students. When the number is less than 100, special foremen's classes, also covering the ninth through 11th grades, are created within evening (shift) secondary general-education schools; this system was introduced in 1964. The general-education subjects in foremen's schools and classes follow the syllabi of the secondary school; specialized subjects are based on syllabi approved by the management of the enterprise. In addition to receiving a certificate of secondary education, graduates of the schools and classes, upon passing additional qualifying examinations, are eligible to hold the position of foreman or chief of a production section.

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FOUR ARTS (full name, the Society of Artists of the Four Arts), an artistic association active in Moscow from 1924 to 1931. The Four Arts was founded mainly by former members of the World of Art and the Blue Rose. It included Soviet painters, graphic artists, sculptors, and architects primarily of the older generation: L. A. Bruni, I. S. Efimov, I. V. Zholtovskii, K. N. Istomin, A. I. Kravchenko, P. V. Kuznetsov, N. N. Kupreianov, A. T. Matveev, V. I. Mukhina, A. P. Ostroumova-Lebedeva, K. S. Petrov-Vodkin, M. S. Sar'ian, V. A. Favorskii, and A. V. Shchusev.

Members of the association strove for high professional quality, as well as an expressive decorative style. In architecture, they advocated the reworking of principles of modern city planning. The Four Arts organized exhibitions in Moscow in 1925, 1926, and 1929 and in Leningrad in 1928.

REFERENCE
Bebutova, E., and P. Kuznetsov. "Obshchestvo '4 iskusstva'." *Tvorchestvo*, 1966, no. 11. [29–360–2]

FOUR-BAR LINKAGE, a plane mechanism consisting of four links that form rotating kinematic pairs. A four-bar linkage (Figure 1) consists of a fixed link (0, the base), two rotating links (1 and 3), and a connecting link (2), which is also called a connecting rod or coupler. A rotating link is called a crank if it can undergo a complete rotation with respect to the axis of rotation; it is called a rocker if it can undergo only part of a rotation.

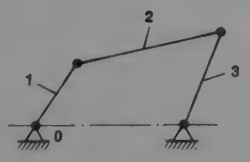

Figure 1

Depending on the type of rotating links present, four-bar linkages are subdivided into crank-and-rocker, drag-link, and double-rocker types. A crank-and-rocker mechanism is used to convert the constant rotation of the crank into the reciprocal motion of the rocker. In manufacturing machinery, the crank is set in motion by a main shaft, and a working member that performs a given production operation is connected to the rocker. A drag-link mechanism converts uniform rotation into nonuniform rotation in a single direction; it is used in machines where the working member, while moving in a single direction, must have a velocity that significantly exceeds the average velocity on some segment. Double-rocker linkages are used chiefly in instruments to provide a mechanical reproduction of a given function, such as $y = \log x$. Four-bar linkages are also used to reproduce the motion of a point along a given curve; for example, the Chebyshev parallel motion can be used to approximate a segment of a straight line.

N. I. LEVITSKII [29–864–1]

FOUR-COLOR PROBLEM, the problem of whether four different colors are sufficient to color any map so that no two regions having a common boundary segment have the same color. Although the conjecture that four colors are enough was proved for all known special cases, the problem long remained unsolved. Not until 1976 was a report of a rigorous mathematical proof published.

First formulated as a mathematical problem in the mid-19th century, the four-color problem became widely known through the lectures of the British mathematician A. de Morgan. A rigorous formulation of the problem requires that the regions in question be bounded by Jordan curves—that is, by simple closed curves. It can be easily proved that five colors are always sufficient to color such a map.

In the corresponding problem for space, no number of colors is sufficient.

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Appel, K., and W. Haken. *Bulletin of the American Mathematical Society*, vol. 82, no. 5, pp. 711–12. [29–360–5]

FOUR-CYCLE ENGINE, an internal combustion engine with an operating cycle consisting of four piston strokes that occur in the course of two revolutions of the crankshaft.

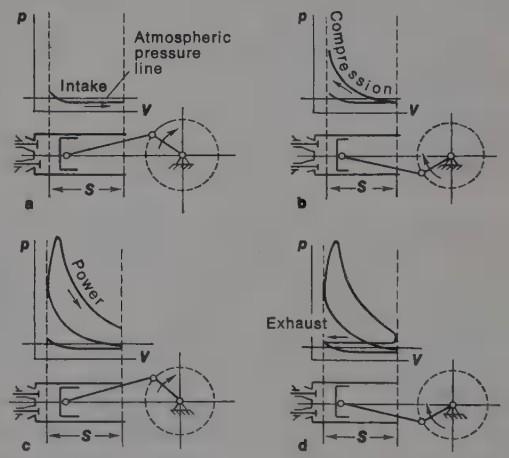

Figure 1. Operation of a carburetor-type four-cycle engine: (a) intake, (b) compression, (c) power, (d) exhaust; (*p*) cylinder pressure, (*V*) effective cylinder volume, (*S*) distance traveled by piston

The first two strokes, the intake and compression strokes, occur during the first revolution of the crankshaft. The intake of the fuel mixture in a carburetor engine or a spark-ignition engine or of the air in a diesel engine occurs as the piston moves from top dead center to bottom dead center. The compression of the fuel mixture or of the air is accomplished as the piston moves from bottom dead center to top dead center.

The power stroke, in which the piston moves as it does during intake, and the exhaust stroke, in which the piston moves as it does in compression, occur in the second revolution of the crankshaft. The power stroke, during which the fuel mixture undergoes combustion and expansion, results from the pressure of the combustion products on the piston. During the exhaust stroke, the final stroke, the combustion products are removed from the cylinder.

The intake, compression, and exhaust strokes are accomplished by means of the kinetic energy stored during the power

stroke in the crankshaft and in the parts connected to it when the chemical energy of the fuel is converted into the mechanical energy of the moving parts of the engine.

Lasting for only a fraction of a second, combustion is accompanied by a rapid increase in the forces acting on the cylinder head, the piston, and other engine parts. Consequently, the weight of the moving parts must be increased in order to strengthen them. An intrinsic drawback of the piston engine is that this increase in weight is accompanied by an increase in the inertial force on the moving parts.

Figure 1 shows the dependence of the pressure p in the cylinder of a four-cycle engine on piston position in each stroke.

The power stroke in a one-cylinder four-cycle engine is accompanied by three nonpower strokes. In a two-cycle engine, however, there is only one nonpower stroke. Consequently, a one-cylinder four-cycle engine runs rougher than a one-cylinder two-cycle engine. For smoother running, four-cycle engines are manufactured with large flywheels or with several cylinders. The operating cycle of a four-stroke rotary-piston engine is analogous to the operating cycle of the four-cycle engine, with the exception that, in the rotary engine, the cycle is completed in one rotor revolution. IU. A. ZARIANKIN [29–364–3]

FOUR FAMILIES OF CHINA, a reactionary Kuomintang coalition that ruled China from 1927 through 1949. The Four Families, which were headed by Chiang Kai-shek, were made up of members of the families of Chiang Kai-shek, Sung Tzu-wen, K'ung Hsiang-hsi and of the brothers Ch'en Kuo-fu and Ch'en Li-fu. After seizing power and establishing their control over the country's monopolies, they subjected the Chinese people to cruel exploitation. In 22 years of rule they accumulated capital in excess of $20 billion. The Four Families relied on the support of the imperialist powers, especially the USA, whose position in Kuomintang China was noticeably strengthened. After the triumph of the people's revolution in 1949, the assets of the Four Families were confiscated and became the state property of the People's Republic of China.

REFERENCE

Ch'en Po-ta. *Chetyre semeistva Kitaia.* Moscow, 1948. (Translated from Chinese.) [29–360–4]

FOUR-HORNED ANTELOPE (*Tetracerus quadricornis*), a ruminant of the family Bovidae. The four-horned antelope is a small, slender animal, with a body length reaching 1 m and a tail length of 10–15 cm. It weighs 15–25 kg. The antelope is the only member of the family Bovidae whose male has four horns—two slightly curved rear horns measuring 8–10 cm long and two straight front horns measuring 2.5–4 cm long. The females are hornless. The body is cinnamon brown, with lighter underparts. The legs are white on the inside; the edges of the snout and the outside of the ears are black.

The four-horned antelope is distributed in India, where it is found in sparse forests and near reservoirs. It lives secretively, in pairs or singly. The diet consists of grass and leafy shrubs. Mating occurs in August, and one to three young are born in January or February. The animal is hunted for its valuable horns. [29–363–1]

FOURHORN SCULPIN (*Myoxocephalus quadricornis*), a fish of the family Cottidae. The fish measures as much as 37 cm in length and reaches 500 g in weight. Two pairs of bony protuberances on the head are highly developed in ocean forms and poorly developed or absent in lake forms.

The fourhorn sculpin is distributed along the shores of the northern Arctic Ocean, the Baltic Sea, the lakes of Northern Europe, and the Great Lakes of North America. It feeds on crustaceans and fish. It reproduces in winter. The fish is edible but has no commercial importance.

REFERENCE

Nikol'skii, G. V. *Chastnaia ikhtiologiia*, 3rd ed. Moscow, 1971. [29–363–2]

FOURTEEN POINTS, the conditions for peace, as formulated in 14 articles by President W. Wilson of the USA at the end of World War I in an address to Congress on Jan. 8, 1918.

The Fourteen Points consisted of the following aims: (1) open covenants of peace openly arrived at; (2) absolute freedom of navigation ("freedom of the seas"); (3) abolition of trade barriers ("freedom of trade"); (4) establishment of disarmament guarantees; (5) settlement of colonial claims; (6) evacuation by Germany of all occupied Russian territories and the granting to Russia of the opportunity to determine its own political development; (7) evacuation and restitution of Belgium; (8) the return of Alsace-Lorraine to France and the restoration of occupied regions to France; (9) the readjustment of Italian frontiers along lines of nationality; (10) autonomous development for the peoples of Austria-Hungary; (11) evacuation by Germany of the occupied territories of Rumania, Serbia, and Montenegro, with an outlet to the sea for Serbia; (12) opportunity for autonomous development for the non-Turkish portions of the Ottoman Empire and freedom of shipping through the Dardanelles for all nations; (13) the creation of a Polish state; and (14) the creation of the League of Nations.

The Fourteen Points represented an imperialist program for peace based on the establishment of the hegemony of the USA in international affairs. In particular, the "freedom of trade" was to open world markets for the economically most powerful country—the USA. The "freedom of the seas" was directed against the British Navy's control over world trade routes. The slogan "disarmament" was calculated to weaken the military might of Great Britain and Japan. One of the essential goals of the Fourteen Points was to mask the expansionist aims of US foreign policy, which was especially necessary with regard to the enunciation by Soviet Russia of a democratic and just peace, which was contained in the Decree on Peace. [29–371–1]

FOURTEENTH ALL-RUSSIAN CONGRESS OF SOVIETS OF WORKERS', PEASANTS', AND RED ARMY DEPUTIES, a congress held in Moscow from May 10 to May 18, 1929. The congress was attended by 1,158 voting delegates and 626 with observer status. Industrial workers made up 57.1 percent of the delegates, peasants, 25 percent, and nonindustrial workers, 17.9 percent. Of the delegates, 70.7 percent were members or candidate members of the ACP(B), 1.2 percent were members or candidate members of the Komsomol, and 28.1 percent were not party affiliated.

The agenda of the congress included elections to the All-Russian Central Executive Committee and a series of reports. A. I. Rykov gave the report of the government of the RSFSR, A. I. Lezhava spoke on the five-year plan for the development of the republic's economy, and A. V. Lunacharskii dealt with the tasks of cultural construction. In addition, A. B. Khalatov spoke on the state of Soviet book publication after ten years, A. S. Kiselev reported on lower-echelon soviets and the strengthening of their powers, and Ia. V. Poluian explained changes in and additions to the Constitution of the RSFSR.

The congress approved the activities of the government of the RSFSR and adopted the first five-year plan for the development of the economy of the RSFSR (1929–32). After making a positive assessment of the country's accelerated rate of industrialization, the congress enjoined the government to intensify its efforts in the socialist reorganization of agriculture. The congress appealed to urban and rural working people to help fulfill the five-year plan and to promote socialist competition in every way possible. In a resolution concerning cultural construction, the congress emphasized the need to pay special attention to the work of implementing universal compulsory elementary education and of eliminating illiteracy among the adult population.

The program for the socialist reconstruction of the economy required improved functioning of government bodies, especially at the local level. The congress called upon the All-Russian Central Executive Committee to reexamine the Statute on Rural Soviets for the purpose of broadening their powers in organizational, economic, and cultural work as well as in serving the everyday needs of the peasantry. The congress directed the Central Executive Committee to devise measures to combat breaches of revolu-

tionary legality and to put an end to the terrorist activities of the kulaks.

A resolution was passed recommending that soviet agencies be purged of alien elements and that new cadres be formed from among workers, farmhands, the poor, and party-minded middle peasants. The congress amended several articles of the Constitution of the RSFSR to reflect the completion of regionalization, the introduction of new administrative and territorial divisions, and the expansion of the powers of the local soviets. A new All-Russian Central Executive Committee was elected, with 400 members and 150 candidate members.

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[29–368–1]

FOURTEENTH CONFERENCE OF THE RUSSIAN COMMUNIST PARTY (BOLSHEVIK), a conference held in Moscow from Apr. 27 to Apr. 29, 1925. The conference was attended by 178 voting delegates and 392 with observer status. The agenda included a series of reports. V. M. Molotov presented a report on aspects of party organization, A. I. Rykov spoke to the conference on cooperation, and A. D. Tsiurupa read a report on the agricultural tax. In addition, F. E. Dzerzhinskii gave an account of the metallurgical and machine-building industry, G. E. Zinoviev reported on the enlarged plenum of the Executive Committee of the Communist International, and A. A. Sol'ts spoke to the delegates on the revolutionary legality.

The primary work of the conference centered on the prospects of building socialism in the USSR. This question was of paramount importance because the economy had approached prewar levels and, consequently, problems associated with its modernization were arising. Drawing attention to capitalist encirclement of the Soviet Union, the partial stabilization of capitalism, capitalist suppression of the revolutionary movement in a number of countries, and the economic backwardness of Russia, the Trotskyists and the leaders of the New Opposition, Zinoviev and L. B. Kamenev, argued that it would be impossible to build socialism in the USSR without outside help.

The Central Committee rejected Zinoviev's draft theses "On the Tasks of the Comintern and the RCP(B) in Connection With the Enlarged Plenum of the Executive Committee of the Communist International," in which he stated that the victory of socialism could be achieved only on an international scale. The Central Committee reworked the theses to support the Leninist position that the victory of socialism in the USSR was possible at a time when the growth of the world revolution was slackening.

The conference unanimously approved the Central Committee's theses (Zinoviev and Kamenev did not express their views on the revised theses during the conference). It pointed out that the Soviet Union had all the prerequisites for the creation of a socialist society and that an alliance of the working class and the toiling peasantry would be able on its own to defeat capitalism within the country not only politically but also economically. Inasmuch as capitalist encirclement of the USSR presented the danger of intervention and of the restoration of capitalism in the country, a resolution was adopted stressing that the final victory of socialism, which would provide a full guarantee against the restoration of bourgeois relations, would be possible only if proletarian revolutions were successful in a number of countries.

Other discussion centered on the immediate tasks of economic construction. It was suggested that the development of the metallurgical and machine-building industry be accelerated, that a three-year plan be prepared for the industry, and that construction of new metallurgical plants begin. It was also proposed that production of nonferrous metals be expanded and that more attention be devoted to increasing the productivity of labor and to improving the quality of output. The conference pointed out the need for maximum cooperation in all phases of rural economic life. In order that the influence of the poor and middle peasants be enhanced through cooperation, it was recommended that kulak elements not be permitted in the governing bodies of cooperative associations. The conference rejected N. I. Bukharin's politically incorrect notion that kolkhozes were not the highroad to socialism for the peasantry, and it urged that greater emphasis be placed on the establishment and strengthening of kolkhozes. It was decided that the method for determining the agricultural tax should be based on farm size, thus serving the interests of the poor and middle peasants.

The resolution On Building the Party established a goal of improving party leadership in all branches of the economy, especially in the rural sector. It was decided that at least 1,000 Communists would be sent to district and *volost* (small rural district) RCP(B) committees and that, for the purpose of raising the level of ideological and educational work in the villages, at least 3,000 propagandists would be sent. The conference devoted special attention to the need to provide sound leadership for the peasantry from the ranks of the proletariat and to strengthen the alliance with the middle peasants in order to enlist them in the building of socialism. To reinforce the leadership of the mass organizations of working people, it was suggested that the Communist factions in the soviets, the trade unions, and the cooperative bodies be strengthened and that the party nucleus in the Komsomol be enlarged. The conference called for strict observance of socialist legality and for an intensification of the struggle against bureaucracy and infractions of state discipline.

The conclusion of the conference that the victory of socialism was possible in the USSR was put in the form of a party resolution, which obliged every Communist to take an active part in socialist construction and to rally the working people of the country around the achievement of this goal.

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Chetyrnadtsataia konferentsiia RKP(b): Stenografich. otchet. Moscow-Leningrad, 1925.

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Istoriia KPSS, vol. 4, book 1. Moscow, 1970.

S. S. SHAUMIAN [29–366–1]

FOURTEENTH CONGRESS OF THE ALL-UNION COMMUNIST PARTY (BOLSHEVIK), a congress held from Dec. 18 to Dec. 31, 1925, in Moscow. The congress was attended by 665 voting delegates and 641 with observer status. The delegates represented 643,000 party members and 445,000 candidates for membership.

The agenda of the congress included the political report of the Central Committee, delivered by J. V. Stalin; the organizational report of the Central Committee, read by V. M. Molotov; the report of the Auditing Commission given by D. I. Kurskii; the report of the Central Control Commission presented by V. V. Kuibyshev; and the report of the RCP(B) delegation in the Executive Committee of the Comintern, read by G. E. Zinoviev. In addition, M. P. Tomskii gave an account of the work of the trade unions, N. I. Bukharin reported on the work of the Komsomol, and A. A. Andreev spoke on alteration of the party Rules. Elections were held, and at one of the sessions the congress heard G. V. Chicherin's report on the international situation and Soviet foreign policy.

During the preparation for the congress and during the congress itself, an intense struggle was waged against the New Opposition, a faction that had taken issue with the party's course in implementing Lenin's plan for building socialism in the USSR and was attempting to revise the political line of the Central Committee from a Trotskyist position. The leaders of the faction—Zinoviev and L. B. Kamenev—had decided to make the Leningrad party organization a strongpoint in the struggle against the Central Committee. Through deception and flagrant violation of internal party democracy, they had arranged to have the delegation to the congress from the Leningrad organization consist solely of their confederates. Since the overwhelming majority of Leningrad Communists were faithful to the Central Committee of the RCP(B), the leaders of the New Opposition camouflaged their adoption of Trotskyist positions.

In its political report the Central Committee set forth its line on the fundamental questions of socialist construction. The committee stressed that a balance of power had been established in relations between the Soviet Union and the capitalist states as a

result of the inherent weakness of world capitalism and the growth of the revolutionary movement around the world.

Of primary importance to the country's international standing was the economic and political consolidation of the USSR and the achievement of an environment that would enable peaceful coexistence with the capitalist countries. The congress pointed to the need to continue a policy of peace while strengthening the defense capability of the USSR. In a resolution on the report of the Central Committee, the congress expressed complete solidarity with the revolutionary struggle of the proletariat and oppressed peoples of the world and declared that the party would strengthen the alliance between them and the toiling masses of the USSR and would give them support.

The Central Committee's report also noted that in building socialism the party strictly adhered to the Leninist general line, which regarded heavy industry as the foundation of the socialist transformation of the economy. The Central Committee's position in favor of preferential development of heavy industry was approved, and a directive was issued "to continue the industrialization of the country and the development of the production of the means of production" (*KPSS v rezoliutsiiakh*, 8th ed., vol. 3, 1970, p. 247).

Outlining a program designed specifically to draw the middle peasantry into socialist construction by means of cooperation, the congress stressed that if the poor, and especially the farmhands, were the foundation of the rural working class, then the middle peasant should be a staunch ally of that class.

The New Opposition challenged the measures devised by the party to implement Lenin's plan for building socialism. On the second day of the congress, the faction demanded the floor in order that Zinoviev might deliver a supplementary statement on the report of the Central Committee. The New Opposition thereby announced its disagreement with the political line of the Central Committee.

Exaggerating the difficulties of socialist construction, Zinoviev tried to persuade the delegates that building socialism in an economically backward country was doomed to failure. Rationalizing its own divisive and factional behavior, his group accused the Central Committee of a myriad of errors. Like Trotsky in 1923 and 1924, it was seeking to seize control of the party leadership. It wanted to alter the composition of the Politburo and to remove from his position as general secretary of the Central Committee J. V. Stalin, who, with the support of the majority of the members of the party, was leading the struggle against the opposition. The New Opposition was prepared to bring about a split in the party, a danger against which Lenin had warned.

Adopting a position of silent support of the New Opposition, Trotsky did not take the floor at the congress and concealed his plan to unite with the faction (*see* TROTSKYIST-ZINOVIEVIST BLOC). The delegates to the congress rebuffed the New Opposition and exposed the Trotskyist-Menshevik nature of its platform. The congress approved the political and organizational line of the Central Committee, censured the attempts of the anti-Leninist elements to pervert the fundamental principles of party politics and theory, and authorized the Central Committee "to wage a determined struggle against all attempts to undermine the unity of the party, no matter where they originate" (*ibid.*, p. 252). Of the 653 delegates who participated in a roll-call vote on the resolution on the report of the Central Committee, only 65 voted against it. The opposition's isolation in the congress was apparent.

In the resolution On the Report of the Central Control Commission, the congress approved the position taken by the commission on the defense of party unity and on the support of the Leninist line of the Central Committee. The congress urged the new members of the commission "to fight even more resolutely against ideological vacillation and attempts to violate the common will and discipline of the party" (*ibid.*, p. 253).

The tasks associated with the reconstruction of the country required improved functioning of government bodies. The congress approved the work of the organs of state and party control and made an appeal in the resolution On the Work of the Central Control Commission and the Workers' and Peasants' Inspectorate for an intensification of the struggle against bureaucracy and for an improvement of the manner and methods of operation of state institutions.

After taking a stand against strengthening party control of trade unions and after propagandizing for the "independence" of the Komsomol from the party, the New Opposition was again rebuffed. It was pointed out in several resolutions that the trade unions could accomplish their tasks only under the leadership of the party. The congress called for recognition of the full and unconditional authority of the party and its Central Committee in the guidance of the Komsomol. The opposition's demand for the unlimited expansion of party ranks was rejected, since such expansion could lead to the end of the party's role as a politically aware organized forward detachment of the working class. It was proposed that internal party democracy be improved and that the level of activity of the broad masses of Communists be raised. It was also proposed that the guiding role of the party be increased in all areas of socialist construction, especially in the economic sphere, and the proletarian nucleus of the party be augmented.

The congress adopted a new set of party Rules, and, as a result of the formation of the Soviet Union, the RCP(B) was renamed the ACP(B), or All-Union Communist Party (Bolshevik). Kamenev's report, "On the Immediate Problems of Economic Construction," was removed from the agenda at the suggestion of a number of delegations, since he had demonstrated by his vote against the resolution on the Central Committee's report that his point of view did not correspond to the party line.

The congress approved the "Address to All Members of the Leningrad Organization," in which it gave a political appraisal of the behavior of the organization's delegation to the congress and issued an appeal to Leningrad Communists to put an end to all attempts to subvert party unity. Before it adjourned, the congress sent a group of Communists to Leningrad to explain the party line and to expose the opposition's activities. The Communists of Leningrad condemned the opposition, expressed their support of the congress, and declared that the Leningrad delegation did not express the will of the organization.

The congress elected the membership of the Central Committee of the ACP(B) (63 members and 43 candidate members) and the Central Control Commission (163 members). It scientifically substantiated and enunciated the party's course toward the industrialization of the country. It condemned the attempts of the anti-Leninist elements in the party to revise the general party line, which was oriented toward the victory of socialism. The Fourteenth Congress of the party entered history as the congress of the industrialization of the country.

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Istoriia KPSS, vol. 4, book 1. Moscow, 1970.

S. S. SHAUMIAN [29–368–2]

FOUR-TERMINAL NETWORK, an electrical network or a part of a network with four poles, or terminals, to which other networks or parts of another network may be connected. The four-terminal network is the most widely used type of multiterminal network.

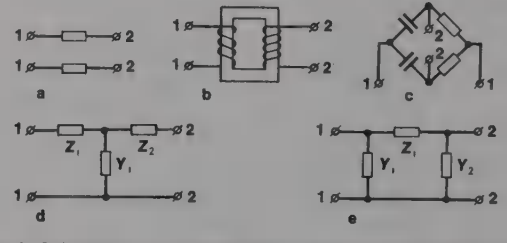

Figure 1. Schematics of four-terminal networks: (a) a power line, (b) ■ transformer, (c) ■ bridge circuit, (d) a four-terminal T network, (e) ■ four-terminal pi network; (1) input terminals, (2) output terminals, (*Z*) impedances of the network elements, (*Y*) admittances of the network elements

In four-terminal networks, two pairs of terminals, called the input terminals and the output terminals, are usually distinguished (Figure 1). The input terminals are used to connect a network to a source of electrical energy; the output terminals, to connect a

network to a load. If the four terminals are grouped in pairs, the network is known as a two-terminal–pair network, which is also called a four-pole, a quadripole, a four-pole network, a quadripole network, or a quadrupole network.

If the relationship between the currents flowing through a four-terminal network and the voltages across the network's terminals is linear, the network is said to be linear; in the opposite case, the network is referred to as nonlinear. The main characteristic of a linear four-terminal network is the complex transfer ratio, which is equal to the ratio of the complex amplitudes at the network's input and output. A four-terminal network is said to be bilateral if its characteristics do not change when the connections to a source and a detector are reversed.

Examples of four-terminal networks include transformers, power lines, bridge circuits, and electric filters. [29–362–3]

FOURTH CONFERENCE OF THE RUSSIAN SOCIAL DEMOCRATIC LABOR PARTY (Third All-Russian Conference of the RSDLP), a conference held from Nov. 5 (18) to Nov. 12 (25), 1907, in Helsinki, Finland. The conference was attended by 27 delegates comprising ten Bolsheviks, four Mensheviks, five Polish Social Democrats, three Latvian Social Democrats, and five Bundists. The delegates represented party organizations in Moscow and St. Petersburg and in the central industrial provinces, the Urals, the Volga Region, Siberia, the Northern Caucasus, Transcaucasia, and southern Russia. V. I. Lenin was among the Bolshevik delegates at the conference.

The agenda of the conference included discussion of three topics: the tactics to be employed by the Social Democratic faction in the State Duma, the faction's local organizations and the improvement of communication between the Central Committee and local organizations, and participation in the bourgeois press.

In his report on the tactics to be used by the Social Democratic deputies in the Duma in response to the onset of reaction, Lenin called on the deputies to point out that the bills sponsored by the government and the liberal-bourgeois elements run counter to the people's interests. He stressed that the Social Democrats should use the Duma not for the legislative "reforms" advocated by the Mensheviks but for the revolutionary education and organization of the proletariat and for large-scale agitation for a democratic republic, confiscation of the lands of the *pomeshchiki* (landowners), and an eight-hour workday. They would be able to accomplish these tasks, Lenin said, if they adhered to an independent political line and did not ally themselves with the Cadets. The Mensheviks and the Bundists continued to insist on the need for "purely practical" work in the Duma and appealed for support of legislative activity in a bloc with the Cadets.

The conference adopted the resolution drafted and proposed by Lenin on behalf of the St. Petersburg all-city conference. The resolution contained the Bolshevik assessment of the Third State Duma and of the policies of the autocracy and set forth the revolutionary tactics to be used in the Duma by the Social Democratic deputies. Agreements with deputies of the Populist parties and with the Trudoviki, who were left of the Cadets, were sanctioned for the purpose of freeing the peasantry from the influence of the liberal bourgeoisie. The conference named the RSDLP delegation in the State Duma the Social Democratic faction, barred Social Democrats from participating in the bourgeois press, and drafted measures for improving communication between the Central Committee of the RSDLP and local party committees.

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FOURTH CONGRESS OF SOVIETS OF THE USSR, a congress held in Moscow from Apr. 18 to Apr. 26, 1927. The congress was attended by 1,601 voting delegates and 747 delegates with observer status. Industrial workers made up 47.1 percent of the delegates, peasants, 28.3 percent, and nonindustrial workers, 24.6 percent. Party membership was held by 72.5 percent of the delegates, and 116 of the delegates were women.

The agenda of the congress included the summary report of the government of the USSR, which was delivered by A. I. Rykov. V. V. Kuibyshev reported on the state of industry and the prospects of its development. M. I. Kalinin identified the primary goals of agriculture in terms of the overall development of the economy and the industrialization of the country, and K. E. Voroshilov spoke on the defense of the country and on the Workers' and Peasants' Red Army. Constitutional questions and Central Executive Committee elections were also part of the agenda.

The congress approved the activities of the Soviet government. Kuibyshev noted in his report that overall industrial production had increased by 20 percent in 1926 and 1927 and that the output of the industries responsible for producing the country's means of production had grown by 23 percent. The delegates adopted a resolution enjoining the government to draw up as soon as possible a five-year plan for the economy of the USSR.

Kalinin pointed out in his report that the Soviet state was the first in history to look upon agriculture as part of an integrated national economy. A special section of the report was devoted to the development of kolkhozes and sovkhozes. The congress defined goals for agriculture that were linked with the industrialization of the country.

Voroshilov's report dealt with measures that were needed to increase the defense capability of the USSR. The delegates confirmed the unswerving will of the peoples of the USSR to maintain friendly relations with other states.

Among the amendments to the Constitution of the USSR that were introduced by the congress was an amendment involving proportional representation at the All-Union Congresses of Soviets. It was established that city soviets would send one deputy for every 25,000 voters and that provincial and okrug congresses of soviets would send one deputy for every 125,000 voters. The congress combined two commissariats to form the People's Commissariat of Internal and Foreign Trade of the USSR, and the Central Statistical Board was granted the status of a consolidated people's commissariat of the USSR. The new Central Executive Committee that was elected represented 48 nationalities.

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FOURTH REPUBLIC, a bourgeois republic in France that was established in 1944 after the liberation of the country from fascist German occupation and that existed until 1958. The constitution of the Fourth Republic was adopted in 1946. Until the constitution went into effect, the country was governed by a provisional regime (1944–46). In 1958 the Fifth Republic was established in France. [29–349–1]

FOURTH (UNITY) CONGRESS OF THE RUSSIAN SOCIAL DEMOCRATIC LABOR PARTY, a congress held in Stockholm, from Apr. 10 to Apr. 25 (Apr. 23 to May 8), 1906. The congress was attended by 112 voting delegates from 57 organizations of the RSDLP and 22 delegates with observer status. A total of 62 organizations were represented. Of the 12 observers representing national Social Democratic parties, the Social Democracy of the Kingdom of Poland and Lithuania accounted for three, as did both the Latvian Social Democratic Labor Party and the Bund; the Ukrainian, Finnish, and Bulgarian Social Democratic parties each sent one observer. The Bolsheviks had 46 votes, and the Mensheviks 62. In all, 157 persons took part in the work of the congress.

The political situation created by the Revolution of 1905–07 required that the split in the party be mended, since it was disrupting the unity of the working class. Increasingly, attempts at unifying the RSDLP were being made in such places as St. Petersburg, Kharkov, and Baku. Although V. I. Lenin favored the unification, he did not slur over his differences with the Mensheviks on aspects of the revolution: "We agree to uniting the two parts, but we shall never agree to mixing them up" (*Poln. sobr. soch.*, 5th ed., vol. 47, p. 80).

In late 1905 the leaders of the two factions formed a united

Central Committee of the RSDLP for the purpose of convening the congress. In the party organizations, key draft resolutions prepared separately by the Bolsheviks (written by Lenin) and by the Mensheviks were discussed during the election of delegates to the congress. Delegates to the previous congresses had been elected by members of the RSDLP committees; for this congress, they were chosen by general meetings consisting of from one to 300 party members. Many of the organizations in industrial regions—where the Bolsheviks predominated—were seriously weakened by repression and either were unable to send delegates or sent fewer than they were allowed. The makeup of the congress, therefore, did not reflect the actual alignment of forces within the party.

The first point on the agenda of the congress was a review of the agrarian program; Lenin, P. P. Maslov, G. V. Plekhanov, S. A. Suvorov, and P. P. Rumiantsev spoke on this topic. The second point—the immediate situation and the class goals of the proletariat—was the subject of speeches by Lenin and A. S. Martynov. P. B. Aksel'rod and Lenin addressed the congress on the third point—the tactics to be used regarding election results in the State Duma and regarding the Duma itself. The fourth point—the question of an armed uprising—was dealt with by V. P. Makhnovets, L. B. Krasin, and F. A. Lipkin. Also on the agenda were elections, routine reports, and a number of issues resolved by special commissions without floor discussion. These issues included partisan actions, a provisional revolutionary government and revolutionary self-government, trade unions, the peasant movement, parties and organizations other than the Social Democrats, party organization, and union with the Social Democracy of the Kingdom of Poland and Lithuania, the Latvian Social Democratic Labor Party, and the Bund. Two items of the agenda were removed from discussion entirely—the issue of the soviets of workers' deputies and, in connection with the nationalities question in the party program, the issue of a special constituent assembly for Poland. In addition to reports on the agrarian question and on the immediate situation, the texts of which have been lost, Lenin delivered speeches on the state Duma and on such issues as the armed uprising.

The congress began its work with a review of the party's agrarian program, since the agrarian question formed the basis of the first Russian revolution and had determined the revolution's national characteristics. The course of the revolution had demonstrated the inadequacy of the agrarian program adopted in 1903 by the Second Congress of the RSDLP: opposed to all landholding by the *pomeshchiki* (landowners), the peasantry sought to acquire not simply the *otrezki*, or lands lost by them as a result of the abolition of serfdom, but all the lands held by the *pomeshchiki*.

Lenin viewed the agrarian program of Bolshevism both as a proletarian program in a peasant revolution directed against the vestiges of serfdom and as a program of a peasant uprising. The program was drafted for the purpose of creating between the working class and the peasantry an alliance that would achieve the goals of the bourgeois democratic revolution and would transform it into a socialist revolution. Although Lenin's report on the issue was not preserved, it is known that he defended and developed the point of view that he set forth in the pamphlet *Revision of the Agrarian Program of the Workers' Party*, which came out on the eve of the congress and was distributed to the delegates.

Lenin's program aimed at a revolutionary break with all landholding of the past. Its main points were (1) the confiscation of all church, monastery, appanage, state, and cabinet lands and all lands of the *pomeshchiki*; (2) the establishment of elected peasant committees for eliminating all traces of the power and privileges of the *pomeshchiki* and for redistributing the confiscated land; and (3) the nationalization of all land after the achievement of certain political conditions, that is, after the final victory of the revolution and the establishment of a democratic republic. The program reflected the scope and depth of the agrarian movement that was unfolding in Russia. It called the peasants to revolutionary action and was linked with the general tactical line of the Bolsheviks of transforming the bourgeois democratic revolution into a socialist one.

A group of Bolsheviks that included Suvorov, V. A. Bazarov, and J. V. Stalin and that came to be known as the *razdelisty* (partitionists) advocated dividing the lands of the *pomeshchiki* and transferring the ownership to the peasants. Although the program of the *razdelisty* was erroneous, it bore a revolutionary-democratic character. Assuming a long interval between the bourgeois democratic revolution and the socialist revolution, the *razdelisty* failed to see that nationalization of the land would expedite the growth of the democratic revolution into a socialist revolution.

The Mensheviks advocated a program of municipalization of land; that is, the lands of the *pomeshchiki* were to be transferred to local bodies of self-government such as *zemstvos*, which would in turn lease the lands to the peasants. This reformist solution of the agrarian problem failed to bring the peasantry into the revolution. Although the Menshevik program was adopted by the congress by a majority vote, a number of amendments were introduced at the insistence of the Bolsheviks, one of which was a demand for the confiscation of the lands held by the *pomeshchiki*. Lenin called this program "a deal with reaction" (*ibid.*, vol. 13, p. 20).

Differences with the Mensheviks became even sharper during an evaluation of the immediate situation and the discussion of the state Duma. The Mensheviks openly challenged the hegemony of the proletariat in the revolution, praised the role of the Duma as a national political center, and in effect rejected an armed uprising. Lenin pointed out that the essence of a revolution is the direct revolutionary struggle of the masses and not constitutional, legal forms of action. He proposed that the Duma and its conflicts with the government be used to deepen the revolutionary crisis. The congress adopted the Menshevik resolution relegating the proletariat to a position of support of the Cadet Duma. Its resolution on an armed uprising was a veiled criticism of the December uprising and did not address the need for renewed insurgence.

The congress accepted the Social Democracy of the Kingdom of Poland and Lithuania into the RSDLP and worked out conditions for a union with the Latvian Social Democratic Labor Party and the Bund, which would function as territorial organizations operating among the proletariat of all the nationalities in their own regions. Fearing they would alienate the workers, the Mensheviks were forced to accept Lenin's formulation of the first paragraph of the party Rules for party membership. The Central Committee that was elected by the congress consisted of three Bolsheviks and seven Mensheviks, and only Mensheviks were elected to the editorial board of the party's central organ.

The union with the Mensheviks that was effected at the congress was merely a nominal union, since ideological differences remained. The important, practical business of the congress—the fusion of the RSDLP with national Social Democratic parties—was partially accomplished. Rallying the revolutionary forces of the working class around the principles of proletarian internationalism facilitated the struggle against tsarism. After the congress, the Bolshevik delegates approved an address written by Lenin to the party, in which he stated that the Bolsheviks would support the decisions of the congress but would wage an ideological struggle against the decisions they considered erroneous.

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[29–351–4]

FOUR-YEAR SEJM, the parliament of the Polish-Lithuanian Commonwealth (Rzeczpospolita) from 1788 to 1792.

The Four-year Sejm carried out many reforms of the state

structure. Through the efforts of the "patriotic party," which had formed under the ideological leadership of H. Kołłontaj and S. Staszic, it voted to expand the Polish Army to 100,000 men (October 1788), abolished the Permanent Council (January 1789), and passed a law on cities (April 1791). The reforms adopted by the Four-year Sejm were summarized in the Constitution of May 3, 1791.

Reactionary magnates opposed to the constitution formed the Confederation of Targowica in 1792, which invited Russia and Prussia to occupy the commonwealth. The reforms adopted by the Four-year Sejm were rescinded, and a new Sejm was convened in Grodno in 1793 and compelled to ratify the second partition of the country.

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FRAME FREQUENCY. (1) The rate of succession of the film frames during motion-picture filming or projection; the same as the filming or projection speed. The standard filming and projection speed is 24 frames per sec; 8-mm and 16-mm films are sometimes exposed and projected at a speed of 16 frames per sec. If filming is done at a speed higher or lower than the projection speed, the action photographed will be seen as retarded or speeded up, respectively, during projection. The two effects are widely used in all types of motion pictures.

(2) The rate at which complete frames change on the screen of a television receiver. The frame frequency adopted as a television standard in the USSR is 25 frames per sec. [29–84–2]

FRAZIL ICE, an accumulation of loose, spongy ice within a body of water (deep frazil ice) or on its surface (surface frazil ice). Frazil ice forms from tiny crystals of deep ice (intermediate and bottom ice) and from grease ice and slush. It occurs before the freeze-up when water is supercooled below 0°C, primarily on mountain rivers and rivers with rapids, below polynyas and the lower pools of hydroengineering complexes, and, occasionally, on lowland rivers and lakes.

Frazil ice, carried downstream by the current, covers large areas and dams up the channel, causing ice jams. It also considerably impedes the operation of hydroengineering structures by clogging up the filters of water intakes and the aperture grills at hydroelectrical power plants. [29–1521–1]

FREQUENCY. The frequency of an event A is the ratio m/n of the number m of occurrences of A in a given series of trials to the total number n of trials. If the trials are independent and there is a definite probability p of the occurrence of A in an individual trial, then, for arbitrarily small $\epsilon > 0$, at sufficiently large m it is practically certain that the frequency m/n satisfies the inequality

$$\left|\frac{m}{n} - p\right| \leq \epsilon$$

(*see* LARGE NUMBERS, LAW OF and PROBABILITY).

The term "frequency" is used in mathematical statistics to designate the number of elements of a set that have a specified attribute. [29–84–1]

FREQUENCY, ELECTRICAL, the time parameter of a periodically (cyclically) varying electric current, expressed by the ratio of the number of complete cycles of current variation to unit of time; the quantity is the inverse of the period of current variation. It is measured in hertz (Hz). For a sinusoidal alternating current the concept of angular frequency is used, which is related to the electrical frequency by the formula $\omega = 2\pi f$ (where ω is the angular frequency and f is the electrical frequency).

In many countries of the world, including the USSR, the frequency of the current generated by electric power stations and commercially distributed to industry is 50 Hz; in the USA it is 60 Hz. Railroads in many countries use current with a frequency of 16⅔ Hz (for electric traction) as well as frequencies of 25 and 75 Hz (for automatic block signaling, for example, on track circuits). In aviation, the current used has a frequency of 400 Hz (for independent power-supply systems). In certain industrial and agricultural equipment the operating frequency is raised to 200–400 Hz. [29–85–2]

FREQUENCY-CONTRAST RESPONSE CURVE, a function with which the sharpness characteristics of optical imaging systems and of the individual elements of such systems are evaluated. It is the Fourier transform of the line scattering function, which describes the nature of the blurring of an image of one thin line taken separately. It gives more complete information about the properties of an imaging system than does the resolving power because it characterizes the ability of the system to transfer adequately to the image details of any size from an object, and not merely the smallest.

Use of the frequency-contrast response curve has been of particular value in the development of aerial photographic surveying, space photography, and other specialized techniques of optical imaging. Since the 1970's a variety of equipment has been produced industrially in several countries for the measurement of the frequency-contrast response curve of objective lenses and photosensitive emulsions. Computer programs have been used extensively to calculate frequency-contrast response curves, and theoretical studies have also been conducted.

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FREQUENCY DICTIONARY, a type of dictionary, usually monolingual, in which lexical units are characterized according to their frequency of use in a corpus of texts that are representative of the language as a whole, of a particular style, or of an individual author. Such dictionaries are classified according to the type of lexical unit examined as word-form, word (lexeme), stem (used in information science), semantic (words with particular meanings), and word-group frequency dictionaries.

Absolute and relative characteristics of the use of a lexical unit x are distinguished. An absolute characteristic is the frequency f of a given lexical unit x equal to the number of uses of x in the investigated corpus of texts $f(x)$. A frequency dictionary has either $f(x)$ or the normalized frequency $f(x)/N$, where N is the number of examined words in the text. The relative characteristic of the use of a lexical unit is either the unit's rank, which is the number of lexical units in the dictionary with an absolute characteristic of use greater than or equal to that of the given lexical unit, or some property that permits the rank to be calculated more or less accurately. Most frequency dictionaries give both absolute and relative characteristics.

Frequency dictionaries are used in the development of efficient methods of teaching language. They are used in information science to isolate key words and in communication theory to create efficient codes.

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FREQUENCY-INDEPENDENT ANTENNA, an antenna with primary electrical characteristics that vary insignificantly with frequency over an extremely wide range; the various types of such antennas constitute a group of broadband antennas for which the ratio of maximum operating frequency to minimum range to 20:1 or more. The theoretical and technological foundations for frequency-independent antennas were established between 1957 and 1965 by the American scientists V. H. Rumsey, D. Dyson, and others.

The weak dependence of the antennas' characteristics (the shape of the directive pattern, the front-to-rear ratio, the input impedance, and so on) on frequency stems from the fact that the radiation field is created by currents distributed over a finite portion of the antenna surface, known as the active region, beyond whose limits the currents decrease sharply; as the frequency varies, the active region changes in such a way that its relative dimensions expressed in terms of the wavelength λ corresponding to the frequency remain unchanged. The lower wavelength limit λ_{max} of the antenna's operating range is determined by the frequency at which the active region is shifted to the edge of the antenna. The antenna's operating range can, in principle, be extended toward the shorter wavelengths as far as desired, but in practice the limit is determined by a number of incidental factors, such as the cross-sectional dimensions of the power feeder that are acceptable for given values of the losses introduced, the breakdown voltage, the transmitted power, and so on.

The most common frequency-independent antennas are in the form of two-arm spiral and conical helical antennas, log-periodic antennas, and sickle-shaped dipoles. There are also multiarm spiral and helical antennas that have several independent inputs; a well-known type is in the form of a conical dipole with an ultrawide range of input impedances.

Frequency-independent antennas are used for shortwave radio communications, telemetry, and radio astronomy. During the 1970's lightweight types of relatively simple design were developed for various frequency ranges: log-periodic wire antennas were developed for decameter waves, and spiral and helical antennas were created for centimeter and millimeter waves from strip conductors deposited on a fiberglass substrate by a photochemical process. Highly directional frequency-independent antennas are being designed as horn antennas with walls having transverse ribs and antenna arrays composed of log-periodic or conical helical radiators positioned along radii in a specific sector of a circle.

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L. S. BENENSON [29–86–3]

FREQUENCY METER, an instrument for measuring the frequency of periodic processes (oscillations). The frequency of mechanical vibrations is usually measured by means of mechanical vibration frequency meters and by electrical meters equipped with transducers to convert the mechanical vibrations into electrical oscillations.

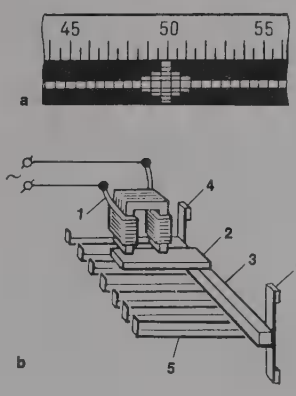

Figure 1. Electromechanical vibration frequency meter: (a) scale, registering ■ reading of 50 Hz, (b) diagram of the instrument; (1) electromagnet winding, (2) electromagnet armature, (3) base of the frequency meter, (4) elastic supports, (5) reeds

The simplest mechanical vibration frequency meter operates on the resonance principle and consists of a series of flexible reeds fastened at one end to a common base. The lengths and masses of the reeds are chosen in such a way that their natural vibration frequencies form a specified discrete scale, from which the value of the frequency being measured is determined. When mechanical vibrations act on the base of the meter, they cause the flexible reeds to vibrate; the highest vibration amplitude is observed on the reed whose natural vibration frequency is equal or close to the value of the frequency being measured.

The frequency of electrical oscillations is measured by means of electromechanical, electrodynamic, electronic, moving-iron, and moving-coil frequency meters. The simplest electromechanical type consists of an electromagnet and a series of flexible reeds (as in the mechanical frequency meter) on a common base that is attached to the armature of the electromagnet (Figure 1). The electrical oscillations being measured are fed to the winding of the electromagnet; the armature vibrations thereby produced are transmitted to the reeds, and the value of the frequency being measured is determined from the vibrations.

The principal element in electrodynamic frequency meters is a ratio meter with an oscillatory circuit in one of its branches that is permanently tuned to the average frequency for the measurement range of the given instrument (Figure 2). When connected to an AC circuit, the moving part of the ratio meter is deflected by an angle proportional to the phase shift between the currents in the windings of the ratio meter, which depends on the ratio of the frequency being measured to the resonance frequency of the oscillatory circuit. The measurement error of electrodynamic frequency meters ranges from 10^{-1} to 5×10^{-2}.

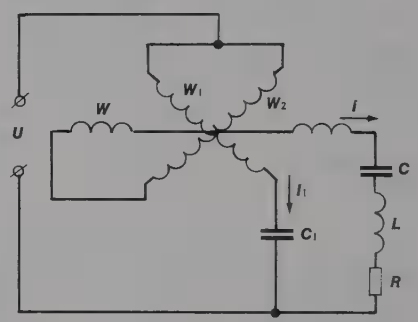

Figure 2. Schematic diagram of an electrodynamic frequency meter: (*W*) fixed coil of a ratio meter consisting of two identical parts, designed to create a uniform magnetic field; (W_1) and (W_2) moving coils rigidly secured together at an angle of 90°, which interact with coil *W*; (*C*), (*L*), and (*R*) electrical capacitance, inductance, and resistance, respectively, of the oscillatory circuit; (C_1) capacitor to produce a phase shift of 90° between *U* and I_1; (*U*) voltage whose frequency is being measured; (*I*) and (I_1) currents in the branches of the ratio meter

The frequency of electromagnetic oscillations in the radio-frequency and microwave-frequency ranges is measured by means of electronic frequency meters (wavemeters), such as the resonant, heterodyne, and digital types.

The operation of a resonant-type frequency meter is based on the comparison of the frequency being measured with the frequency of natural oscillations in an electrical circuit (or a microwave resonator) that is tuned to resonance with the frequency being measured. The meter consists of an oscillatory circuit with a coupling loop that picks up the electromagnetic oscillations (radio waves), a detector, an amplifier, and a resonance indicator (Figure 3). During measurement, the circuit is tuned by means of a calibrated capacitor (or the plunger of a microwave resonator) to the frequency of the electromagnetic oscillations being picked up until resonance is achieved, as shown by the greatest deflection of the pointer on the indicator. The measurement error ranges from 5×10^{-3} to 5×10^{-4}.

In heterodyne frequency meters, the frequency being measured is compared with a known frequency (or one of its harmonics) produced by an oscillator, or heterodyne. As the heterodyne frequency is tuned to the frequency of the oscillations being mea-

sured, beats occur at the output of a mixer (in which the frequencies are compared); after amplification the beats are indicated by the pointer on an instrument, by an earphone, or sometimes by an oscilloscope. The relative error of heterodyne frequency meters ranges from 5×10^{-4} to 5×10^{-6}.

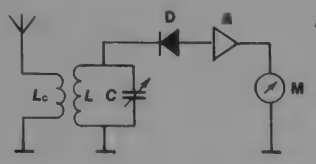

Figure 3. Schematic diagram of a resonant-type frequency meter: (L_c) coupling loop, (L) and (C) oscillatory circuit (C is a calibrated variable capacitor), (D) detector (semiconductor diode), (A) amplifier, (M) indicator (microammeter or millivoltmeter)

Digital frequency meters (frequency counters) are now widely used. Their operation involves a count of the number of periods in the oscillations being measured during a specified time interval. Frequency counters consist of a device that converts the sinusoidal voltage of the frequency being measured into a train of unidirectional pulses, a gate for the pulses that opens for a certain time interval (usually from 10^{-4} to 10 sec), an electronic counter that registers the number of pulses at the gate output, and a digital display. Modern digital frequency counters operate over a frequency range from 10^{-4} to 10^{9} hertz with a relative measurement error from 10^{-9} to 10^{-11} and a sensitivity of 10^{-2} volt. Such devices are used primarily for testing radio equipment and, with various measuring transducers, for measuring temperature, vibrations, pressure, strain, and other physical quantities.

Primary and secondary frequency standards, which have an error in the range from 10^{-12} to 5×10^{-14}, function as a type of high-accuracy reference frequency meters. The rotational speed of shafts in machines and mechanisms is measured with a tachometer.

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E. G. Bilyk [29–89–2]

FREQUENCY MODULATION, a method of modulating oscillations, in which the frequency of the high-frequency carrier oscillations is varied over time according to a law that corresponds to the signal being transmitted. A feature of frequency modulation is its high immunity to noise. Frequency modulation is used for high-quality transmission of information: in radio broadcasting (in the very-high-frequency band), for the audio signal of television programs, in voice-frequency telegraphy, in radiotelephone communications, and in other fields. [29–85–3]

FREQUENCY-RESPONSE METHOD, in automatic control theory, a method of evaluating the dynamic characteristics of an automatic control system by using the system's frequency-response curves expressed as the steady-state response of the system to a harmonic input signal.

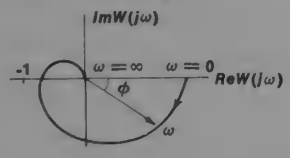

Figure 1. Amplitude-phase characteristic of an open-loop system

The steady-state response of a stationary linear system to an input signal $x_1 = A_1 e^{j\omega t}$ is also a harmonic signal $x_2 = A_2 e^{j(\omega t + \phi)}$. The output and input signals are related by the complex transfer function $x_2 = W(j\omega)x_1$, for which the modulus is given as the ratio of the signal amplitudes $|W(j\omega)| = A_2/A_1$ and the argument $W(j\omega)$ is given as the phase shift $\phi(\omega)$ between x_2 and x_1. The hodograph of $W(j\omega)$ on the complex plane as ω varies from 0 to $+\infty$ (Figure 1) is called the amplitude-phase characteristic (APC). Every point on the hodograph corresponds to a specific frequency. The length of the vector drawn from the origin of coordinates to a point on the APC corresponding to a frequency ω is equal to $|W(j\omega)|$, and the phase shift of the vector relative to the real, positive semiaxis is the argument of $W(j\omega)$. The dependence of the modulus and the argument on frequency is expressed by the amplitude-frequency characteristic (AFC) and phase-frequency characteristic (PFC). When the logarithmic amplitude-frequency characteristic (LAFC) and the logarithmic phase-frequency characteristic (LPFC) are plotted, the frequency is laid out along the axis of abscissas on a logarithmic scale, and on the axis of ordinates the values of the modulus expressed in decibels $|W(j\omega)|$ dB (for LAFC) and of the argument $\phi(\omega)$ (for LPFC) are laid out on a linear scale (Figure 2). The frequency-response curves are plotted according to the complex transfer function derived from the system's differential equation or according to the results of measurements of the amplitude ratio and the phase shift between signals at various frequencies. The frequency-response curves (APC or LAFC and LPFC) are used to examine the stability of an automatic control system and the quality indexes of transients in the system. The frequency-response method was introduced into automatic control theory by A. V. Mikhailov between 1936 and 1938.

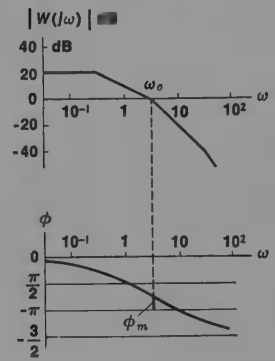

Figure 2. Logarithmic amplitude-frequency and phase-frequency characteristics of an open-loop system

Use of the Nyquist criterion makes it possible to determine beforehand the stability of a closed-loop linear system (that is, a system with feedback) from the APC of the open-loop system; a closed-loop system is stable if the APC of the open-loop system does not enclose the critical point having the coordinates $-1, 0$ (Figure 1). The stability of the closed-loop system can be evaluated directly from the LAFC and the LPFC of the open-loop system; the closed-loop system is stable if the phase margin $\phi_m = \pi - |\phi(\omega)_c|$ is positive (Figure 2; ω_c is the cutoff frequency at which LAFC intersects the axis of abscissas). The cutoff frequency can be used as a measure of the system's speed of operation, and the phase margin is useful as a measure of the rate of decay of free oscillations in the system. Logarithmic frequency-response curves and the Nyquist criterion have been used as a basis for developing very effective methods of synthesizing correction devices that ensure the required dynamic characteristics for a closed-loop system. Similar frequency-response methods have been devised for the analysis and synthesis of linear pulse systems. The quality indexes for a transient in a linear system are evaluated with respect to the transient response, which expresses the response of a system to a step signal. The Soviet scientist V. V. Solodovnikov has proposed methods for the synthesis and evaluation of the properties of transient response with respect to the real frequency-response curve $P(\omega) = ReW(j\omega)$. For nonlinear closed systems the Soviet scientist L. S. Gold'farb has used the frequency-response method to derive a criterion for the occurrence and stability of self-excited oscillations, and the Rumanian mathematician V.-M. Popov has proposed a criterion for absolute stability.

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E. L. L'vov [29–87–1]

FREQUENCY-SHIFT TELEGRAPHY, a method of transmitting electric telegraph signals over communications lines by means of alternating currents. It converts DC signals formed by telegraph apparatus into AC signals, which are then transmitted over the line (cable, radio-relay link, or the like). The channel equipment (*see* MULTICHANNEL COMMUNICATION) produces from one to 24 or more channels within one standard voice-frequency telegraph channel (0.3–3.4 kilohertz). The signal in each channel of the system is transmitted on its own carrier frequency, usually by means of frequency modulation; amplitude and phase modulation are also sometimes used. [29–86–1]

FREQUENCY STANDARD, PRIMARY (Russian, *etalon chastoty*), a frequency measure that reproduces a unit of frequency with the greatest accuracy achievable at the time. It differs from a secondary frequency standard (*standart chastoty*) in that the error has been more closely studied and its use is more strictly regulated. (*See* QUANTUM FREQUENCY STANDARDS.) [29–92–2]

FREQUENCY STANDARD, SECONDARY (Russian, *standart chastoty*), a device containing a reference frequency that emits an electric signal with a fixed frequency or a range of fixed frequencies. (*See* QUANTUM FREQUENCY STANDARDS and QUANTUM CLOCK.) [29–92–1]

GABLE (Russian, *shchipets*), in architecture, the upper portion of (usually) an end wall of a building, bounded by the two slopes of the roof and not separated on the bottom by a cornice (unlike a pediment). The term is sometimes applied to structures with a steep, two-sided roof that forms a gable with an acute angle; such structures sometimes surmount the main facade of a building. The Russian term *vimperg* is also sometimes used to mean a gable. [29–1604–1]

GAGE (Russian, *shablon*), in engineering, a device or tool for checking the accuracy of the shape of various finished items; a standard to which uniform items are manufactured.

A radius gage is an instrument for checking the profile radii of curvature of convex and concave surfaces of machine parts and other items. It is a steel plate 0.5–1 mm in thickness with a convex or concave curvature at the end. The circular radii are from 1 to 25 mm. The gage is positioned next to the item in order to check the radius of curvature. Any deviation from the radius of curvature of the gage is judged by the gap.

A thread gage is a device for determining thread pitch and angle. It consists of a steel plate 0.5–1 mm thick with teeth designed to fit the axial profile of a thread. There are gages for checking threads in inches and in the metric system. The gage is placed against the thread to be checked in such a way that the gage teeth enter the depressions in the thread. The correspondence of the pitch and angle of the thread to those of the gage is determined by the gap or by the tightness of fit. M. N. SOSNENKO [29–792–1]

GALLERY (Russian, *shtrek*), a horizontal, underground mine passage that has no exit on the surface and that usually follows the vein or rock in which it is excavated, in which case it may be called a drift or rock drift. Various types of galleries are distinguished according to purpose, including primary (main roads), panel, horizontal, excavation, intermediate, transport, and ventilation galleries. [29–1494–4]

GALLNUT, a gall formed on young branches and leaves of certain species of oak and sumac. Gallnuts form at the sites where the larvae of gall wasps or aphids develop. They are spherical or somewhat elongated excrescences measuring 1.5–2 cm or more in diameter. Gallnuts contain tannins (up to 70 percent of the dry mass), which are used for tanning leather and making pharmaceuticals (for example, astringents). [29–250–3]

GARLIC (*Allium sativum*), a bulbous plant of the family Liliaceae. The erect or drooping leaves are flat, lanceolate, and grooved. The flower stalk, which is developed and straight, measures 60–150 cm in height. The bulb is compound and consists of two to 50 cloves, each of which is covered with a coarse, leathery scale.

Garlic grows wild in the mountains of Middle Asia, southern Kazakhstan, the Caucasus, India, and the Mediterranean region. It is cultivated in Europe, Asia, North and South America, and tropical Africa and Australia. In the USSR garlic is almost ubiquitous.

Cultivated garlic has bolting and common, or nonbolting, forms. There is an intermediate form with attenuated bolting. Garlic is classified as spring or winter, according to the method of cultivation. Spring garlic has narrow leaves and does not usually bolt; winter garlic has broad leaves and may be bolting or nonbolting. Winter garlic gives considerably higher yields than spring garlic but is not suitable for prolonged storage. Spring garlic can be preserved until the next harvest. In contrast to wild garlic, cultivated garlic does not yield seeds but forms 60 to 450 aerial bulbels in the inflorescence and approximately the same number of flower buds, which wither before they open. If the bulbel is not used for propagation, the flower stalks are broken off soon after they appear from the axil of the last leaf, increasing the harvest of underground bulbs by 20 to 40 percent.

Garlic is used in cooking in fresh and preserved form. The bulbs contain 35–42 percent dry matter, 6.0–7.9 percent protein substances, 7.0 to 28 mg percent vitamin C (the leaves contain up to 80 mg percent), 0.5 percent sugars, and 20–27 percent polysaccharides. The pungent flavor and distinctive odor of garlic are caused by the presence of essential oil (0.23–0.74 percent) containing phytoncides that kill the causative agents of many diseases.

Phytoncidal preparations of garlic bulbs—garlic tincture and *allilsat* (a 40-percent alcoholic garlic extract)—are used medicinally to intensify the motor and secretory functions of the gastrointestinal tract. They are prescribed internally to suppress the processes of putrefaction and fermentation in the intestine in cases of atonia of the intestine and in colitis, as well as in cases of hypertension and atherosclerosis.

About 20 selectively bred varieties have been regionalized in the USSR. Cultivated garlic is propagated by cloves of root bulbs or by aerial bulbels. In the first year single-cloved bulbs are grown from the bulbels; the next year bulbs divided into cloves appear. Spring garlic is set out in early spring; winter garlic is planted in time to take root before prolonged frosts. About 400,000 cloves are set out per hectare (500–2500 kg/ha). Plantings consist of single-, double-, or triple-row strips, with 20 or 40 cm between rows. Where there is excessive moisture, garlic is grown on ridges or in beds. The average yield is 50–80 quintals per ha. The most dangerous pest of garlic is the stem eelworm (*Ditylenchus dipsaci*).

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IU. V. ABRAKHINA [29–339–3]

GATE (Russian, *shiber*), a closing device in the form of a slide or damper, used to open or close a channel for the flow of liquids or gases. Gates include draft-regulating dampers in the flues of industrial furnaces and boiler installations as well as sluice gates designed to shut off water-intake channels from a river or to close connections between channels. The working member of a sliding-vane pump is also a type of gate. Small gates are operated manually; large gates are operated by toothed racks, worm drives, and the like. [29–1173–3]

GEAR PUMP, a rotary pump with gears as working members. Involute straight-cut, helical, or herringbone gears are ordinarily used. Such pumps are simple in design, compact, and reliable. Their output ranges from 0.25 to 40 cu m per hr at pressures up to 3 meganewtons per m^2 (30 kg-force per cm^2). Gear pumps are used mainly for circulating petroleum products in machine lubrication systems and in hydraulic drive mechanisms. [29–1156–1]

GENGHIS KHAN (personal name, Temujin). Born circa 1155, in the district of Deliun-Boldok, on the Onon River; died Aug. 25, 1227. Military leader and founder of the unified Mongol empire.

Genghis Khan was the son of Yesugei, a member of the royal Borjigin clan. By 1204 he had eliminated his principal rivals and, having seized vast territories, became the de facto ruler of the many clan-tribal alliances in the subjugated regions. In 1206, at a *khurultai* (assembly) of the steppe aristocracy, he was proclaimed the great khan of all the tribes and was given the title Genghis, from the Turkic *tengis* (ocean, sea).

In domestic policy, Genghis Khan concentrated on uniting the Mongol tribes and centralizing the government of the newly created state in the interests of the feudalized clan-tribal aristocracy. In 1206 he promulgated decrees that constituted a codification of customary law (*yasa*). He divided the Mongol tribes into military-administrative units called thousands: at the command of the khan each unit had to produce 1,000 mounted soldiers. The thousands, along with pasturelands, were granted as fiefs (*khubi*) to his relatives and to the *noions*—members of a new class of feudal lords made up of his trusted lieutenants. Genghis Khan created a personal guard (*keshig*) of 10,000 men that served as the principal force in the suppression of any stirrings of discontent in the empire.

In foreign policy, Genghis Khan sought to extend the territory under his control as far as possible. His strategy and tactics were based on thorough reconnaissance and sudden attack; his troops tried to divide the enemy forces and set up ambushes using special detachments to lure the enemy. He also made use of large groups of cavalry that could maneuver quickly.

Genghis Khan subdued the peoples of Siberia and eastern Turkestan between 1207 and 1211 and attacked the Jurchen kingdom of Chin in 1211 (*see* MONGOL CONQUESTS OF THE 13TH CENTURY). These wars, waged in the interests of the *noion* class, wreaked havoc on the peoples of the subjugated countries, most of which had achieved a higher level of economic and cultural development than the Mongol tribes, and hampered the development of the Mongol empire itself and the broad masses of its people—the simple *arats* (herdsmen bound to the land). The wars exhausted the empire and led to its political, economic, and cultural decline by the end of the 13th century. Genghis Khan died in the Tangut state of Hsi Hsia during a campaign undertaken in 1226.

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N. TS. MUNKUEV [29–604–4]

GLOBULAR CLUSTER, a tightly packed group of stars that can be seen in a small section of the sky, consisting of stars that are close to one another in space and characterized by the spherical shape of the distribution of the stars. Two of the globular clusters closest to us, with a myriad of stars, are located in the constellations Hercules and Centaurus. (*See* STAR CLUSTER.) [29–866–4]

GNATHOSTOMATA, higher vertebrates having jaws, paired nostrils, and paired limbs. The Gnathostomata include fish, amphibians, reptiles, birds, and mammals. [29–157–1]

GOLDFINCH (*Carduelis carduelis*), a bird of the family Fringillidae of the order Passeriformes. The body length is 12 cm. The wings are black with a yellow stripe, and the crown is black or gray. There is a red ring around the beak. The goldfinch occurs in Europe, Western Asia, and Northwest Africa. In the USSR it is found from the western border east to the Enisei River. The goldfinch settles in deciduous groves, felled areas, and gardens. It nests in shrubs or trees. A clutch contains four to six eggs, which are incubated for 12 or 13 days by the female. The bird feeds on seeds of broad bean sorrel, burdock, thistle, and other weeds. The nestlings are fed insects. Goldfinches are frequently kept as pets. [29–1576–4]

GRINDING. (1) In metalworking, the machining of surfaces of workpieces with an abrasive tool. It is performed on grinding machines and other types of meal-cutting machine tools by means of special attachments (such as grinding heads), as well as by hand. A distinction is made between grinding in which the peripheral speed of the tool is approximately 20 m/sec and high-speed grinding, in which the peripheral speed is greater than 50 m/sec. Grinding makes it possible to fabricate metal parts having a precision of class 1 and a surface roughness of class 10. It is widely used to machine external and internal flat, cylindrical, conical, and irregularly shaped surfaces of workpieces made from metals, plastics, ceramics, ferrites, stone, and wood. Rough grinding is also used to some extent to remove large machining allowances from cast pig iron and steel workpieces.

The various types of grinding include external and internal cylindrical grinding, grinding with a planetary motion, external and internal centerless grinding, surface grinding, and grinding of special shapes.

Electrochemical grinding is used to work metals that are difficult to machine. Current-conducting grinding wheels are fed with a DC current, and an electrolyte is supplied to the cutting zone. Grinding can also be performed by means of vibration machining with an abrasive powder suspended in a liquid.

A carborundum abrasive tool is usually used to grind stone. The process may be accomplished by grinders or by hand.

(2) In groats production, grinding removes the germ and the outer parts of the kernel, thereby imparting a definite shape and uniformity to the crushed grains.

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A. A. SHISHKIN [29–1298–1]

GRINDING HEAD, an attachment that makes it possible to grind workpieces on metal-cutting machine tools. Located within the housing of a grinding head is a spindle running on roller or gas bearings with a grinding wheel attached to the front section; the rear section of the spindle is rotated by means of a belt drive from an electric or compressed-air motor or from a spindle of the machine tool. Grinding heads can be mounted on lathes for external and internal grinding, on standard planers and planer-type milling machines for grinding long surfaces, and on surface and internal grinding machines for grinding holes greater than 30 mm in diameter. [29–1295–3]

GRINDING MACHINE, in metalworking, a machine tool designed to remove material from workpieces by means of an abrasive tool. The first modern grinding machine (a universal cylindrical grinder) was built in 1874 in the USA. Initially, grinding machines operated with disks, or grinding wheels, made from solid pieces of natural abrasive rocks; stronger wheels of pulverized natural abrasives later came into use. The invention in 1893 of a method of making artificial abrasives (carborundum) substantially broadened the application of grinding machines.

According to the classification adopted for metalcutting machine tools, grinding machines are divided into cylindrical and internal grinding types (including centerless grinders and those with planetary motion), specialized grinders, surface grinders, and other types that operate with an abrasive tool (gear grinders and thread grinders belong to the gear-cutting and thread-cutting group of machines). The characteristics of the tool used impose some added requirements on design and structural materials: resistance to vibration, wear resistance, and the rapid removal of abrasive dust. The principal motion of a grinding machine (*see* METALCUTTING MACHINE TOOL) is the rotation of the abrasive tool at a velocity that is generally considerably higher than the feed rate and other motions.

Cylindrical grinding machines are the most common type. In such machines the workpiece is carried on centers or in a chuck (Figure 1,a) and rotated in a direction opposite to that of the grinding wheel; together with the table of the machine, the workpiece executes reciprocating motion. At the completion of every single (or double) traverse of the table, the grinding wheel is shifted transversely by an amount equal to the cutting depth (*see* MACHINING). External cylindrical and conical surfaces and the ends of workpieces are usually ground on cylindrical grinding machines. Infeed, or plunge, grinding is used to grind external cylindrical, conical, and irregularly shaped surfaces with a wide wheel (wider than the dimension of the workpiece); in this case there is no longitudinal feed.

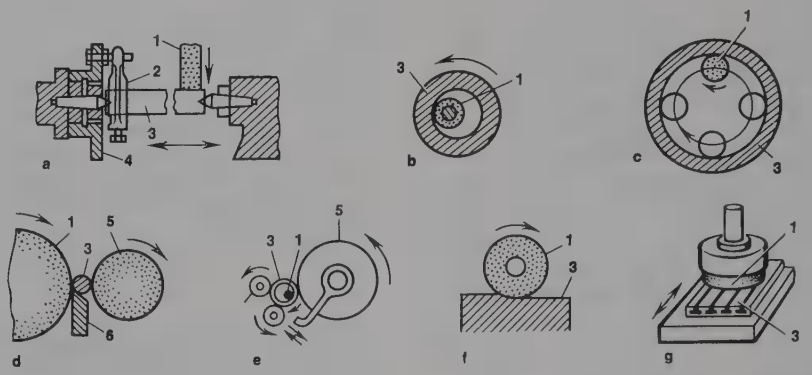

Figure 1. Diagrams of the operation of grinding machines: (a) cylindrical grinder, (b) internal grinder, (c) internal grinder with planetary motion, (d) centerless grinder, (e) centerless internal grinder, (f) surface grinder using the periphery of the wheel, (g) surface grinder using the end of the wheel; (1) grinding wheel, (2) clamp, (3) workpiece, (4) chuck, (5) regulating wheel, (6) workrest blade

Internal grinding machines are designed to grind internal surfaces of rotation. In the most common types the workpiece is rotated around the axis of the hole being ground while the grinding wheel rotates around its own axis (Figure 1,b); the wheel is moved both longitudinally and transversely. Internal grinding machines with planetary motion are used to machine holes in workpieces that are difficult to rotate. In such machines the grinding wheel simultaneously rotates around its own axis and around the axis of the hole being machined (Figure 1,c).

Centerless grinding machines are designed to grind external and internal cylindrical surfaces. When external surfaces are to be ground, the workpiece (or a series of workpieces placed end to end) is positioned between two wheels, one of which is for machining and the other for regulating (Figure 1,d), and is pressed against a workrest blade. As a result of the tilt of the regulating wheel, the frictional forces not only cause the workpiece to rotate but also to feed through. The regulating wheel is also fed transversely. When internal surfaces are to be ground, such as ball bearing races, the workpieces are supported between two pressure rolls and a regulating wheel (Figure 1,e) that rotates the workpiece. The grinding wheel is moved along and across the axis of the hole, if necessary, or only radially (for infeed grinding). Centerless grinding machines are less versatile than cylindrical grinders and internal grinding machines, but they are simpler in design.

Surface grinding machines are designed to machine the plane surfaces of workpieces with the periphery or the end of a grinding wheel. In machines that use the periphery of the wheel (Figure 1,f), the table and the workpiece mounted on it execute a reciprocating or rotary motion; the rotating grinding wheel is moved crosswise for each traverse or rotation of the table, and it is also shifted by an amount equal to the depth of the cut. In surface grinding machines that machine with the end of the wheel (Figure 1,g), unlike machines that use the wheel periphery, there is no transverse feed, because the diameter of the wheel is greater than the transverse dimension of the workpiece (infeed grinding).

Specialized grinding machines are usually designed to machine parts of some given shape, for example, crankshaft journals, parts of dies, templates, and splined parts. The workpieces are usually machined to a template (the forming method); the generating method is less often used.

The general group of grinding machines also includes lapping, polishing, microfinishing, tool-grinding, spline-grinding, honing, and other machines that use an abrasive tool.

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A. A. SHISHKIN and N. K. IAKUNIN [29–1296–2]

GROUND JOINT, a joint whose surfaces are ground to form a hermetic seal between glass, quartz, or metal parts. [29–1294–2]

HALIMODENDRON, a genus of small (0.5–2 m tall) deciduous thorny shrubs of the family Leguminosae. The leaves are bipinnate and compound; their stalks harden and turn into thorns. The corolla ranges in color from violet to almost white. The pods are usually obovate. *Halimodendron* are found mainly in saline soil. Drought-resistant ornamentals, they are suitable for landscape gardening, particularly in arid steppe and semidesert regions. The sole species, *H. halodendron*, occurs in Iran, Mongolia, and China. In the USSR it grows in the lowlands of the Don, eastern Transcaucasia, Western Siberia, and Middle Asia. [29–604–3]

HATCHED-WARE CULTURE, an archaeological culture of eastern Baltic tribes widespread during the early Iron Age (seventh century B.C. to fifth century A.D.) in central Byelorussia and eastern Lithuania.

Identified by A. N. Liavdanskii in the 1920's, the culture was named for the method of ornamenting modeled vessels with hatching. It arose on the basis of local cultures of the late Bronze Age and is known chiefly from ancient town sites. Early sites were poorly fortified, while later ones were surrounded by one or several earthen banks or ditches. Traces of iron-making were also discovered. Among the objects found were iron spearheads, axes, sickles, spurs, knives, and awls and bronze ornaments. No burials of the hatched-ware culture have been found. By the middle of the first millennium A.D., the population no longer lived in fortified towns but in unfortified settlements. The tribes of the culture engaged in slash-and-burn farming, stock raising, hunting, fishing, and gathering.

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V. B. PERKHAVKO [29–1496–2]

HATS, an 18th-century Swedish political party. Formed in the 1730's, it represented the interests of certain elements in the nobility and of some leading members of the bourgeoisie, especially those living in the capital. The party sought to revenge Sweden's defeat in the Northern War of 1700–21 and to restore the country's influence in foreign affairs and its military might through the rapid development of industry and a rapprochement with France.

The Hats came to power in 1738 after gaining a majority in the Riksdag and bringing down the government of A. Horn. Strong opposition to the party, however, arose as a result of Sweden's defeat in the war with Russia of 1741–43, which the Hats had instigated, and the inflation and financial collapse caused by the country's participation in the Seven Years' War of 1756–63. In 1765 the Hats, who had become increasingly identified as the party of the conservative nobility, were displaced from power by the party known as the Young Caps (*see* CAPS). From 1769 to 1771 the Hats again had a majority in the Riksdag. The palace revolution of 1772 led to the abolition of political parties, including the Hats. [29–1307–3]

HAYMARKET SQUARE RIOT OF 1886, a demonstration by workers in Chicago that took place May 1, 1886, under the ban-

ner of the struggle for an eight-hour workday. It involved participants in a strike by workers of industrial and commercial enterprises that had started that same day and that had totally paralyzed the business life of the city. Demonstrations and mass meetings also took place on the following days. On May 4, during a mass meeting at Haymarket Square, an anti-working class provocation occurred: a bomb thrown into a police detachment killed several policemen and workers. This event brought about the arrest of the workers' leaders, four of whom were later sentenced to death and were hanged on Nov. 11, 1887.

The Haymarket Square Riot of 1886 and the subsequent demonstrations and mass meetings of solidarity with its participants marked the awakening of the political consciousness of the US working class. In memory of the uprising, the Paris congress of the Second International in July 1889 passed a resolution to hold yearly demonstrations on May 1. In 1890, May Day was celebrated as an international workers' holiday for the first time.

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HÉBERT, JACQUES-RENÉ. Born Nov. 15, 1757, in Alençon; died Mar. 24, 1794, in Paris. Figure in the French Revolution; member of the political club known as the Cordeliers and a leader of the left Jacobins.

Hébert founded the newspaper *Le Père Duchesne* in 1790. It won popularity among the lower classes through its topicality and through Hébert's ability to sense the mood of the masses and to give the mood witty expression in simple language.

Hébert took part in the popular uprising of Aug. 10, 1792, and became deputy procurator of the Paris Commune in December of that year. He waged a bitter struggle against the Girondins. Under the Jacobin dictatorship he advocated the use of extreme methods of terror and took a leading role in carrying out the policy of dechristianization. Hébert fought to purge the National Convention first of the Girondins and the Marais and then of the right-wing Jacobins. He was among those who instigated the arrest of the Enragés, although he supported the Enragés' demand for a ceiling on prices.

In March 1794, Hébert and his supporters—the Hébertists—began agitating against the Jacobin government. After calling for a popular uprising, Hébert and the other Hébertists were arrested, tried by the Revolutionary Tribunal, and guillotined. [29–1629–2]

HÉBERTISTS, during the French Revolution, a left Jacobin faction that took its name from J.-R. Hébert, one of its leaders. The Hébertists, who included A. F. Momoro, F. N. Vincent, and C. Ronsin, were tried as a group in the spring of 1794.

The faction formed during the winter of 1793–94 and, in large measure, reflected the social discontent of the poorer elements of the working people. The Hébertists advocated an intensification of revolutionary terror. They demanded strict observance of the Law of the Maximum and called for relentless struggle against speculation and sabotage by large-scale landowners and well-to-do peasants. They supported the policy of dechristianization and sought to expel G. J. Danton's right-wing Jacobins from the National Convention and the ministries.

Demanding greater severity in the reign of terror against speculators and enemies of the revolution, the Hébertists threatened in March 1794 to lead a revolt against the Committee of Public Safety. They hoped to purge the government of moderates, but they received no support from the Paris Commune or the revolutionary masses. Arrested by the government on March 14, the Hébertists were tried by the Revolutionary Tribunal and, on March 24, guillotined. [29–1630–5]

HELMET, a form of protective headgear. Helmets made of wood, birch bark, plaited twigs, and leather appeared in prehistoric times, and others decorated with feathers and carvings have been described by ethnographers. Ancient helmets made of copper and gold have been found in the royal tombs of Ur and date from the third millennium B.C. When there was a shortage of metal in ancient Egypt, warriors wore small, round, leather or linen caps that were sometimes reinforced with metal plates. Low copper helmets were worn in Babylonia, and a conoidal helmet better than any other existing helmet for deflecting blows was developed in Assyria. The bronze and iron helmets of the Greeks had high crests, and iron helmets were used in ancient Rome. The hemispherical metal helmets commonly used in Western Europe during the early Middle Ages were replaced in the tenth century by conical helmets; one of the ancient Russian helmets found at the Gnezdovo burial mounds is an example of the latter type.

Helmets with a beaver that covered the face appeared in the 13th century in Western Europe. Spherical, visored sallets with a beaver and helmets that covered the entire head were typical of the 14th through 16th centuries. Excavations of such sites as the Gnezdovo burial mounds and the Chernaia Mogila indicate that the basic Russian helmet from the tenth century through the 17th was a pointed, conoidal helmet (*shishak*), camailed to protect the neck and shoulders. The ancient Russian helmets used before the Mongol conquests had nasals as well as masks that covered the entire face.

Some Russian helmets—for example, the helmet of Prince Iaroslav Vsevolodovich, found at the site of the battle of Lipetsk—bore embossed images. Richly decorated helmets of the 13th through 17th centuries were preserved in the Armory of the Kremlin. Hemispherical helmets with a neckguard, earpieces, a visor, and a nasal were widely used by cavalrymen of Eastern and Central Europe during the 1500's. A low, flat helmet (in Russian, *misiurka*) was also used.

After the 17th century, helmets became lighter. Sometimes decorated with crests and plumes, they were called casques. The shape of the *budenovka*, the headgear worn by members of the Red Army, derives from the Russian pointed helmet. Steel helmets—called *kaski* in the Soviet Army until 1939—were introduced in World War I. Since the early 1900's, the special protective headgear worn by pilots, tank crews, and skiers have also been called helmets.

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HELMET, COMMUNICATIONS, headgear in the form of a helmet and equipped with an electroacoustical headset consisting of two earphones and either a microphone with a low sensitivity to ambient noise or two laryngophones. Communications helmets are intended for personnel who work under very noisy conditions, for example, in airplanes or tanks.

The helmet, which is made of fabric or leather and is lined with acoustic insulation, covers the entire head except the face. When laryngophones are used, the helmet also covers the neck. The earphones are snugly fitted into acoustically insulating pads sewn into the helmet; the edges of the pads are pressed against the head around the ears. The microphone is in a special holder near a corner of the mouth. The laryngophones, which are usually employed at noise levels exceeding 120 decibels, are fastened to the neck at the larynx. The headset is connected to equipment for intercommunication, outside communication, or both. [29–1287–1]

HERBERT, EDWARD (First Baron Herbert of Cherbury). Born Mar. 3, 1583, in Eyton-on-Severn, Wales; died Aug. 20, 1648, in London. English philosopher, poet, and political figure.

Herbert served as British ambassador to France between 1619 and 1624. During the Civil War he was an adherent of the parliamentary opposition. Herbert was the founder of English deism in the form of natural religion, the source of which he considered to lie not in discovery, but in the innate principle of reason. Herbert summed up the basic principles of natural religion in the following five points: there is a god; he must be worshipped; the best way to worship is through virtue and piety; crimes and transgressions must be atoned for through repentance; there are rewards and punishments in a life beyond the grave. Herbert's moderate deism met with a sharp reaction from theologians. Herbert's doctrine of cognition is based on his acknowledgement of innate ideas. Herbert's views were criticized by J. Locke and P. Gassendi.

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B. E. BYKHOVSKII [29–178–1]

HEREDITARY FEUDAL LEASE, in feudal law, the standards formulated in Europe in the 13th and 14th centuries to govern a specific type of land tenancy by peasants and mountaineers. The lease was similar to the emphyteusis in Roman law. It secured for a family the use of a piece of land from generation to generation; the tenant was required to pay the feudal lord a fixed quitrent, usually rendered in cash rather than in kind. This quitrent was known as *czynsz* in Polish, *Zins* in German, *cens* in French, and census in English.

In Western Europe, the use of the hereditary feudal lease spread as the *corvée* system of peasant exploitation declined; the *corvée* system became unprofitable for feudal lords as a result of the development of commodity-money relations. In Central and Eastern Europe, the use of the hereditary feudal lease was sharply restricted in the 16th and 17th centuries by the second promulgation of serfdom. In Russia, the lease, which was known as *chinshevoe pravo*, was used only in limited areas, including the Polish and Lithuanian lands and certain southwestern provinces.

[29–612–4]

HERRINGBONE GEAR, a spur gear with V-shaped helical teeth. The mutual inclination of the tooth segments on opposite sides compensates the axial thrust produced by single helical gears. Herringbone gears afford smooth operation and increased load-carrying capacity, which are characteristic of helical gear transmissions in general. They are used in medium-size and large transmissions, including special transmissions operating at pitch-circle velocities up to 200 m/sec (turbine reduction gears).

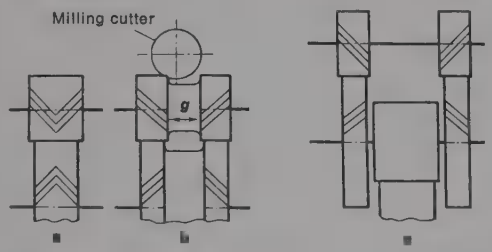

Figure 1. Herringbone gears: (a) continuous-tooth type, (b) double helical gears, (c) two pairs of gears

Continuous-tooth herringbone gears (Figure 1,a) require special equipment to machine the teeth. Double helical, or conventional herringbone, gears (Figure 1,b) have a gap, or groove, where the two sets of teeth meet; they may be made on ordinary gear-hobbing machines, but the width of the gear wheel must be increased by the width of the groove *g*. Transmission through two pairs of helical gears with opposed teeth (Figure 1,c) enables the space between the gears to be used for another transmission.

[29–1070–1]

HEURISTIC. (1) Heuristic methods of solving problems are usually contrasted to formal methods of solution, which are based on exact mathematical models. Heuristic methods, or heuristics, require less time than do methods involving an exhaustive, undirected search of all possible alternatives. Solutions obtained by heuristic methods are generally not optimal; they merely belong to the set of permissible solutions. The employment of heuristic methods does not always lead to the achievement of the goal set. In psychological and cybernetic literature, the term "heuristic" is sometimes applied to any method aimed at reducing the checking of alternatives or to inductive methods of problem solving.

(2) With respect to the organization of the process of productive creative thought, the term "heuristic" is sometimes applied to the mechanisms innate in man by means of which procedures for the solution of problems are engendered. Examples are mechanisms used to establish relations between elements of a problem situation, to eliminate unpromising approaches, and to form refutations with counterexamples. Such mechanisms, which in their aggregate define the metatheory of the solution of problems involving creative thought, are universal in character and independent of the specific problem being solved.

(3) Heuristic programming is a special method of programming for computers. In ordinary programming the programmer expresses a prepared mathematical method of solution in a form comprehensible to the computer. In heuristic programming, however, he attempts to formalize the intuitively understood method of problem solving that he believes a human being would use in solving problems similar to the one at hand. Like heuristic methods, heuristic programs do not necessarily ensure that the goal set will be attained or that the result will be optimal.

(4) The branch of the science of thought that studies heuristic mechanisms or procedures is known as heuristic. Its main subject is creative activity (*see* CREATIVITY), and its principal problems involve models for decision-making in nonstandard problem situations, for seeking that which is new to a person or society, and for structuring descriptions of the external world through classifications like the periodic table of the elements or C. Linnaeus' system for plants and animals. The science of heuristic draws on psychology, the theory of artificial intelligence, structural linguistics, and information theory.

(5) The term "heuristic" is sometimes applied, particularly in the Soviet literature, to a special method of teaching (Socratic method) or of group solution of problems. Heuristic teaching, in this sense, consists in asking the students leading questions and providing the students with suggestive examples. This method of instruction dates back to Socrates. In the group method of solving difficult problems known as brainstorming, creative thought is stimulated through freewheeling discussion. When a group member suggests an idea for a solution, the other members supply leading questions, examples, and counterexamples.

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D. A. POSPELOV [29–1664–5]

HEXABIBLOS OF HARMENOPULUS, a private codification of Byzantine law, compiled by the supreme judge of Thessalonica, C. Harmenopulus, circa 1345. The *Hexabiblos* was the last important monument of Byzantine law; it drew on previous codifications, such as the Digest and the nomocanons. The *Hexabiblos* of Harmenopulus was widely used in Greece during the period of Turkish supremacy (since the Greeks retained special jurisdiction) and after the liberation of the country. The codification was also widely used in Bessarabia. It was divided into six books, each of which dealt with a given topic—legal procedure, real law, liability, inheritance, laws relating to marriage, and criminal law.

[29–1157–2]

HEXACTINELLIDA (or Hyalospongia), a class of sponges. Hexactinellida are predominantly solitary, typically oceanic organisms, usually occurring at depths of more than 100 m, down to the hadal (or ultra-abyssal) zone. The body is saclike, tubular, goblet-shaped, or barrel-shaped, up to 2 meters in height. The

skeleton consists of six-rayed siliceous spicules. The rays lie in three mutually perpendicular planes; in some of the needles, one or more rays are reduced. The canals that thread through the body wall (the canal system) are of the simple leuconoid type.

The class comprises about 500 species, 34 of which are found in the USSR—six in northern seas and 28 in Far Eastern seas. The most common are representatives of the genera *Hyalonema, Aphrocallistes, Schaudinnia, Aulosaccus, Acanthascus*, and *Caulophacus*.

The skeletons of some Hexactinellida are used for decorative purposes.

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V. M. KOLTUN [29–1157–3]

HINGE LINE, a line connecting the points of maximum bending of the strata in a fold. If a series of strata is compressed into a

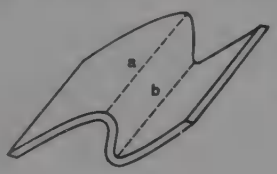

Figure 1. Hinge lines: (a) the hinge line of an anticline, (b) the hinge line of a syncline

fold, each stratum has its own hinge line, and the plane that passes through the corresponding series of hinge lines is called the axial surface of the fold. [29–862–4]

HOBBY (*Falco subbuteo*), a predatory bird of the family Falconidae. The body length is 33 to 35 cm. The upper parts are black with a blue sheen, and the underparts, light with dark markings. The hobby is distributed in Europe, Asia, and North Africa; in the USSR it is found in the forest and forest-steppe zones and in the mountains of the Caucasus and Middle Asia. A migratory bird, it winters in southern Africa and Asia. In the spring it arrives no earlier than late April. It nests in trees in the abandoned nests of crows and other birds. The clutch contains two to four, sometimes five or six, eggs, which are incubated for 28 days. The hobby catches its prey in flight, attaining speeds of up to 150 km/hr. The diet includes small birds and insects, such as dragonflies and beetles. The hobby was formerly used as a hunting bird.

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HODGSON'S HAWK CUCKOO (*Hierococcyx fugax*), a bird of the suborder Cuculiformes. The Hodgson's hawk cuckoo measures about 30 cm in length. It is distributed in Southeast Asia and in the USSR, where it is found in the forests of southern Primor'e. (*See* CUCKOO.) [29–1228–7]

HOHENSTAUFEN (also Staufen), a dynasty of German kings and Holy Roman emperors (1138–1254); a Swabian princely family that ruled the duchy of Swabia (1079–1268).

The Hohenstaufens took their name from their ancestral castle of Staufen in Swabia. The Hohenstaufen kings and emperors were Conrad III (1138–52), Frederick I Barbarossa (1152–90), Henry VI (1190–97), Philip of Swabia (1198–1208), Frederick II (1212–50), and Conrad IV (1250–54). The dynasty's prolonged struggle against the Welfs (Guelphs) began during the reign of Conrad III. Under Henry the dynasty took control of the Kingdom of Sicily.

The last Hohenstaufens were Manfred, who reigned as king of Sicily (1258–66), and Conrad IV's son Conradin (died 1268); both perished in battles against Charles I of Anjou, who had come to southern Italy at the request of the Hohenstaufens' enemy the pope. [29–1461–1]

HONOR AND DIGNITY, LEGAL PROTECTION OF, a personal, nonproperty, inalienable right safeguarding the recognition by a person of his social significance and the recognition by society of the individual's significance.

The right of the citizens of the USSR to protection by the courts against encroachments on their honor and dignity is guaranteed by Article 57 of the 1977 Constitution of the USSR. Honor and dignity are also protected by civil and criminal legislation (*see* DEFAMATION and INSULT). Citizens or organizations have the right to demand in court the retraction of statements damaging to their honor or dignity unless the person who has spread the statements shows that they are truthful. Article 7 of the Basic Principles of Civil Legislation of 1961 and the corresponding articles of the civil codes of the Union republics protect the honor and dignity of a person in cases where defamatory statements are spread innocently—that is, where the person responsible for the statements believes them to be true. The essential distinction between protection of honor and dignity under criminal and under civil legislation rests on the difference between slander and the innocent spreading of defamatory statements.

Defamatory statements may be spread in oral or written form: they may be spoken to one or more individuals or to a group of people, or they may be printed in published or other written works. If the statements appear in the press and are not truthful, they must be retracted in the press. In other cases, the procedure for retracting the statements is established by the court; for example, oral statements may be retracted at a trade union meeting, and written ones, in a wall newspaper. If the retraction is not made in accordance with the judicial decision, the court has the right to impose a fine on the violator; payment of the fine does not release the violator from the obligation to fulfill the decision of the court (Code of Civil Procedure of the RSFSR, art. 406). The money from the fine is added to the state's income. Soviet legislation does not provide for any compensation of a monetary character for personal injury (*see* PERSONAL INJURY).

Cases dealing with the protection of honor and dignity may be heard by people's courts and comrades' courts. The statute of limitations for claims does not apply to demands for the retraction of defamatory statements. [29–345–1]

HOROLOGIUM (the Clock), a constellation of the southern hemisphere; its brightest star has a visual stellar magnitude of 3.9. The constellation is most easily viewed in November; it is partly visible from the southern regions of the USSR. (*See* STELLAR SKY.) [29–103–1]

HOSIERY, a category of knitwear including knitted socks, full-length stockings, panty hose, footgloves, and other articles. The range of hosiery may be classified by consumer type (women's, men's, children's, athletic), material (plain polyamide, elastic, cotton, wool, mixed), and knit structure (plain, stretch, reversible, knitted plush, ravel-resistant), as well as by the manner of manufacture, the trim, and other factors.

Hosiery is usually made on hosiery machines. In order to increase the durability of items made of cotton or wool yarns, the heel and toe are reinforced with another yarn, usually of polyamide. The upper edge of socks and half-length stockings is usually knitted with an additional elastic or spandex-type yarn, which makes the cuff resilient and able to stretch. A tucked knit is used in knitting articles made from plain polyamide yarn in order to reduce raveling. Panty hose are usually made by sewing together two long stockings; a gusset is sewn in to increase the dimensions in the torso, and an elastic waistband is attached. Panty hose made from elastic yarn may also be manufactured without sewing.

Hosiery sizes are measured by the length of the foot in centimeters; there are two subsizes for the length of the sock or stocking. I. I. SHALOV [29–758–1]

HOSIERY MACHINE, a knitting machine for manufacturing hosiery. Circular knitting machines are the most common type, producing approximately 95 percent of all hosiery made. They are characterized by continuous loop formation and the absence of high alternating loads.

Circular knitting machines are used to knit all types of hosiery. The raw materials used are chiefly polyamide and cotton yarns. Machines of this type have internal specialization for various types of finished products. Women's socks are usually made on single-cylinder (single-knit) machines with two, four, or eight loop-forming systems. The primary working elements are latch needles, housed in grooves along the periphery of a needle cylinder, and sinkers set in radial grooves of a ring around the upper edge of the cylinder. The motion of the needles and sinkers along the grooves of the rotating cylinder is imparted by fixed cams that act on the base of the needles and the sinkers. The interaction of the needles and sinkers with the yarn, which is fed to the needles from bobbins through a yarn guide, forms the loops. The sock is drawn through the inside of the needle cylinder by a current of air from a special fan. The finished sock is then tossed into a bin. The toes are usually sewn on special sewing machines (linking or serging types). The newest automatic circular hosiery machines complete the sock with a closed toe.

Patterned full-length stockings are knit on single-cylinder hosiery machines equipped with a pattern mechanism. Three- and four-system machines can knit stockings in three and four colors, respectively. Two-cylinder (double-knit) automatic circular machines are used chiefly to make children's socks and all types of full-length stockings. Their main distinction is that they knit articles with high extensibility (ribbed fabrics). The primary working element of such machines is a two-headed latch needle that can be automatically shifted from the lower needle cylinder to the upper and back again. This type of needle motion is used to switch to ribbed (double-face) or reversible knit structures.

Technical specifications for hosiery machines include the diameter of the needle cylinder (2.5–4.5 inches), the number of needles in the cylinder (40–480), the gauge (measured by the number of needles to 1 inch of the cylinder circumference), the number of loop-forming systems (from one to 12), and the presence of special mechanisms. The productivity of hosiery machines varies greatly, depending on the type of article and the type of machine. The time it takes to knit a woman's sock varies from 1 to 4 min; full-length stockings require from 0.5 to 4 min.

Small quantities of hosiery are manufactured on flat knitting machines and sometimes on ribbers and circular warp-knitting machines.

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I. I. SHALOV [29–757–3]

HULLING MILL, a machine for hulling (removing the shell from the kernel) rice and oats for the production of groats. The principal working member consists of two horizontal millstones; the lower turns on a vertical axis, and the upper is fixed. The working surfaces of the millstones are coated with an abrasive. Grains are loaded into the gap between the millstones, where they are compressed and subjected to friction, which frees the kernels from the shells. The intensity of hulling depends mainly on the clearance between the millstones, which is regulated by a special lifting device. Hulling mills with millstones 1.25 m in diameter can process from 0.33 to 0.5 kg of grain per sec, depending on the type of grain. (*See* GROATS PRODUCTION.) [29–1118–2]

HUMAN FACTORS, in technology, the characteristics of a human being or a group of people and of a machine or a technical system that are manifested under specific conditions of interaction in a man-machine system, whose operation is governed by the performance of a specific task. Human factors are related primarily to the aspect of the man-machine interaction that is specified by human activity. The correct combination of human abilities and machine capabilities substantially improves the effectiveness of a man-machine system and leads to the optimum utilization by man of technical means for their intended purpose.

The consideration of human factors is an integral part of the design, development, and use of machines and technical systems and is a necessary condition for raising the productivity of labor and the quality of production. Such consideration is most complete in the designing of the human activity in man-machine systems. The designing of a specific type of activity entails the study of man's internal means of activity—for example, his experience, knowledge, skills, perceptions, thoughts, and memory—and the coordination of the internal means with such external means as documents, algorithms, tools, and manual controls in accordance with the basic operational task of the system that is devised. The design that is developed is used to formulate the requirements for the system's machine component, which man uses to carry out the specific type of activity.

A distinction is made between the concepts of human factors and the personal factor. In contrast to human factors, the personal factor, which was introduced in connection with the study of human errors involved in industrial and transportation accidents, includes the individual characteristics of a man irrespective of the characteristics of the technical means with which the man interacts. The concept of human factors is relatively new; it arose in connection with the study and design of man-machine systems as a functional whole (*see* SYSTEMS ENGINEERING and SYSTEMS APPROACH).

One of the first attempts in the USSR to shed light on the concept of human factors was undertaken in 1930 by the Soviet scientist N. M. Dobrotvorskii. However, the term "human factors" was later introduced into Russian as a result of the translation and shortening of the expression "human-factors engineering," which is used in the USA to denote both a branch of knowledge and the process of designing man-machine systems with the goal of ensuring effective, reliable, and safe human activity, whether by one person or by a group of people.

In the USA, the Human Factors Society was founded in 1957, and the journal *Human Factors* was first published in 1958. In European countries, including the USSR, the term "ergonomics" is used to denote the specific field of knowledge and the area of professional activity that are analogous to what is called human factors in the USA. (*See* ENGINEERING PSYCHOLOGY and MAN-MACHINE SYSTEM.)

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[29–150–2]

HUMAN RELATIONS THEORY, a concept regarding the principles and goals of management in organizations, especially in industry, that developed in bourgeois social science. The theory arose in the 1920's in the USA as the attitudinal and methodological basis of the industrial sociology of labor. Its leading advocates were F. J. Roethlisberger, W. E. Moore, and E. Mayo in the USA and G. Friedmann in France.

Human relations theory developed as a response to Taylorism. Rejecting the biological and mechanistic approaches of F. W. Taylor's "scientific management," the human relations theory proposed the implementation of methods of dealing with workers as sociopsychological beings. As the basis of its new methods of intensifying and increasing labor productivity, the human relations theory proposed that human psychological and moral qualities—such as goals, motivation, and values—be taken into account. The use of empirical data on worker satisfaction with labor and the influence of collective demands and of the psychological climate in work groups on labor productivity spurred attempts to develop a program to harmonize the relations of different groups and individuals in order to bring about maximum efficiency in the operation of the organization as a whole. The program took into account requirements arising from modern technological progress. New technology and the automation and mechanization of production processes placed in the forefront the task of training workers capable of continual improvement of work habits. Moreover, it was determined that sweatshop methods of increasing worker productivity were ineffective. The practical needs of capitalist production encouraged the study of important problems within the framework of the human rela-

tions theory; such problems included factors fostering a positive or negative attitude toward labor and the influence of the work group on the individual; the effectiveness of forms and methods of supervision; and the improvement of conditions for work, relaxation, and leisure.

The term "human relations theory" reflects an attempt by bourgeois ideologists to pass off a program of measures as the humanization of labor that are of practical value for increasing profits. In fact, the human relations theory attempts to conceal or rationalize the profound social conflicts of capitalist society.

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N. V. NOVIKOV [29–151–1]

HYMENOMYCETES (also Macromycetes), a group of higher fungi that usually have large fleshy fruiting bodies most often consisting of a cap and stalk. Most belong to the class Basidiomycetes (for example, *Boletus edulis, Snillus luteus, Lactarius piperatus, Russula vesca, Armillariella mellea*, and *Amanita muscaria*). Some belong to the class Ascomycetes (for example, *Morchella esculenta, Gyromitra esculenta*, and *Tuber melanosporum*). Sometimes only basidiomycetous mushrooms of the order Agaricales are referred to as Hymenomycetes. [29–1308–1]

ICE CHUTE, FRAZIL, a device that makes possible the passage of frazil ice through or around a hydroengineering complex, from the upper pond to the lower pond or from the canal. An ice chute usually consists of an ice receptacle installed cross-current, often in the shape of a trough, which intercepts the top layer of water containing the floating frazil ice, and an outlet, which directs the frazil ice to the lower pool or out of the canal. Frazil ice may also be removed through the spillways of a dam or the drop valves in the gates. Also used are ice-chute designs based on the use of specially created eddy craters in the hydroengineering complex' upper pool that carry the frazil ice down to outlets at the bottom. [29–1521–4]

IDEHAN MARZUQ (also Murzuq Sand Sea), a sandy desert in southwestern Libya. Idehan Marzuq is situated in a depression bordered by outlying massifs 450–500 m in elevation. It occupies an area of approximately 200,000 sq km. In the north and northwest there are dunes up to 300 m in height, which are devoid of vegetation. Annual precipitation is approximately 10 mm. Oases with date palms are found along the northern and eastern borders. [29–1679–5]

IDEHAN UBARI (also Ubari Sand Sea), a sandy desert in Libya, located at an elevation of 400–500 m. The relief mainly features ridges, although isolated dunes with a relative height of up to 200 m are found. Annual precipitation is approximately 10 mm. The desert is almost devoid of vegetation. The depressions have salt marshes and lakes, from which soda and salt are mined. There is nomadic animal breeding. Around the borders of the deserts there are small oases with groves of date palms. [29–1679–6]

IJMUIDEN, a city and port in The Netherlands, in the province of North Holland; situated on the North Sea. IJmuiden is the outer port of Amsterdam, with which it is connected by the North Sea (Amsterdam) Canal. It is part of the Amsterdam conurbation. IJmuiden is a center for ferrous metallurgy and has enterprises of the chemical and cement industries. [29–1719–1]

IJSSEL, a river in The Netherlands. The IJssel, a right branch of the Rhine, originates near the city of Arnhem. It measures 123 km in length. The river empties into the IJsselmeer, the southern part of the Zuider Zee, after flowing through a plain in an embanked channel. The mean flow rate is approximately 280 cu m per sec, and the maximum flow rate is approximately 2,000 cu m per sec. In the winter the water level rises 4–7 m. The IJssel is navigable for its entire length. A network of canals connects it with the northern and eastern parts of the country. The cities of Deventer and Zwolle are located in the valley of the IJssel. [29–1729–5]

ILTUTMISH, SHAMS AL-DIN. Ruler of the Sultanate of Delhi (1211–36). Member of the Ghulam (Slave) dynasty.

Of Turkic origin, Iltutmish was a *ghulam* (slave) of Qutb al-Din Aibak, who founded the Sultanate of Delhi; he later became a *mukta* (governor) of several districts. He annexed the Punjab and Sind to the sultanate and successfully warred against the Indian princes. In 1229 he was recognized as an independent ruler (sultan) by the Baghdad Caliphate. Under Iltutmish, large religious structures were built in Delhi. [29–829–2]

IMBRICATE STRUCTURE, a tectonic structure characterized by relatively thin and elongated rock sheets that overlap one another. The thickness of the rock sheets ranges from a few meters to a few hundred meters. Imbricate structures are usually found in series, forming groups of closely spaced folds, low-angle thrust faults, or fault-folds. In folded regions, they form imbricated fault zones. The amplitude of displacement may reach several kilometers but is usually not greater than a few hundred meters. [29–531–1]

INK SAC, an organ in most cephalopods, for example, octopuses, cuttlefish, and squids, in which a fluid is formed containing granules of a black pigment of the melanin group.

The ink sac, which serves a protective function, consists of a glandular portion and a reservoir, which opens into the rectum through a duct. Old cells of the glandular portion are gradually destroyed, dissolve in the secretions of the gland, and accumulate in the reservoir. When threatened, the mollusk ejects the contents of the reservoir, creating a dark cloud in the water that serves as a smokescreen to hide the mollusk. The coloring capacity of the inky liquid is unusually high; for example, the cuttlefish can color the water of a tank holding up to 5,500 liters in 5 seconds. A dye, natural sepia, has been obtained from the dried contents of the ink sac treated with potassium hydroxide. [29–250–4]

INTERLACED SCANNING, a method of television scanning in which the transmitted image on the target of the television camera tube and the television frame on the screen of the picture tube are produced by a single scanning of two frame fields; the odd lines are scanned and reproduced for the first field, and the even lines, which are positioned in the spaces between the lines of the first field, make up the second field. When scanning of the second field has been completed, the beam is returned to the point where the scanning of the first field begins.

Interlaced scanning is used in television systems with an odd number of scanning lines z because only in this case is there a nonintegral number of lines $z/2$ in each field, so that the beginning of scannings of the first and second fields (and, as a result, the television rasters of these fields) are displaced along the vertical by half the displacement of adjacent lines in a field. It permits a 2:1 reduction in the frame frequency needed for line scanning (since the flicker frequency of the images on the screen is equal to the field frequency) and thereby reduces by half the upper frequency limit of the television signal spectrum.

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See references under TELEVISION.

N. G. DERIUGIN [29–219–1]

INVOLUTE GEARING, a gear tooth system in which the tooth contours are described by the involute of a circle, known as the base circle.

Figure 1 shows the involute tooth system of a gear train. The tooth contour of gear wheel 1 is described by the involute I_1 of the base circle with the radius r_1, and the tooth contour of gear wheel 2 is described by the involute I_2 of the base circle with the radius r_2. The involutes I_1 and I_2 are tangent at the point C. Ac-

cording to the conditions for the construction of an involute, the normal to involute I_1 at the point C must be tangent to the base circle with the radius r_1 and the normal to involute I_2 must be tangent to the base circle with the radius r_2. From this it follows that in an involute tooth system the common normal to the contiguous contours of the teeth always coincides with the common tangent

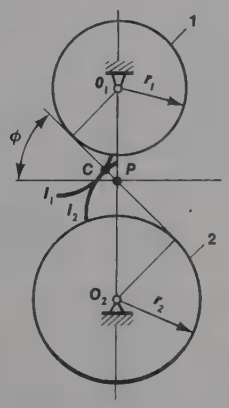

Figure 1. Involute gearing: (1) and (2) gear wheels

to the base circles. This tangent is known as the line of action because the point of contact between the teeth moves along the line as the gear wheels move. The point P where the line of action intersects the line of centers O_1O_2 is called the pitch point, and the angle made by the line of action with the perpendicular to the line of centers is the pressure angle ϕ. The gear ratio m_G, that is, the ratio of the angular velocities of gear wheels 1 and 2, is given for involute gearing by $m_G = O_2P/O_1P = r_2/r_1$. It is therefore evident that with involute gearing a change in the center distance does not affect the gear ratio but only the pressure angle. Involute gears are the most common type in use.

N. I. LEVITSKII [29–1653–2]

INVOLUTE-PROFILE-MEASURING INSTRUMENT, an instrument designed to measure the contours of involute gear teeth in a section perpendicular to the axis of the gear wheel. It functions by comparing an involute generated by the instrument with the actual involute of the tooth profile. Depending on the design of the mechanism for generating the involute, such gauges are classified as individual (disk) and universal types. In a disk-type instrument, the comparison curves are reproduced by means of interchangeable disks having diameters equal to those of the base circles of the gear wheels being checked. In universal instruments the curves are reproduced by a special device that is adjusted for the different radii of the base circles. Among the most popular of the latter type are instruments in which the generating mechanism contains a disk of fixed diameter and a lever-band linkage or a mechanism having a fixed involute template and a lever linkage. The disk-type instruments are the most accurate.

Involute-profile-measuring instruments are made in several standard sizes for measuring tooth contours of both internal and external gear wheels having base circle diameters usually between 40 and 1,250 mm. They are usually provided with an auxiliary device for measuring the helix of helical gear wheels (*see* WORM GAGE) that moves the measuring point of the indicating mechanism along the axis of the gear wheel being measured as the wheel turns. Measurements are usually obtained by means of a recorder.

A promising advance in the development of involute-profile-measuring instruments is a system that uses pulses from a transducer and a miniature computer. In a number of such instruments the gear wheel being measured is rotated and the measuring point is shifted so that pulses that are proportional to the angle of rotation of the gear wheel and to the linear movement of the point arrive simultaneously at the computer. The data are compared in the computer with theoretical values previously supplied. In other versions the theoretical angles and the linear movements of the gear wheel and measuring point are provided by the computer, and the indicating device gives the deviation of the actual contour from the theoretical values.

N. N. MARKOV [29–1653–3]

IRON AND STEEL MONOPOLIES. Ferrous metallurgy in the capitalist countries is characterized by a high degree of concentration and monopolization of production. The five largest monopolies account for approximately one-fourth of the capitalist world's steel production.

Until the 1960's, the level of concentration and monopolization of production in the US iron and steel industry was significantly higher than in Western Europe and Japan, where a rapid procession of mergers and take-overs in the industry took place in the 1960's. In the Federal Republic of Germany (FRG), the steel firms August Thyssen-Hütte AG, Krupp, and Hoesch-Werke AG increased their economic power by absorbing several companies. Thus, in 1973, August Thyssen-Hütte AG, after having absorbed the firm of Rheinstahl AG, controlled more than 30 percent of the steel production capacity of the FRG. Japanese iron and steel companies, which had rapidly introduced and improved advanced foreign technology and which used modern methods for the intensification of labor, occupied a leading position in world steel production by the early 1970's. In 1970, the firm Nippon Steel became the largest capitalist steel producer through the merger of the two leading Japanese monopolies, Yawata Iron and Steel and Fuji Iron and Steel. Upon the nationalization of the iron and steel industry in Great Britain in 1967, 14 private companies were combined into one state firm, British Steel Corporation, which almost completely monopolized the country's smelting of pig iron and steel. In France, the firm of Usinor absorbed Lorraine Escaut in 1966 and became the industry's leading firm in that country, accounting for one-third of French steel production. In 1975 the ten largest iron and steel monopolies included four Japanese, two American, one British, one West German, one Italian, and one Dutch–West German firm (see Table 1).

The iron and steel monopolies of the USA and the countries of Western Europe embrace a network of integrated facilities. They mine or participate in the mining of iron ore, coal, and limestone. Most Japanese companies use imported ore, scrap, and coal. The monopolies produce pig iron, steel, ferroalloys, high-quality steels, rolled products, pipe, steel structures, and semifinished

Table 1. The largest iron and steel monopolies in the capitalist countries
(1975)

	Year founded	Steel production (million tons)	Employees (thousands)	Assets (billion dollars)	Sales volume (billion dollars)	Net profit (billion dollars)
Nippon Steel (Japan)	1970	32.5	98	9.5	8.8	0.1
United States Steel (USA)	1901	24.0	173	8.1	8.2	0.6
British Steel (Great Britain)	1967	17.2	223	6.3	5.3	0.2
Bethlehem Steel (USA)	1904	15.9	113	4.6	5.0	0.2
Nippon Kokan (Japan)	1912	14.7	43	5.8	4.2	0.04
Sumitomo Metal Industries (Japan)	1897	13.4	44	5.6	4.2	0.05
Kawasaki Steel (Japan)	1906	13.4	44	5.5	3.8	0.03
August Thyssen-Hütte (FRG)	1871	12.2	141	4.9	8.8	0.1
Finsider (Italy)	1937	11.4	52	5.7	2.7	−0.1
ESTEL (Netherlands–FRG)	1972	9.6	75	3.8	3.3	−0.08

and finished steel products, as well as refractory materials, rollers, and oxygen. They control large machine-building and shipbuilding enterprises and have large transport fleets and an extensive network of marketing branches covering most capitalist countries.

Until World War II, iron and steel monopolies formed the basis of the military-industrial strength of the imperialist countries. From the 1950's to the 1970's, their importance in the production of military hardware diminished somewhat, and they lost their position to aerospace and electronics monopolies. However, the production of military products (special steels and alloys, armored vehicle and tank bodies, gun barrels, and warships) continues to play an important role in their production programs. The major form of foreign economic expansion of iron and steel monopolies is the export of products, which accounts for approximately 30 percent of the total sales volume of most large firms. Iron and steel production is concentrated at domestic plants; mining facilities supplying ore and minerals are mainly located abroad. However, in the 1960's iron- and steel-producing companies increased their capital export to foreign processing and other metallurgical enterprises. The trend was accelerated in the 1970's as a result of increased production costs and the high cost of environmental protection measures, especially in Western European countries. For example, steel monopolies in the FRG are rushing construction of industrial complexes in Brazil.

The iron and steel monopolies are linked by many cartel agreements; examples are the European Coal and Steel Community (ECSC) and the International Iron and Steel Institute (IISI) in Brussels. Iron and steel monopolies are components of the major financial monopoly groups. At the same time, there are strong state monopolistic trends in the industry: the major iron and steel producers in Great Britain, Italy, and Austria are controlled by the state.

The largest iron and steel monopoly, Nippon Steel, accounts for approximately 8 percent of steel production in the capitalist countries and more than 30 percent of Japanese production. It operates 11 plants and imports ore from Australia, India, and Africa and coal from the USA, Australia, and Canada.

The largest iron and steel company in the USA, United States Steel Corporation, produces approximately 25 percent of the steel and 40 percent of the pig iron in the USA. It exploits iron ore deposits in the USA, Canada, Venezuela, and Brazil; coal deposits in the USA; and deposits of manganese, chromium, and other ores in Brazil, Gabon, France, and the Republic of South Africa. It is controlled by the Morgans and the Boston and Chicago financial groups.

The monopoly Bethlehem Steel Corporation produces 15 percent of the steel in the USA and exploits deposits of iron and manganese ore in the USA, Canada, and the countries of Latin America. It is controlled by the Morgans.

British Steel Corporation was established as a result of the nationalization of steel-producing companies and accounts for more than 85 percent of the steel production and 55 percent of the output of rolled steel in Great Britain.

The second-ranking Japanese iron and steel monopoly, Nippon Kokan, produces about 15 percent of the steel in Japan and also manufactures refractory materials and oxygen. Steel and steel products account for approximately two-thirds of the firm's sales. Nippon Kokan imports iron ore, steel scrap, and coal and is a component of the Fuji financial group.

The Japanese firms Sumitomo Metal Industries and Kawasaki Steel each account for 13 percent of Japanese steel production. Sumitomo Metal Industries is Japan's largest producer of steel pipe, accounting for approximately one-fourth of the country's total pipe production; it is the major industrial company of the Sumitomo financial group. Kawasaki Steel specializes in the production of rolled sheet steel (more than 60 percent of its sales) and is linked to the Sanwa group.

The leading iron and steel company in the FRG, August Thyssen-Hütte, was second in sales among the West German industrial monopolies in 1974 and accounts for more than 30 percent of the steel production in that country. It participates in coal mining in the FRG and in mining iron ore in Brazil, Liberia, and Mauritania. It is owned by the Thyssen family and is a component of the Thyssen-Oppenheim financial group.

The Italian government owns 55 percent of the capital of the firm Finsider, and the remaining portion belongs to major Italian monopoly groups. Finsider controls about 90 percent of the production of pig iron and approximately 50 percent of the steel production in Italy. Its largest steel-producing affiliate is Italsider. It also accounts for almost 40 percent of steel pipe production and owns enterprises engaged in the mining of coal and iron ore.

The Dutch–West German monopoly ESTEL has seven plants in the FRG and four in the Netherlands. Hoesch-Werke AG and Hoogovens Ymuiden BV are branches of ESTEL. Hoesch-Werke AG is the second largest steel producer in the FRG, accounting for 5.2 million tons, or 13 percent of the total production, of steel in 1975. Hoogovens Ymuiden BV is the leading Dutch steel producer. (*See also* FERROUS METALLURGY.)

I. A. AGAIANTS [29–288–1]

JACKAL (*Canis aureus*), also Indian jackal, Oriental jackal, or common jackal, a predatory mammal of the family Canidae. The jackal resembles a wolf but is much smaller and has a shorter tail and more pointed muzzle. The body measures 71–82 cm in length, and the tail, about 20 cm. The fur is reddish brown to gray in the winter and reddish brown in the summer.

The jackal is distributed in southern Europe, North Africa, and southern Asia and on the island of Sri Lanka. In the USSR it is found in the Caucasus and Middle Asia; sometimes it occurs in Moldavia. The jackal usually inhabits lowlands and dense thickets along rivers and lakes; more rarely it inhabits deserts and foothills. It is often found near populated areas. It lives in dens. The diet includes rodents, birds, carrion, garbage, and fruits. Mating occurs in January. The female gives birth to four to nine pups, usually in the den. Sexual maturity is attained in the second year of life. Primarily a nocturnal animal, the jackal has a particularly loud howl.

The jackal has little commercial importance; the hide is of little value. The jackal is somewhat harmful to the hunting trade and poultry farming. [29–811–7]

JAPANESE ANGELICA TREE (*Aralia mandshurica*), a tree of the family Araliaceae. The erect unbranched or slightly branched spiny trunk reaches 12 m in height and 15–20 cm in diameter. The alternate leaves reach 1 m in length and are usually concentrated near the top of the trunk; they are twice or thrice pinnate, with sparse spines on the petioles and main veins. The small white flowers are five-parted and bisexual or staminate; they are gathered in numerous umbels, which in turn form compound inflorescences, measuring as much as 50 cm in length, on the top of the trunk and branches. The fruits are baccate and small.

The Japanese angelica tree grows in the Primor'e and in the southern Amur region. Outside the USSR it is found in Northeast China and Korea. The tree occurs in deciduous and mixed forests, on forest margins, and in burned-out and felled forests. In some places it forms impenetrable thorny thickets. A rapidly growing tree, the Japanese angelica tree is used as an ornamental for solitary and group plantings and for hedges. It has medicinal properties: an infusion of the roots is used as a stimulant. The closely related species *A. elata* grows on southern Sakhalin and in the southern Kurils.

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JAW. (1) In animals, any of various organs of different origin used to capture and break up food. Jaws vary in structure among different taxonomic groups and are formed in the course of individual development from different rudiments; that is, they are analogous organs. Jaws exist in several invertebrates, including some worms, mollusks, and arthropods.

In arthropods, modified appendages (extremities) of the head function as jaws. In organisms whose head is fused with the thorax into a cephalothorax, the extremities of the thoracic segments usually serve to capture food, and they are called maxillipeds (crustaceans, chilopods). Particularly characteristic of arthropods is the presence of a pair of upper jaws (mandibles) and two

pairs (less commonly one pair) of lower jaws (maxillae). In insects, a second pair of lower jaws fuse together to form the lower lip. Chelicerata have two pairs of head appendages that perform in part the function of jaws. The chelicerae are used to capture food, while the pedipalpi, located behind them, crush it. Among the echinoderms, sea urchins possess a complex maxillary apparatus called Aristotle's lantern.

All vertebrates are divided into two large groups: those without jaws—the Agnatha, represented by the class Cyclostomata—and those with developed jaws—the Gnathostomata, which constitute all the other classes.

In gnathostomatous vertebrates, the jaws are situated on the facial (visceral) part of the skull. In the course of evolution, they developed first in fish as a result of the transformation of one of the anterior (third) pairs of gill arches. The upper and lower elements became reduced, while the middle portions enlarged to form the primary upper jaw, or palatoquadrate cartilage, and the primary lower jaw, or Meckel's cartilage. Cartilaginous fishes (Chondrichthyes) have only primary cartilaginous jaws, equipped with teeth derived from the placoid scales. In bony fishes, amphibians, reptiles, birds, and mammals, substituting ossifications covered with tectorial bones developed in the posterior portions of the upper and lower jaws, from which secondary jaws then developed. Beginning with the bony fishes, a secondary jaw consisting of the premaxillary and maxillary bones forms the upper jaw. With the development of the secondary jaw, whose bones are situated along the margin of the mouth, the primary upper jaw is pushed back still farther into the palatine region of the skull and in reptiles, birds, and mammals loses its teeth. In some forms, the jaws have no teeth, and they acquire a horny structure (bill).

The development of jaws was a very important stage in the evolution of vertebrates, since it enabled vertebrates to shift from passive feeding to the active seizure of prey.

(2) In humans, the jaws are the largest bones of the visceral cranium. The upper jaw (maxilla) is a paired bone and consists of two superior maxillary bones. It occupies half of the upper part of the face, and its size and configuration greatly influence the shape of the face. Each superior maxillary bone consists of the body, with external surfaces (directed toward the nasal cavity) and posterior surfaces, and four processes—nasal, alveolar, zygomatic, and palate processes. The upper part of the bone, which is in the shape of a bent plate, forms the floor of the orbit. The interior of the body forms a cavity—the maxillary sinus, or antrum of Highmore—which communicates with nasal fossae through an aperture on the internal, or nasal, surface. The alveolar process, the lower margin of the upper jaw, contains eight cavities for teeth. Together with the process of the other supermaxillary bone, it forms the dental alveolar arch.

The lower jaw (mandible) consists of the unpaired inferior maxillary bone of the facial skeleton. This only mobile cranial bone develops from symmetrical left and right halves that fuse in the center and occupies the lower part of the face. It is characterized by a V shape. Two rami project upward vertically or diagonally from the body, or horizontal portion, of the lower jaw. The superior border of the body consists of the alveolar arch, hollowed into 16 cavities for teeth. The end of each ramus breaks up into two processes: the coronoid process, to which the temporal muscle is attached, and the condyloid process, which articulates with the temporal bone. The angle between the ramus and the body varies from 90° to 140°. Nerves and blood vessels pass through the upper and lower jaws to innervate and supply the teeth with blood.

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A. V. IVANOV, N. S. LEBEDKINA, and V. V. KUPRIIANOV [29–154–5]

JÓNSSON, EINAR. Born May 11, 1874, in Galtafell; died Oct. 18, 1954, in Reykjavík. Icelandic sculptor.

From 1893 to 1899, Jónsson studied in Copenhagen under S. Sinding and at the Academy of Arts. He worked in the USA from 1915 to 1919. Jónsson was the greatest Icelandic sculptor of the 20th century. He created monumental compositions close in style to the *art nouveau*, such as the monument to Ingólfur Arnarson in Reykjavík, and realist portraits.

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[29–1719–5]

JURCHEN, the language of the Jurchens. Jurchen, which belongs to the Manchurian branch of the Manchu-Tungus languages, is attested in texts written in the Jurchen "large script" and "small script." The large script was created in 1119, evidently by adapting the Khitan writing system to the Jurchen language; it remains undeciphered. The small script was created in 1138 from graphic elements in the Chinese writing system; it contains syllabic signs and ideograms. Some of the texts in the small script are bilingual, with a translation and transcription in Chinese, which made it possible to decipher the small script and obtain an idea of Jurchen. Jurchen is similar to Manchu, which derives from it, in lexicon, morphemes, and structure. (*See* MANCHU-TUNGUS LANGUAGES.)

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[29–539–4]

JURCHENS (also Juchen, Jürched), tribes of Tungus origin that from ancient times inhabited the eastern part of Northeast China (Manchuria) and the Primor'e.

Until the tenth century, the Jurchens were independent and maintained ties with China and Korea. In the tenth and 11th centuries they were dependent on the Khitans. In the early 12th century the various Jurchen tribes were united by Akuta, who in 1114 led an uprising against the Khitans that resulted in the formation of the independent Chin state (1115–1234), which was eventually destroyed by the Mongol conquerors. Under the Mongols, the Jurchens once again split up into several tribal groups and until the 16th century played a minor role in the history of Eastern Asia.

At the end of the 16th century a tribal elder named Nurhachi emerged from the Chienchou Jurchens, whose designation is derived from the area they inhabited. Between 1583 and 1625 he managed to unite the Chienchou tribes and several other tribes, which were subsequently known as the Manchus.

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[29–539–3]

KALGAN (also Changchiak'ou), a city in North China, in Hopeh Province, in the valley of the Yang Ho (Huang Ho basin). Population, 1 million (1970). Kalgan is a highway junction and has a station on the Chingpao Railroad, which runs from Peking to Pao-t'ou. Industry includes ferrous metallurgy (at the Lunyang Metallurgical Combine) and machine building (the production of mining equipment, geological prospecting instruments, and ball bearings); the city also has a viscose factory and food-processing and glass enterprises. Iron ore is extracted at the Lunyang deposit near the city, and hard coal is also mined nearby. [29–534–2]

KEY JOINT, a coupling between a shaft and a part fitted on the shaft, effected by means of a machine key. Axial slots are required in order to seat the key on the shaft and in the part. Keys may have an interference fit (tightly seated) or a keying fit. The former group includes tangent, tapered sunk, tapered flat, and saddle types; sunk keys of uniform cross section and Woodruff keys have a keying fit (Figure 1). Keys having an interference fit transmit both peripheral and axial forces; those having a keying fit transmit only peripheral force. Interference-fit keys shift the

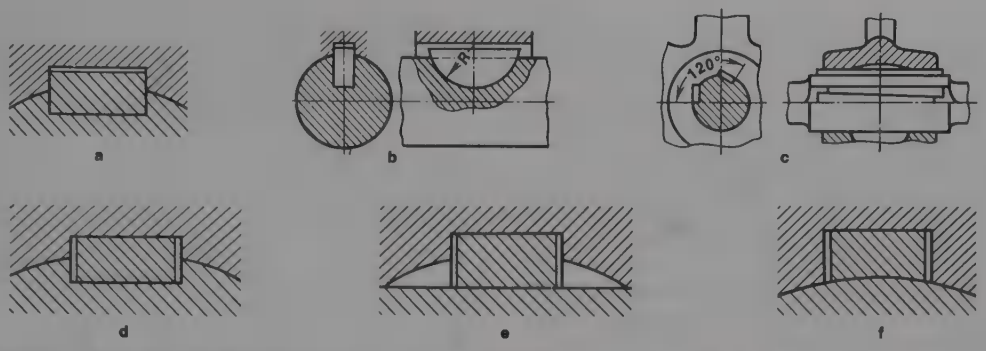

Figure 1. Key joints: (a) sunk key of uniform cross section, (b) Woodruff key, (c) tangent key, (d) tapered sunk key, (e) tapered flat key, (f) saddle key

center of gravity of the part on the shaft by an amount equal to the seating clearance; this usually results in a skewing of the part, which is the principal reason such keys have limited application.

Sunk keys of uniform cross section and Woodruff keys are the most widely used types; tangent keys are used in heavy machine building. Sunk keys of uniform cross section are seated in the shaft to half their height, and they have narrow faces (Figure 1,a). They can be used under a part that is slipped onto the shaft, in which case the key may be attached either to the shaft or to the part. The portion of a Woodruff key (Figure 1,b) seated in a shaft has a semicircular section. When torques are substantial, two or more keys are positioned along the axis of the shaft or around the periphery. Tangent keys (Figure 1,c) are used to transmit substantial torques that vary in value or direction. They consist of two single-taper wedges having the same taper (1 : 100) and narrow faces. Two keys are inserted, since the interference in the coupling is created in a peripheral direction. Tapered interference-fit keys are less often used; they may take the form of sunk keys (Figure 1,d) or flat keys (Figure 1,e); saddle keys (Figure 1,f) may also be used. When flat keys are used, a segmental groove is machined on the shaft; during a sudden increase in load, a flat key slips along the shaft, thereby cushioning the shock. Saddle keys are used to transmit relatively small torques.

S. N. POZDNIAKOV [29–1405–4]

KEYWAY-MILLING MACHINE, a metal-cutting machine tool for cutting sunk keyways of uniform cross section or Woodruff keyways in shafts. When an end cutter is used to mill a sunk keyway of uniform cross section, the machine's spindle carriage undergoes a reciprocating motion, thus providing longitudinal feed, while the tail spindle feeds to the cutting depth. Circular grooving cutters are used for Woodruff keyways. Some machines use both types of cutters to cut two keyways simultaneously. [29–1406–1]

KID LEATHER, a chrome-tanned leather made from goatskin. The best types of kid leather are obtained from the skins of young goats from stock bred for milk or for both milk and meat. Kid leather has attractive grain and exhibits considerable tensile strength (as much as 50 meganewtons per sq m). Kid leather is considered the highest quality material for the manufacture of shoe uppers: it is durable yet thin, soft, pliable, and attractive.

[29–1069–4]

KINGBOLTS AND KINGPINS (in Russian, *shkvoren'*). The pivot of a hinge joint between parts in transportation vehicles is called a kingbolt or a kingpin. Depending on context, the Russian word *shkvoren'* may mean either "kingbolt" or "kingpin."

In diesel locomotives, electric locomotives, and railroad cars, kingbolts are used, for example, to connect the wheeled trucks with one another or with the vehicle frame. A kingbolt is a vertical bolt.

In motor vehicles, kingpins are used to connect the front axle or, in the case of independent front suspension, the front-wheel supports with the steering knuckles, from which the steering spindles for the front wheels project. Kingpins are usually rigidly attached to the axle or the front-wheel supports and are inclined in two vertical planes to improve the steerability and stability of a motor vehicle and also to provide the proper wheel geometry, which affects the tires.

Kingbolts and kingpins are made of steel. [29–1253–5]

KJELLÉN, RUDOLF. Born June 13, 1864, in Torsø, in the *län* (county) of Skaraborg; died Nov. 14, 1922, in Uppsala. Swedish political figure and sociologist.

The son of a priest, Kjellén graduated from the University of Uppsala in 1883 and received the degree of doctor of sciences in 1890. From 1891 to 1916 he taught political science at the higher school of Göteborg, where he became a professor in 1901. In 1916 he began teaching at the University of Uppsala. He was a member of the Riksdag from 1905 to 1908 and again from 1911 to 1917.

Kjellén coined the term "geopolitics" and was an early proponent of the reactionary theory of that name, which defines the state as a geographic and biological organism that naturally seeks to expand. He was an ideologist of Swedish conservatism, a chauvinist, a Germanophile, and a militarist. Kjellén was, objectively speaking, among those who inspired the ideas of the German Nazis.

WORKS

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KJELLGREN, JOSEF. Born Nov. 13, 1907, in Mörkö, Södermanland; died Apr. 8, 1948, in Stockholm. Swedish writer.

Kjellgren first published his writings in workers' newspapers beginning in the second half of the 1920's. He joined the Swedish division of Clarté in 1928. Kjellgren used social motifs in his very first poetry collection, *The Light of the Beacon* (1931). He condemned fascism in the poetry collection *The West* (1933), the short-story collection *Gunshot Hole at the Waterline* (1936), and the play *The Unknown Swedish Soldier* (1938). Kjellgren developed the theme of international worker solidarity in the travel notes *Across Europe Without a Penny in My Pocket* (1930) and the collection of poems and essays *On the Banks of the Thames* (1937).

Kjellgren wrote "novels of the collective," for example, *People Around the Bridge* (1935; Russian translation, 1938) and the trilogy consisting of *The Emerald* (1939), *The Gold Chain* (1940), and *Men's Friendship* (1947). In *People Around the Bridge* he depicted the working class in the style of socialist realism and used a Communist as his hero. Kjellgren also wrote children's books. Many of his works reveal elements of expressionism.

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LABOR ECONOMICS, in the USSR, the branch of economic science that studies the social organization of labor (hiring practices, cooperation and division of labor, distribution of the social product, and reproduction of labor power).

Labor economics studies the theoretical principles and objective economic laws that determine the most rational use of social labor at the various levels represented by the enterprise, the branch, and the national economy as a whole; it devises specific techniques to ensure the scientifically justified organization and planning of labor in socialist society; and it analyzes the basic differences between the socialist and the capitalist organization of labor, the superiority of socialism in this area, and the features that distinguish the organization of labor at different stages of communist construction.

Among the pressing issues of labor economics are (1) the development of methods ensuring a more effective coupling of material and moral incentives to increase production efficiency, (2) higher labor productivity, (3) better product quality, and (4) economical utilization of material resources. Problems that are an important concern of labor economics are those related to the wages of workers in the national economy—namely, improving the wage rate system as the basis of state regulation of wages, improving the system of bonuses for workers and office employees, and instituting a more efficient system of wage payments to kolkhoz workers.

Labor economics is related to various technical and economic sciences—the latter category including national economic planning, statistics, and finance. The scientific and practical recommendations of labor economics provide the foundation for a common methodological approach to such questions as national economic planning and labor accounting. At the same time, labor economics is based on the data of branch disciplines, such as industrial and construction economics; it resolves internal production problems through the extensive use of data pertaining to the technical implementation of labor rates, and it applies the conclusions and methods of the sociology of labor and labor statistics.

A considerable proportion of the problems related to the scientific organization of labor—whether in an enterprise, institution, or branch—fall within the province of labor economics. The scientific organization of labor constitutes a separate field of study. Many of the questions arising in labor economics are resolved on the basis of conclusions drawn from the biological disciplines—specifically, physiology, occupational hygiene, and labor psychology.

Labor economics interacts to a significant degree with labor law, which regulates the juridical labor relations of workers and employees. The labor law provides for certain economic relations that are studied by labor economics (for example, the extent of workers' participation in collective work, length of time allotted to work and to leisure, labor discipline, labor safety, and special measures for the protection of working women and youth).

Research studies in the area of labor economics are carried out in the academic institutions, in the scientific institutions of the various branches, in the higher educational institutions throughout the country, and in various subdivisions of the institutes of the Academy of Sciences of the USSR and of the Union republics. The results of labor economics research are extensively utilized by planning and management bodies for production planning, design, organization, and management. Research studies in labor economics are published in the journals *Sotsialisticheskii trud, Voprosy ekonomiki, Planovoe khoziaistvo*, and *Ekonomicheskie nauki*. All the central scientific and technical journals of the various branches of the national economy have special sections devoted to the labor economics of the particular branch.

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L. S. KHEIFETS [29–1808–1]

LADLE CAR, a welded steel ladle mounted on a railway car for transporting molten pig iron to the mixer in a steel-smelting plant or to a casting machine. The interior is lined with refractory brick. Locomotive traction is used to move the car; five or six cars are coupled together. The most common ladle cars used in the USSR have capacities of 100 and 140 tons. [29–734–1]

LANDING GEAR, the parts of an airplane that make possible maneuvering on the ground or the deck of an aircraft carrier and that soften the landing shock. The principal components of an airplane's landing gear are the shock struts, the wheels—pneumatic tires equipped with brakes to reduce the length of the landing run—and a system of drag struts, which connect the shock struts and wheels to the wings and the fuselage and which absorb the drag load and the impulsive drag load.

Before 1939, tail-wheel landing gear designs were the type most widely used. During World War II and in the postwar years, the tricycle landing gear came into common use. Such an undercarriage has two main struts aft of the aircraft's center of gravity and a nose gear that carries 10–15 percent of the airplane's weight and serves as a third support point. Although the landing gear in most airplanes is drawn up into the fuselage or the wings after takeoff, the landing gear in small planes is usually not retractable. It is most often of a simple design that allows replacement of the wheels with skis or pontoons for flights in regions with expansive water areas. Heavy airplanes sometimes have landing gear with 20–30 wheels fitted in bogies.

S. IA. MAKAROV [29–873–6]

LAND VALUATION, the determination of the comparative worth of land as a means of agricultural production, based on the land's natural and enhanced fertility, on the various natural and economic conditions of the region in which it is located, and on the lay of the land.

Carried out primarily through classification of soils according to agricultural-production indexes, valuation of land on a point scale gives an idea of what the land is like and what demands can be made of a farm with respect to such matters as income, yield, and taxation. Under capitalism, land valuation has a decisive influence on the price of land and on rent. In the USSR, valuation of land is provided for in the Basic Principles of Land Legislation of the USSR and the Union Republics (1968). Land-valuation data are recorded in the land cadastre. [29–1828–2]

LAPAROTOMY, a surgical incision in the abdominal cavity. Although laparotomy was even known to ancient physicians, it was seldom used before the introduction of antisepsis and asepsis because of the danger of infection. It provides access to the organs of the abdominal cavity and lesser pelvis and is performed in cases of inflammation and tumors, as well as in cases of stomach wounds and other injuries; it is sometimes used as an independent procedure for diagnostic purposes (celiotomy, or diagnostic laparotomy). It is sometimes combined with thoracotomy.

Laparotomy is performed using a transverse, vertical, or oblique incision. The purpose of the surgical procedure determines the patient's position on the operating table—completely horizontal or with the head of the table raised or lowered or a bolster placed under the small of the back. Preoperative preparation of the patient and the anesthesia used depend on the nature of the procedure and the patient's condition. The abdominal cavity is closed by layer-by-layer suturing of the anterior abdominal wall, with insertion of drains if required. [29–690–2]

LAPWING (*Vanellus vanellus*), also green plover or pewit, a bird of the family Chardriidae of the suborder Limicolae. The body measures 30 cm in length, and the weight is approximately 200 g. The upper parts and breast are greenish, with a purple sheen. The lapwing is distributed in Europe and Asia. In the USSR it is found from the western border to Primor'e Krai; in Siberia it occurs only in the south. In the winter it is commonly found in Middle Asia and Transcaucasia. Lapwings nest in grassy marshes, pasturelands, or fields. The clutch contains four eggs, which are incubated primarily by the female for 27 to 29 days. The diet includes insects and other small invertebrates, as well as seeds.

[29–545–5]

LARD, the subcutaneous fatty tissue of hogs. The protein content of lard amounts to as much as 1.4 percent, and the fat content, to more than 92 percent. The proteins are primarily incomplete proteins, such as elastin and collagen. Most of the fatty acids making up the fat are unsaturated, for example, oleinic and linoleic acids. The principal saturated fatty acids are palmatic and stearic acids. Lard is used as part of sausage stuffings; it is also eaten in salted or salted and smoked form, for example, Hungarian bacon. [29–1394–2]

LARIDAE, a family of birds of the order Charadriiformes. The body length ranges from 20 cm (least tern [*Sterna albifrons*]) to 76 cm (glaucous gull [*Larus hyperboreus*]). Some species have a rather thin, straight, pointed bill, while other species have a more powerful, slightly decurved bill, with a prominence on the mandible. The bill is often brightly colored. The long and pointed wings are adapted for prolonged flight over water; some species can soar and glide. The legs are short or of moderate length; the feet are webbed, sometimes deeply lobed. The Laridae are good swimmers; they sometimes dive after their prey by simply plunging into the water. The plumage is thick and waterproof. It is alike in males and females but differs considerably depending on the season and the bird's age. The adult plumage is acquired in the third to fourth year of life. White, gray, and black predominate in the coloration.

All the Laridae are closely tied to the water, inhabiting the shores of oceans, seas, rivers, and open and overgrown lakes. They are predominantly gregarious birds, living in flocks. They nest in colonies and on sandbars, cliffs, broken reeds, and floating plants; some nest in trees, shrubs, and even burrows. The clutch contains one to four solid-colored or spotted eggs. Both the male and female incubate the eggs and feed the young, which are covered with a thick down. The young leave the nest very soon after hatching but remain close to it; the parents feed them until they begin to fly.

The Laridae are distributed all over the world. Many species migrate, but some winter near their nesting sites in ice-free bodies of water, sometimes very far north; some make long migratory flights. The diet includes fish, marine and freshwater invertebrates, carrion, and waste products of the fishing industry. Some species are beneficial to man, for they fly over fields and catch rodents and insects; other species are harmful, since they kill fish or destroy the nests and kill the young of commercially useful birds, such as eiders and other ducks.

The family comprises 82 species, grouped into two subfamilies: Sterninae (terns) and Larinae (gulls). Of the latter, 20 species nest in the USSR, including the ivory gull (*Pagophila eburnea*), Ross's gull (*Rhodostethia rosea*), the fork-tailed, or Sabine's, gull (*Xema sabini*), the herring gull (*Larus argentatus*), the short-billed, or mew, gull (*Larus canus*), the black-headed gull (*Larus ridibundus*), the Mediterranean gull (*Larus melanocephalus*), the lesser black-backed gull (*Larus fuscus*), and the kittiwake (*Rissa tridactyla*). (*See also* TERN.)

REFERENCE

Ptitsy Sovetskogo Soiuza, vol. 3. Edited by G. P. Dement'ev and N. A. Gladkov. Moscow, 1951. A. I. IVANOV [29–23–1]

LATHYRUS, a genus of annual and perennial herbaceous plants of the family Leguminosae. The four-angled main stalks are trailing, clinging, climbing, or—less commonly—erect. Their height is 15–20 cm (to 1.5 m). The lateral branches rapidly overtake the main stem in length. The leaves are uniparipinnate or, less commonly, bijugate to quadrijugate; they are oblong-lanceolate or lanceolate. The inflorescence contains one or, less often, two white, purple-violet, yellow, orange, lilac-blue, or pink flowers. The plants generally are self-pollinating. The fruit is a two-winged pod. Three groups are distinguished according to the color of the seeds and flowers (white, light, and dark) and according to the size of the seeds (large, small, and medium—lengths from 4 to 16 mm).

There are more than 100 species, distributed in Europe, Asia, and Northwest Africa. The USSR has 50 species. Most species are forage plants. *Lathyrus* is cultivated in many countries. In the USSR small areas are planted with the perennial meadow pea (*L. pratensis*) and the annual field pea (*L. sativus*), flat podder (*L. cicera*), and Tangier pea (*L. tangitanus*). Most widely distributed is the field pea, which is cultivated as a grain crop in the Northern Caucasus, Transcaucasia, the forest-steppe regions of the Ukrainian SSR, the central regions of the RSFSR, Western Siberia, and Middle Asia. The field pea is also grown for green feed and hay in more northern areas. The plant grows well in various soils; it is drought resistant and can withstand temperatures to −8°C. The vegetative period lasts 100 to 115 days in the temperate zone. The seeds are sown at the same time as early spring crops, using the wide-row (for grain) or broadcast (for green feed or hay) method. The sowing rate for pure plantings is 130–160 kg per hectare (ha); the sowing depth is 4–8 cm. The field pea is harvested for grain when 75 percent of the beans turn yellow, for green feed when the plants are in early bloom, and for hay when the beans first develop. In humid years it may yield a good aftercrop and, in a mixture with Sudan grass, a second cutting. The harvest from 1 ha is 220–230 quintals of green feed in pure plantings, 30–35 quintals of hay, and 15–20 quintals of grain.

There are 108.2 feed units and 20.5 kg of digestible protein in 100 kg of the grain and 15.8 feed units and 3.6 kg of digestible protein in 100 kg of green matter. Green feed is readily eaten by cattle and swine, and the hay by cattle and sheep. The meadow pea is particularly leafy. It is cultivated as green feed and hay in the forest, forest-steppe, and steppe zones and the mountain regions of the Caucasus and Middle Asia. The yield of hay is 25–35 quintals per ha. The plant is eaten readily by sheep and horses but not as well by cattle.

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A. P. MOVSISIANTS [29–602–3]

LATITUDE, one of the coordinates in numerous systems of spherical coordinates that determine the position of points on the earth's surface (*see* GEOGRAPHIC COORDINATES and COORDINATES [in geodesy]), on the celestial sphere (*see* CELESTIAL COORDINATES), or on the surface of the sun, moon, and planets (*see* HELIOCENTRIC COORDINATES; SELENOGRAPHIC COORDINATES; and PLANETOGRAPHIC COORDINATES).

For the earth, a distinction is made between astronomical latitude and geodetic latitude (or geographical latitude), depending on the method of determination. The astronomical latitude ϕ of a point on the surface of the earth is equal to the angle between a plumb line (normal to the geoid) to the point and the plane of the earth's equator. It is also equal to the height of the pole of the earth above the horizon and is considered to be positive in the northern hemisphere and negative in the southern hemisphere. The latitude of points on the equator is 0°; the latitude of the north pole is +90°, and that of the south pole, −90°. Lines with the same values of ϕ are parallels.

Unlike astronomical latitude, which is determined from astronomical observations, geodetic latitude is computed on the basis of measurements on the earth's surface, for example, by the triangulation method, taken between the point being measured and a certain starting point. Geodetic latitude is equal to the angle formed by the normal to the reference ellipsoid passing through the given point and the plane of its equator.

The geocentric latitude ϕ' is equal to the angle between the radius drawn from the center of the earth's ellipsoid to the given point and the plane of the equator. There is a relationship between astronomical latitude and geocentric latitude: $\tan \phi' = (b/a)^2 \tan \phi$, where a is the semimajor axis of the earth's ellipsoid and b is the semiminor axis. The largest difference between ϕ and ϕ' occurs when $\phi = 45°$ ($\triangle\phi \simeq 11'5$); at the equator and the poles, $\triangle\phi = 0$.

In geodesy, the reduced latitude u is also used, whose values lie between ϕ and ϕ' and are determined by the formula $\tan u = (b/a) \tan \phi$.

A. A. MIKHAILOV [29–1235–1]

LATITUDE, GEOMAGNETIC, the angle ϕ, which is the complement (to 90°) of the angle formed by the axis of a uniformly magnetized earth (the axis of the earth's magnetic dipole) and a

radius vector drawn from the center of the earth to a given point on its surface. Geomagnetic latitude ranges from $+90°$ at the geomagnetic pole in the northern hemisphere to $-90°$ at the pole in the southern hemisphere.

The concept of geomagnetic latitude is used in studying various geophysical phenomena. However, for detailed investigations of the latitudinal distribution of the aurora borealis, magnetic and ionospheric disturbances, the absorption of cosmic radiation, and similar phenomena, the concept of corrected geomagnetic latitude is used. Its calculation considers both the dipole members and the higher terms in the expansion of the earth's potential in a series of spherical harmonics. (*See* TERRESTRIAL MAGNETISM.)

REFERENCE
Akasafu, S. I., and S. Chapman. *Solnechno-zemnaia fizika*, part 1. Moscow, 1974. (Translated from English.) [29–1236–3]

LATITUDE, MAGNETIC, the angle ψ, determined from the equations $\tan \psi = (1/2) \tan J$, where J is the magnetic inclination (or magnetic dip). Magnetic latitude ranges from 0°, at the magnetic equator, to 90°, at the north and, correspondingly, south magnetic poles. The concept of magnetic latitude is used in all research involving the study of the physics of the magnetosphere, in particular, in the analysis of geophysical phenomena at magnetically conjugate points on the earth's surface (points lying on one line of force of the geomagnetic field). [29–1236–4]

LATITUDE STATION, a specialized astronomical observatory that studies the regularities governing the phenomenon of variability of geographic latitudes.

Latitude stations are equipped with instruments for the regular determination of the station's geographic latitude on the basis of astronomical observations. The combined mathematical processing of the observations made at several latitude stations makes it possible to determine the position of the earth's geographic pole on the earth's surface at a series of moments in time and thus construct a curve of polar motion, called a polhode. The chief instruments used at latitude stations are a zenith telescope, a photographic zenith telescope, and a prismatic astrolabe.

Included within the International Polar Motion Service are five latitude stations with similar instruments, situated on the same geographic parallel—39°08′—and more or less evenly spaced by longitude; one of these stations is in the Soviet Union—the Ulugbek Latitude Station of the Academy of Sciences of the Uzbek SSR, located in Kitab. At the same time, about 50 astronomical observatories in different countries are conducting systematic observations of variations in latitude for the immediate computation of the coordinates of the poles at the International Time Bureau and the introduction of necessary corrections in the world time scale.

Of particular scientific value for the study of polar motions have been the long-term observations with two high-precision zenith telescopes at the Pulkovo Observatory of the Academy of Sciences of the USSR; the lengthy series of observations with the zenith telescopes of the Greenwich Observatory in Great Britain; the series of around-the-clock observations of two bright stars in Poltava, USSR, conducted over a period of 40 years; the observations with the photographic zenith telescope conducted since 1915 in Washington, D.C., (United States); and the observations with two zenith telescopes, a photographic zenith telescope, and a prismatic astrolabe conducted at Misuzawa, Japan. Laser range-finding observations by artificial earth satellites began to be carried out in the mid-1970's to determine the position of the poles of the earth. L. V. RYKHLOVA [29–1236–7]

LEAF CAST, a disease of coniferous needles caused by pathogenic fungi. There are three types of leaf cast. The most common is caused by ascomycetes of the genus *Lophodermium*. A second type is caused by the ascomycete *Phacidium infestans*, and a third by the imperfect fungi of the genus *Meria*.

Symptoms of leaf cast are yellowing and then browning and falling of the needles. In leaf cast caused by *Phacidium infestans*, a white gossamer-like mycelium appears in the spring; the needles turn brown, and by autumn they are ash-gray. Leaf cast is especially dangerous in tree nurseries. Control measures include removal and burning of dead plants and fallen needles, pinching off diseased needles, and spraying seedlings (before the formation of the snowy covering) with a suspension of zineb or other fungicides.

REFERENCE
Zhuravlev, I. I., and D. V. Sokolov. *Lesnaia fitopatologiia*. Moscow, 1969. [29–1565–1]

LENS (lentil), a genus of annual herbs of the family Leguminosae. The erect or partly climbing stem is 20–55 cm tall. The compound even-pinnate leaves have three to eight pairs of narrow leaflets, which end in short bristles measuring 1–60 mm long. The small white, pink, or violet-blue flowers are distributed singly or in groups of two or three on the axillary peduncle. The fruit is a pod; the flat or protuberant seeds are multicolored, monochromatic, or in patterns. The common lentil (*L. culinaris*) is classified into two groups according to the size of the seeds: the large-seeded plate-like group has a seed diameter of 5.5–9 mm, and the small-seeded group has a seed diameter of 2–5.5 mm.

There are five species in the Mediterranean region, Asia Minor, Transcaucasia, and Middle Asia. The common lentil, the only cultivated species, is distributed in many countries of Europe, Asia, and North Africa. In the USSR it is found in the southern European region, the Volga region, and Middle Asia. The plant is a food and feed crop.

Lentils are a spring crop, with a vegetative period of 75 to 115 days. The plants are relatively drought resistant, and the shoots can withstand brief frosts to $-5°C$. The best soils are loose loams and sandy loams rich in lime. The feed is poor on very acidic and solonetzic soils. In crop rotation, lentils follow winter and root crops. Like other legumes, lentils enrich the soil with nitrogen and are good predecessors for subsequent crops. Seeds are sown in rows spaced 15 cm apart. Phosphorus fertilizer (40–80 kg/ha of P_2O_5) and potassium fertilizer (60–100 kg/ha of K_2O) are applied during late-fall plowing or during spring cultivation. Granulated superphosphate is used during seeding. Harvesting operations are begun when the beans on the lower and middle section of the plant begin to ripen and the seeds of the upper beans finish ripening in swathes. Combines, reapers, and hay cutters are used for harvesting. When the swathes are dry, they are threshed by combines and grain threshers.

Mature lentil seeds contain 23–32 percent protein (in dry matter), as much as 60 percent starch, and as much as 2.5 percent fat; they also contain vitamins B_1 and B_2. The seeds of large-seeded lentils are used in the production of groats and flour for bread, sausage, confectioneries, and canned goods. The seeds of small-seeded lentils, the green mass, the chaff, and the straw are fed to agricultural animals. One hundred kg of grain contains 120 feed units and 21 kg of digestible protein. Ten varieties of lentils have been regionalized in the USSR, including Petrovskaia-4/105, Talinskaia-6, Penzenskaia-14, and Petrovskaia lubileinaia.

In 1976 the world area under lentil cultivation was about 1.8 million ha, the gross grain yield was 1.2 million tons, and the average yield was 6.8 quintals per ha. In the USSR lentils are grown on small areas; in 1976 the crop occupied 35,700 ha.

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Zhukovskii, P. M. *Kul'turnye rasteniia i ikh sorodichi*, 3rd ed. Leningrad, 1971. N. R. IVANOV [29–505–5]

LENTICEL, a loose lens-shaped mass of cells in the periderm. Lenticels appear on the trunks of perennial limbs and, sometimes, on the roots of woody plants in the form of protuberances. Lenticel formation is activated by phellogen; the lenticels usually form beneath the stomata. Lenticels permit the exchange of gases. [29–506–2]

LEONTOPODIUM (edelweiss), a genus of perennial plants of the family Compositae. The heads are crowded together into dense tufts or complex cymes. Sometimes the heads are solitary. The tufts or cymes are usually surrounded by feltlike, extended terminal leaves, which are arranged in a characteristic star form.

There are about 30 species (according to other data, as many as 50), distributed throughout Eurasia except for the Caucasus and

Western Asia. The USSR has six to eight species in the Far East and Siberia, two species in Middle Asia, and one species in the Carpathians. The plants grow mainly in the mountain-steppe and high-mountain belts with elevations to 5,000 m. The most common species is the alpine edelweiss (*L. alpinum*), whose snow-white woolly terminal leaves form a regular many-rayed star. Gathered widely for its exceptional beauty, the plant almost became extinct. It was listed in the *Red Data Book* and is now a protected species.

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Grubov, V. I. "Edel'veis—*Leontopodium* R. Br." In *Flora SSSR*, vol. 25. Moscow-Leningrad, 1959.

M. E. KIRPICHNIKOV [29–1679–7]

LEVEL WIDTH, the uncertainty in the energy of a quantum-mechanical system having discrete energy levels $\mathcal{E}_k$ in a state that is not strictly stationary. The system may be an atom, a molecule, or an atomic nucleus.

The level width $\Delta\mathcal{E}_k$ characterizes the broadening of an energy level and the energy spread in the level. It depends on the mean life of a system in a given energy state—that is, on the lifetime τ_k of the system in the level—and, in accordance with the uncertainty relation for energy and time, is given by the expression $\Delta\mathcal{E}_k \approx \hbar/\tau_k$, where $\hbar$ is Planck's constant. For a stationary state of a system, $\tau_k = \infty$ and $\Delta\mathcal{E}_k = 0$. The lifetime τ_k and, consequently, the level width result from the possibility of quantum transitions of the system to states of lower energy.

For a free system, such as a single atom, spontaneous radiative transitions from level $\mathcal{E}_k$ to lower-lying levels $\mathcal{E}_i$ ($\mathcal{E}_i < \mathcal{E}_k$) determine the radiation width, or the natural width, of the level: $(\Delta\mathcal{E}_k)_{\text{rad}} \approx \hbar A_k$, where $A_k = \Sigma_i A_{ki}$ is the total probability of spontaneous emission from level $\mathcal{E}_k$; A_{ki} is Einstein's coefficient for spontaneous emission. The broadening of an energy level may also be caused by spontaneous nonradiative transitions, for example, by the alpha decay of a radioactive atomic nucleus. The width of an energy level of an atom is very small in comparison with the energy of the level.

In other cases, the level width may become comparable to the level spacing. For example, the probability of quantum transitions in excited nuclei is determined by the emission of neutrons and is very high.

Any interactions that increase the probability of a transition of a system to other states result in additional broadening of the system's energy levels. The Stark broadening of the energy levels of an atom or ion in a plasma as a result of collisions with ions or electrons may be cited as an example. In the general case, the total level width is proportional to the sum of the probabilities of all possible transitions—both spontaneous transitions and transitions induced by various interactions—from a given energy level.

The level width determines the line width of a spectral line.

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See references under SPECTRAL LINES, WIDTH OF.

M. A. EL'IASHEVICH [29–1225–1]

LIGHT-BEAM OSCILLOGRAPH, an instrument used for the visual observation and the automatic recording, by a photographic method, of physical processes that are periodic, aperiodic, or nonrecurrent. Examples of such processes include strain, temperature changes, pressure variations, and changes in rate. In the case of periodic processes, light-beam oscillographs are usable for repetition rates ranging from fractions of a hertz to 10–15 kilohertz. At the oscillograph input, a variation in a physical quantity that characterizes the process under investigation is converted by appropriate sensors into a proportional change in voltage or current.

A light-beam oscillograph (Figure 1) consists of the following: one or more mirror galvanometers, usually with a bifilar moving coil; an optical system; a recording medium, which may be either photosensitive paper or photographic film; a unit that moves the paper or film (not shown in Figure 1); and a device for visual observation.

The optical system forms and focuses a light beam and directs it to the galvanometer mirror. The beam is reflected from the mirror onto the sensitized film or paper, where it traces a curve that depicts the variation over time in the physical quantity under investigation. The time base of the curve is provided by the uniform movement of the recording medium in a direction perpendicular to the deflection of the light beam. The speed at which the recording medium moves in various light-beam oscillographs ranges from 1 to 10,000 mm/sec. The recorded curve is observed visually by means of a spherical mat screen, upon which impinges

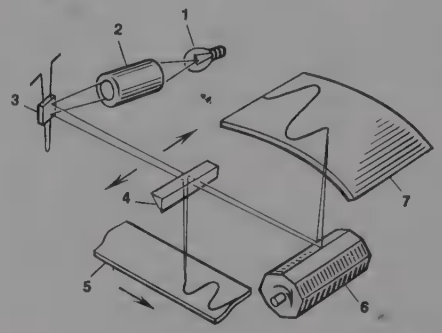

Figure 1. Diagram of the primary components of a light-beam oscillograph: (1) light source, (2) focusing objective, (3) mirror, (4) optical prism, (5) recording medium, (6) specular drum, (7) screen for visual observation

a portion of the light beam reflected from the mirror. The time base of the visually observed curve is provided by means of a uniformly rotating polyhedral specular drum. When the drum rotates, the light beam is reflected from its specular surfaces and periodically sweeps the screen. By adjusting the rotational speed of the drum, a stationary image of the curve may be obtained.

Multichannel light-beam oscillographs are used for the simultaneous recording of several physical quantities. Such oscillographs contain from four to 60 mirror galvanometers, which provide for the simultaneous recording of a corresponding number of curves.

Light-beam oscillographs are widely used in scientific research, laboratory experiments, and industrial testing.

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LINCHPIN, a wedge-shaped rod that fits into a hole in a part and prevents another part from shifting to one side while fastened to the first part. The shape of a linchpin prevents the pin from falling out of the hole. Linchpins were used in horse-drawn vehicles to prevent the wheels from coming off the axle. They are used for unstrained joints between parts, for example, as safety pins in hand grenades. [29–128–2]

LINKAGE (in Russian, *sharnir*), a movable connection between two bodies. In a cylindrical linkage, the relative movement of the two bodies is rotation about an axis; in a spherical linkage, the relative movement is rotation about a point.

A cylindrical linkage in a mechanism is called a rotary kinematic pair. It consists of a journal rotating in either a simple bearing or a rolling-contact bearing.

A spherical linkage in a mechanism is referred to as a spherical kinematic pair. It may be either a ball and socket or a ball bearing. Such a linkage is difficult to manufacture. Therefore, it is often replaced by a universal joint, which consists of two or three cylindrical linkages that are connected in tandem and whose axes of rotation intersect at a single point. Various modifications of the universal joint may be used instead of a spherical linkage; such modifications differ in the number of intermediate links and in the type of kinematic pairs formed by the intermediate links.

A linkage may be exposed or enclosed. An enclosed linkage is protected from dust or sand by a housing and is used in machinery that operates in air with a high dust content.

Linkages are used not only in machine mechanisms but also in

building systems, such as trusses. In such systems, linkages are employed to relieve the components of bending stresses and to reduce thermal stresses. N. I. LEVITSKII [29–862–3]

LINKWORK (in Russian, *sharnirnyi mekhanizm*), a mechanism whose elements (links) form only rotating kinematic pairs (linkages).

Depending on the type of motion of the links, linkworks are classified as plane, spherical, and general three-dimensional. In plane linkworks the axes of the linkages are parallel, and all links therefore undergo plane-parallel motion. The simplest plane linkwork consists of four links and is called a four-bar linkage. In spherical linkworks the axes of the linkages intersect at a single point. The smallest number of links in a spherical linkwork also is four. A spherical four-link motion (Figure 1) is used, for example, in multipiston pumps and aircraft stabilizers. The Cardan mechanism is a particular case of the spherical four-bar motion, in which the axes of two rotating pairs are mutually perpendicular. In three-dimensional linkworks the axes of the rotating pairs cross at different angles. In the general case a three-dimensional linkwork should have at least seven links (a three-dimensional seven-bar motion). When certain relations between the linear and angular dimensions of the links are satisfied, however, the minimum number of links is reduced to four (for example, Bennett's mechanism). Three-dimensional linkworks find application in agricultural machinery and automatic machines used in food processing and light industry.

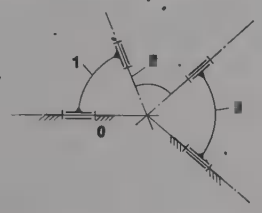

Figure 1. Spherical four-bar motion: (0) fixed link, (1), (2), and (3) movable links

Depending on the method used to define the required motion of a working link, linkworks are subdivided into positioning, guiding, and transmission mechanisms and mechanisms for interrupted motion. Positioning linkworks are designed to move a working link from one position to another; the number of defined positions is usually two, less often three or four. Such linkworks are used in metallurgical machines (such as tilters, tippers, and mechanisms for plugging tap holes) and in automatic machinery for the food-processing industry (for positioning working members of machines). Guiding linkworks are designed to move along a specified curve a single point of a link that does not form a kinematic pair with the stay. Linkworks that guide along the arc of a circle (circular guiding mechanisms) and straight-line mechanisms, such as the Chebyshev parallel motion, are the most widely used types. Linkworks are also used to shape parabolas and hyperbolas, such as the mechanisms for grinding the mirrors

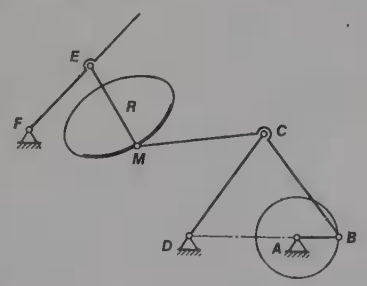

Figure 2. Linkwork for interrupted motion

of astronomical instruments. Transmission linkworks are designed to convert rotary motions according to a specific law. They act as mechanisms for reproducing a given function. In calculators, transmission linkworks are used to perform such mathematical operations as addition, multiplication, and raising to powers. Through special selection of the lengths of the links, it is possible to obtain an approximate reproduction of diverse functions. For example, when the function $y = f(x)$ is reproduced, the angles of rotation of one rotating link are proportional to the argument x, and the angles of rotation of the other are proportional to the function y.

Linkworks for interrupted motion are used in automatic machines to set in motion a working member that, after completing a specific operation, must remain stationary for some period of time while the other working members move. A diagram of a six-bar linkwork for interrupted motion is shown in Figure 2. The mechanism transforms the continuous motion of link AB into the motion of link EF with prolonged stops in a single position. The linkwork is based on the circular guiding mechanism $ABCD$, in which the lengths of the links are selected such that the trajectory of point M on the section marked by the heavy line on the diagram nearly coincides with the arc of a circle of radius R. As point M moves along the segment, link EF remains stationary if the length of link EM is equal to radius R and point E coincides with the center of the circle at this time. As point M moves along a different segment of the trajectory, link EF is shifted by some angle and returns to the stop position.

Linkworks are widely used in various fields of engineering because of their simplicity of manufacture and high reliability. Their shortcomings include relatively large size and the possible appearance of significant forces acting on the links at positions where the displacement of some center of a linkage subtends an angle close to 90° with the effective force. Furthermore, not all laws that may be required for the transformation of motion can be obtained by means of linkworks.

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See references under MECHANISM. N. I. LEVITSKII [29–863–2]

LISP (parasigmatism), the imperfect pronunciation of sibilants (z, s, ts, ʒ, tʃ, ʃ, ʃtʃ). It may be due to defective arrangement of the teeth (such as the presence of a gap between the front teeth), inadequate mobility of the tongue, partial deafness, or other cause. It sometimes occurs when the structure of the vocal apparatus is normal as a manifestation of underdeveloped speech. The afflicted person usually places the tip of the tongue between the front teeth when articulating sibilants, which results in the characteristic lisping sound. Logopedic methods are used to correct the defect. Surgery or the use of a prosthesis is sometimes indicated when there are structural anomalies of the vocal apparatus. [29–1133–1]

LITHUANIAN BLACK AND WHITE CATTLE, a breed of dairy and dairy-meat cattle. The Lithuanian Black and White was developed in the early 20th century by crossing local cattle with Ostfriesian, Swedish Black and White, Holstein-Friesian, and other breeds. The bulls weigh 850–1,000 kg, and cows, 500–550 kg. The average milk yield is 3,500–4,000 kg, and the largest yield is 12,550 kg. The fat content of the milk is 3.6–3.8 percent. The young fatten rapidly; by 15 months the bulls weigh 450 kg or more. The dressed yield is 58–60 percent. The breed is raised in the Lithuanian SSR. The purebred cattle are exported to other republics to improve local stock.

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LOCATION THEORIES (also *Standort* theories), bourgeois theories of the most advantageous location for enterprises. Location theories were developed to determine the location (German, *Standort*) for a given enterprise that would ensure the minimum production costs or maximum profits for the owner. The expression "location (*Standort*) of an industrial enterprise" and the basic ideas of location theories as they apply to industry originated with the German economist W. Launhardt in 1888. The German economist A. Weber gave a more fully developed exposition of the theories in 1909. [29–1453–6]

LOCK, in navigation, a hydraulic engineering installation that is located between bodies of water with different levels and through which vessels or rafts pass. Locks are built on canals, at hydraulic

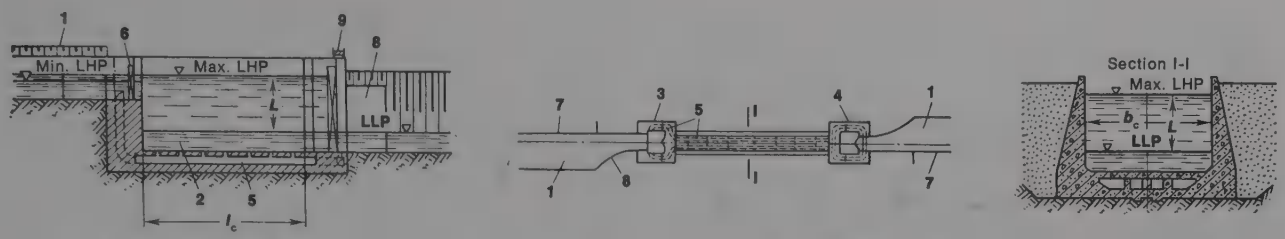

Figure 1. Diagrams of a single lock: (1) approach canal, (2) lock chamber, (3) upstream end, (4) downstream end, (5) filling and emptying system, (6) gate, (7) docks, (8) guiding dolphins, (9) a bridge; (l_c) chamber length, (b_c) chamber width, (L) lift, (LHP) level of the higher pool, (LLP) level of the lower pool

engineering complexes on rivers, and in seaports whose water area experiences large-amplitude tides.

A sketch of a lock was discovered in the papers of Leonardo da Vinci. Locks were first built in Western Europe in the 16th century and in Russia—on the Vyshnii Volok Water System—in the 18th century. In the USSR, many large locks have been constructed on numerous navigation canals, at reservoirs, and at hydraulic engineering complexes on the Volkhov, Dnieper, Svir', Volga, and Kama rivers. A substantial number of large locks have been built in Western Europe and in the USA, for example, on the Ohio, Mississippi, and St. Lawrence rivers.

A lock (Figure 1) consists of chambers, ends, and approaches. A lock chamber, in which vessels to be raised or lowered are held, is formed by two longitudinal walls and a floor. As a rule, the walls and floor are made of reinforced concrete. The chamber is sealed by metal gates located within the upstream and downstream ends. According to the number of successive chambers in a lock, a distinction is made between single locks and flights of locks. The number of chambers in a lock depends on the magnitude of the change in water level and on the relief of the terrain. To increase the traffic capacity of a lock, two or more lanes of chambers are built in tandem.

The main dimensions of lock chambers—that is, their length and width—are chosen when a lock is designed. They depend on the category of the waterway, the amount of freight expected to be handled on the waterway, and the size of the largest vessel, train, or convoy the lock is designed to accommodate at one time. The chambers of the largest locks are up to 33 m wide, up to 400 m long, and—in locks in seaports—from 5 to 15 m deep at the sea entrance. Lock chambers are filled or emptied in a prescribed time, from 5 to 15 min, by means of filling or emptying valves and a culvert system.

The ends of a lock are usually massive headworks. In addition to gates, which maintain the difference in water levels and permit vessels to pass through when the levels of adjacent pools are equalized, the ends contain sluice culverts, equipment for eliminating water turbulence, repair and emergency booms, equipment control mechanisms, and automatic control systems. The approaches to a lock's upstream and downstream ends comprise canals for sectors of a water area that contain both berthing facilities and facilities for mooring ships waiting to be locked and guiding structures for the safe entry of vessels into the lock.

The process of passing vessels through a lock, called lockage, consists in a sequence of operations that are carried out in accordance with commands issued from a control center. The operations include the opening and closing of gates and valves, the filling of the lock chambers with water, the emptying of the chambers, and the entry and departure of vessels. The number of lockages completed in a day during the continuous operation of a lock determines the traffic capacity of the lock.

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A. V. MIKHAILOV [29–1302–2]

LOCKING OF RIVERS, increasing the depth of rivers in individual sections by building a series of hydroengineering complexes that raise the water level above the natural level. Locks are built to facilitate navigation and the integrated use of water resources; in such cases the hydroengineering complexes built include structures to allow the passage of ships (*see* SHIP LIFTS AND INCLINED PLANES). Locks intended solely for navigation are part of low-head hydroengineering complexes with sectional dams whose head levels do not allow the river to leave its channel; they are used where the floodplain is built-up or is valuable for agriculture, for example, on the Moscow, Oka, and Don rivers.

When the water resources of rivers are subject to integrated use, such as the combined use for purposes of power generation and navigation with regulation of river flow by reservoirs, locks are built as the transportation part of the complex and must provide a specified navigation depth on the approaches to the hydroengineering complexes located upstream.

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[29–1305–1]

LOCKSTITCH, in sewing, the portion of stitched thread between two punctures of the needle, produced by means of a shuttle. In lockstitches the interlacing of the threads normally takes place in the material; the form of the stitching on the front and back sides is identical.

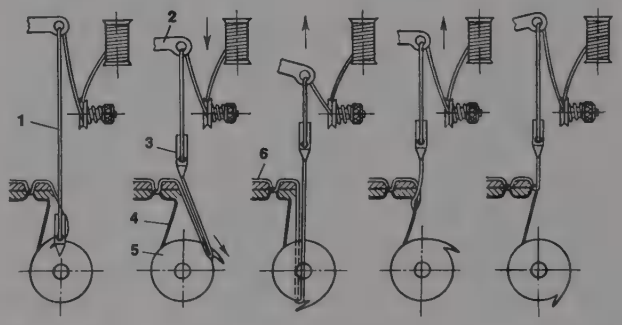

Figure 1. Sequence in the formation of a lockstitch by drawing a loop around a bobbin: (1) needle thread, (2) thread tensioner, (3) eye-pointed needle, (4) bobbin thread, (5) shuttle, (6) material being sewn

Lockstitching usually involves two threads; three threads are used when working with two needles and one shuttle. Lockstitches do not permit much stretching along the stitching and are therefore unsuitable for elastic materials, for example, in knitwear. They are not subject to raveling. Their principal drawback is the loss in strength in the needle thread, since the same portion of the thread passes through the eye of the needle many times while forming the stitches (see Figure 1). [29–137–1]

MAN, the most advanced form of life on earth and the subject of social and historical activity and culture. Various branches of knowledge, including sociology, psychology, physiology, pedagogy, and medicine, are devoted to the study of man. By reworking the various types of data furnished by these sciences, philosophy interprets and gives meaning to their findings.

The question of man's nature (essence), his origin and purpose, and his place in the world has been one of the fundamental problems in the history of philosophical thought. In ancient Chinese, Indian, and Greek philosophy man was perceived as being

a part of the cosmos, of a unified supratemporal "order" and "system" of existence ("nature"). He was viewed as a "microcosm" (Democritus), as a reflection and symbol of the universe, the macrocosm, which was in turn interpreted anthropomorphically as a living being possessing a soul. Man was thought to contain all of the principal elements of the cosmos and to consist of a body and soul (spirit), which were interpreted either as two aspects of a single reality (Aristotelianism) or as two different substances (Platonism). In the doctrine of the transmigration of souls, which was developed in Indian philosophy, the boundary between living beings (plants, animals, men, gods) is not fixed; only man, however, strives for "release" from the fetters of empirical existence and its law of *karma-samsara*. According to the Vedanta, man's specific principle is *atman* (soul, spirit, "self"), which is essentially identical with the universal spiritual principle, or *brahman*. Aristotle's philosophy expressed the view, characteristic of classical philosophy, that man was a living being endowed with spirit and reason (a "rational soul" as opposed to a sensitive or vegetative soul) and with the capacity for social life.

In Christianity, the biblical concept of man as the "image and likeness of god," divided against himself after his fall from grace, is combined with the doctrine of the union of the divine and the human in the person of Christ, enabling every man to commune with the divine. (The term "superman"—Latin *superhumanus*—crystallized in Christian tradition.) Medieval philosophy advanced the concept of personality as distinct from psychophysical individuality and not reducible to some universal "nature" or substance (whether corporeal or spiritual), defining personality as a unique relationship (Richard of St. Victor, 12th century).

The Renaissance was pervaded by a fervent belief in man's autonomy and his boundless creative capacities (Pico della Mirandola). The specific nature of man's sphere of existence was acutely felt by such Renaissance thinkers as Nicholas of Cusa (*On Conjecture*, II, 14). Descartes's idea of thought as the only reliable testimony of human existence ("I think, therefore I am") formed the basis of a new European rationalism that perceived man's uniqueness and essence in his ability to think and reason. The Cartesian dualism of body and soul long determined the kinds of questions raised in anthropology. The body was considered an automaton, a machine common to man and animals (J. de La Mettrie, *L'Homme machine*), and the soul was identified with consciousness. Benjamin Franklin defined man as "a tool-making animal."

Kant regarded What is man? as the fundamental question of philosophy. Proceeding from the dualistic concept of man as a being who belongs to two different worlds, that of natural necessity and that of moral freedom, Kant divided anthropology into physiological and pragmatic spheres: the former investigates "how nature affects man," and the latter studies "what man, as a being possessed of free will, makes or can and must make of himself" (*Soch.*, vol. 6, Moscow, 1966, p. 351).

Rejecting both Cartesian rationalism and the sensationalist empiricism of the 17th and 18th centuries, German philosophy of the late 18th and early 19th centuries revived the Renaissance conception of man as a living totality (J. G. Herder, J. W. von Goethe, romantic nature philosophy). Herder described man as the first being emancipated by nature. Man's sense organs and physical structure, in contrast to those of animals, are not specialized and are more indefinite, which is the source of man's particular advantage: he must mold himself, creating culture in the process. Herder, the Romanticists, and Hegel developed the idea of the historical nature of human existence; Novalis called history applied anthropology. In German classical philosophy man was perceived as the subject of spiritual activity, creating the world of culture, and as the bearer of a universally significant consciousness and a universal ideal principle, namely spirit and reason. Criticizing these ideas of German idealism, L. Feuerbach effected an anthropological reorientation of philosophy. At the center he placed man, defined as a sensible-corporeal being, as the meeting of the concrete "I" and "thou." In Russia the anthropological principle was developed by N. G. Chernyshevskii.

Such noncognitive capacities and powers as feeling and will became paramount in the irrationalist conceptions of man that emerged in the 19th and 20th centuries. According to F. Nietzsche, it is the interplay of vital forces and passions that determines man, and not consciousness and reason. S. Kierkegaard gave primacy to the act of free will by which man "gives birth to himself," to the choice by which the individual—that is, a spontaneous natural being—becomes a personality, a spiritual, self-determining entity. The question of personality is central to the conception of man in personalism and existentialism, which hold that man cannot be reduced to some sort of "essence," whether biological, psychological, social, or spiritual. Rejecting the social nature of personality, existentialism and personalism differentiate between and oppose the concepts of individuality and personality, viewing the former as part of a natural and social totality and the latter as a unique spiritual self-determination (*Existenz*). Dilthey's "philosophy of life" and Husserl's phenomenology paved the way for the emergence of philosophical anthropology as a distinct trend in 20th-century German philosophy, expounded principally by M. Scheler, H. Plessner, A. Gehlen, and E. Rothacker (*Kulturanthropologie*). The naturalist approach to man is characteristic both of exponents of traditional Freudianism and of many 20th-century naturalists in the West.

IU. N. POPOV

Rejecting the idealist and naturalist conceptions of man, Marxism undertook to explain man's natural and social aspects on the basis of dialectical-materialist monism. Marxism begins by treating man as a derivative of society, as the product and subject of social labor. Marx wrote that "the essence of man is no abstraction inherent in each separate individual. In its reality it is the ensemble of the social relations" (K. Marx and F. Engels, *Soch.*, 2nd ed., vol. 3, p. 3).

The Marxist analysis of the question of man is predicated on the discovery of the social essence and concrete historical determination of his consciousness and activity, on knowledge of the historical forms of man's existence and way of life. It also presupposes a disclosure of the relationship between man's social and biological aspects.

Man's social history was preceded by his natural prehistory: the worklike activity of the anthropoid apes, the development of gregarious relations among the higher animals, and the development of acoustic and motor means of communication. According to Marxism, the determining factor in man's development from these precursors was labor, whose origin marked the transition from anthropoid apes to man (F. Engels, *ibid.*, vol. 20, pp. 489–90). Animals cannot fundamentally alter their living conditions; they adapt to their environment, which determines their way of life. Man, on the other hand, does not simply adapt to prevailing conditions. By uniting in joint labor man transforms these conditions to suit his constantly growing needs, thereby creating a world of material and spiritual culture. Culture is created by man to the same extent that man himself is shaped by culture.

Man is a living system uniting the physical and spiritual, the natural and social, and hereditary and acquired traits. As a living organism, man is part of the natural chain of phenomena and is subject to biological (biophysical, biochemical, physiological) laws; at the level of conscious mind and personality, he is oriented toward society, with its specific laws. In terms of physical and morphological structure, man is the most highly organized matter in the known universe. He embodies everything that mankind has accumulated over the ages. This embodiment is achieved through exposure to cultural tradition and through biological heredity. A child inherits a store of genetic information by virtue of the specifically human structure of his body, brain, nervous system, and instincts. "*Man* is directly a *natural being*. As a natural being he is on the one hand endowed with *natural powers, vital powers*—inasmuch as he is an *active* natural being. These forces exist in him as tendencies and abilities—as *instincts*" (K. Marx, in K. Marx and F. Engels, *Iz rannikh proizvedenii*, 1956, p. 631).

However, natural (anatomical and physiological) instincts develop and are realized only under the conditions of social life, through a child's interaction with adults. Marxism repudiates metaphysical concepts about the existence of inborn ideas and capabilities in man. The way in which the biological principles of human life manifest themselves is socially conditioned. Man's life is

determined by a single system of conditions that includes both biological and social elements. The biological components of this unified system are simply the necessary conditions, not the driving force of development. Man's actions and his way of thinking and feeling depend on the objective historical conditions under which he lives and on the characteristics of the social group and class whose interests he represents, either consciously or unconsciously. His spiritual life and the principles by which he lives are not genetically programmed. This is definitely not the case, however, with respect to certain potential artistic aptitudes and individual gifts, which are shaped by society but are based on inherited traits. The development of man's propensities and capabilities is also affected to a certain degree by heredity, primarily through characteristics of the central nervous system.

A world of objects and social structures embodying the activity of preceding generations lies before every newborn human being. It is this humanized world, in which every object and process appears to be charged with a human significance, social function, and purpose, that surrounds man. Human cultural achievements, however, are not presented to man in a finished form but are rather implied in the objective circumstances in which they are embodied. The assimilation of social, historically shaped forms of activity is the fundamental condition and pivotal mechanism in the making of an individual. In order to transform these forms of activity into their personal abilities and make them part of their individual character, human beings from early childhood interact with adults, imitating and being taught by them. As a result, the developing individual acquires the ability to deal rationally with tools, various types of symbols, words, concepts, ideas, and the totality of social norms. As he assimilates the humanized natural world, the child becomes familiar with culture by various means. "Each of his *human* relations to the world—seeing, hearing, smelling, tasting, feeling, thinking, observing, experiencing, wanting, acting, loving—in short, all of the organs of his individual being" take part in this familiarization (*ibid.* p. 591).

During acculturation man develops mechanisms of self-control that are manifested as the ability to control by an effort of will a wide range of inclinations and instincts. This self-control, essentially social control, smothers impulses that are unacceptable to a given social group and constitutes a prerequisite for social life. The more intensively mankind develops, the more complex are the problems of education and upbringing, of the shaping of man as a personality.

Historically formed legal and moral norms, customs, rules of thought and grammar, and aesthetic tastes shape man's behavior and intellect, making individual people representatives of a particular way of life, culture, and psychology. Man "will develop his true nature only in society, and the power of his nature must be measured not by the power of the separate individual but by the power of society" (K. Marx and F. Engels, *ibid.*, vol. 2, p. 146). Marx criticized the concept of man as an isolated monad and emphasized that man remains in full contact with society even when he is alone. Man's awareness of himself always comes through his interaction with other people. Every man is a unique individual but at the same time he possesses a certain essence of the species. A man emerges as a personality when he attains self-awareness, an understanding of his social functions, and a consciousness of himself as the subject of a historical process. The formation of personality is bound up with social differentiation, with the separation of the individual from the collective through the expansion of personal rights and obligations.

The Marxist concept of man rests on the assumption that man can only be free in a free society, where he is not only the means by which social goals are achieved but is above all an end in himself. Marxism holds that the ideal society is a communist society, for only in such a society can man obtain the means that will enable him to realize fully his individuality.

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A. G. SPIRKIN

Origin of man. Man's appearance on earth was the culmination of a complex and prolonged evolutionary development, and as a biological being, he retains close ties with the animal world. These ties are closest to the Primates, an order in which man makes up the hominid family. It is widely thought that the human evolutionary branch separated from the common anthropoid stem during the intense adaptive radiation of apes in the Miocene, most likely 12–15 million years ago. The most probable ancestor of man during this stage was *Ramapithecus* (or *Kenyapithecus*), a highly developed primate known from jaw fragments found in Asia (India, Pakistan), East Africa (Kenya), and Europe (Hungary).

The question of when the first hominids appeared is bound up with the hominization criterion itself, concerning which there are diverse opinions. If hominization is to mean a certain degree of assimilation by man's ancestors of a fundamentally new adaptive zone associated with the development of work activity and culture and with the appearance of a new mode of behavior, then from the morphological point of view the criterion must include the following: erect posture, initial adaptation of the wrist for performing work, and a fairly high level of development of the brain. Accordingly, the oldest authentic representative of the hominids was until recently considered to have been *Homo habilis* ("skillful man"), identified by the British scientists L. Leakey, P. Tobias, and J. Napier in 1964 on the basis of finds in the Olduvai Gorge. The advanced morphological features of *H. habilis* (erect posture and a high level of development of the brain, in which he surpasses all contemporary and fossil anthropoid apes) were linked to the earliest and most primitive stone implements known to science. This hominid, who lived approximately 2 million years ago, was probably the creator of the oldest Stone Age culture, the Olduvai culture.

Later discoveries, however, attested to the even greater antiquity of hominids, particularly the genus *Homo*. In the course of excavations in Kenya in 1972, R. Leakey found "skull 1470" and the accompanying skeletal remains of limbs in the area east of Lake Turkana, formerly Lake Rudolf. The absolute age of the find is more than 2 million years. The skull displays a number of advanced features, even when compared with later hominids, including a relatively high and rounded vault, slight projection of the frontal and occipital bones, and moderate postorbital constriction. The cranial capacity (770–775 cu cm) exceeds that of *H. habilis* (averaging 625 cu cm) and attains a size characteristic of some specimens of Archanthropinae. The shape of the femur is fully human. Working in Tanzania in 1975, M. Leakey found fragments of fossil hominids and stone implements in a stratum 3.5 million years old. Fossil hominids dating from approximately 3 million years ago had been discovered in Hadar (Ethiopia) in 1973–74. The chronological predecessors of modern man also include the Archanthropinae, who appeared some 1.9 million years ago (or perhaps earlier), and *Palaeoanthropus*, who lived from 300,000 to 35,000 years ago. The present species of man (*H. sapiens*) appeared no later than 40,000 years ago and possibly earlier. It would appear that Australia and the Americas were settled as early as the Upper Paleolithic. The predominant type of early *H. sapiens* was Cro-Magnon man, whose remains have been found both in Europe and elsewhere and who survived beyond the Paleolithic. Cro-Magnon man had a straight forehead, superciliary arches (instead of a supraorbital torus), a clearly formed chin protuberance, and a high cranial vault.

The general evolution of the hominids is quite complex and cannot be said to be fully understood. It is likely that during anthropogenesis branchings within polymorphic groups coincided with the direct development of individual branches and their "transformation by stages" (*see* PALAEOANTHROPUS and NEOANTHROPINAE). But these stages were widely coexistent, and their representatives may at times have shared the same culture.

E. N. KHRISANFOVA

Man's biological features. Man is classified as a member of the species *Homo sapiens* (thinking man), genus *Homo*, family Hominidae, order Primates, class Mammalia, and phylum Chordata. The human organism has many characteristics in common with

vertebrates, and especially with mammals. As in all vertebrates, the basis of man's internal skeleton is the spinal column, which is preceded during embryonic development by the notochord. Man has two pairs of extremities, a closed cardiovascular system, and a tubular nervous system. His body is structured on the principle of bilateral symmetry and exhibits metamerism, which is typical of all vertebrates.

As a mammal, man has a characteristic skin structure (a highly developed corium, or dermis, numerous sebaceous and sweat glands, and a covering of hair, albeit rudimentary over most of the body), a stable body temperature, pulmonary respiration, a four-chambered heart, erythrocytes without nuclei, and mammary glands producing milk for the nourishment of the young. Development of the embryo within the mother's body is accompanied in man, as in the other higher mammals, by the appearance of a special organ, the placenta.

Mammals have a well-developed nervous system and sensory organs, which helped them to survive and progress. Man advanced beyond the other mammals by virtue of the strong development and differentiation of his cerebral cortex.

Man's most characteristic anatomical and physiological features are his erect posture and gait, free upper extremities (for making and using tools), and highly developed means for social interaction. Also distinctive are certain features of the structure of the teeth, jaws, digestive glands, and alimentary organs. The need to maintain balance while walking erect has resulted in a curvature of the spinal column and a shift in the center of gravity.

The freeing of the upper extremities from their functions of body support and locomotion necessitated an increase in the size of the skeleton of the lower extremities, a powerful development of the muscles of the lower extremities, and the appearance of the arches of the feet, with their cushioning function. There was also a significant change in the structure of the pelvis, which became larger and wider and which came to serve as the main support for walking erect. All the internal organs adapted to erect posture; the means for supplying blood from the lower extremities to the heart and from the heart to the brain became more complex. The diaphragm shifted from a vertical to a horizontal position, and the muscles of the abdominal prelum acquired a significantly greater role in respiration.

Man interacts with other people by means of gestures, mimicry, and articulated speech, which are made possible by a corresponding development of the muscles, the vocal apparatus, and the means for controlling them, including the speech centers of the cortex. Articulated speech, the main channel of interpersonal communication, is inaccessible to animals.

Man's brain has surpassed the simian brain in both absolute and relative terms. A human brain weighs three times more than the brain of a gorilla, whose body weight is three times that of a man. Because of his remarkably well-organized nervous system, man has the prerequisites for unlimited intellectual and emotional progress.

Man is born with incompletely formed anatomical and physiological systems, but they are in the "human" mold. Thus, the parts of the skeleton and the muscles that are involved in walking erect are genetically preadapted even before a child's birth. The skeleton of children who develop using all four extremities for support (children reared by animals, mental defectives), as well as the skeleton of children with paralyzed lower limbs, remains human. In such animals as monkeys and dogs, enforced two-legged locomotion is capable of altering only certain structural features of the skeleton. Similarly, the morphophysiological characteristics of the vocal apparatus and the prerequisites for the subsequent development of speech are also established before birth. These features are absent even in animals that are closely related to man. Advanced development of the new areas of the cortex, and especially of those areas that will become the most highly differentiated, is observed during the ontogenetic development of the human brain. Consequently, man's social nature is manifested as soon as his hereditary information is implemented.

V. V. KUPRIIANOV

All modern men belong to a single species, which is subdivided into several main races. The main traits of the species *H. sapiens* are characteristic of all races of man, without exception. All races are thus at an equally high level of biological development, contrary to the reactionary assertions of racists. With respect to the time of origin and the number of centers of racial genesis, several hypotheses have been put forward. According to some of them, there was a single fairly extensive geographic area in which modern man, and the races of modern man, developed. Polycentric hypotheses postulate from two to four or five such centers. During the Paleolithic and Mesolithic the density of the population was extremely low, less than one person per 3 sq km. In the Neolithic the density increased approximately tenfold. By the year 1000 the population of the earth was 275 million, by 1500 it had expanded to 450 million, and by 1600 it had grown to 500 million. In 1800 the earth was inhabited by about 1 billion people, and in 1977 by approximately 4 billion.

The early stages in the development of hominids were probably closely associated with tropical forest-steppe and steppe regions. Subsequently, man significantly extended his habitat, settling even in deserts, polar areas, and mountain regions, although the largest modern groups inhabit tropical forests and temperate regions with mixed forests. Thus, *H. sapiens* is panecumenical, that is, a widely distributed species. He includes numerous populations that, upon interbreeding, produce fertile offspring and that exhibit significant phenotypical variability.

The intraspecies polymorphism of man's physique has been known since ancient times. Attempts to classify the various builds of the human body have resulted in the creation of constitutional schemes generally based on clearly delineated types. Since such schemes make it impossible to classify most people, increasing work has been done on the elaboration of quantitative methods that are based on a continuous distribution of constitutional components (muscles, bones, fat). Modern anthropology takes a comprehensive approach to the question of the human constitution, studying the correlation between morphological, physiological, biochemical, and psychological factors.

The quantitatively balanced polymorphism of man as a species reflects, to a certain extent, the adaptive radiation of human populations. Thus, for example, the proportion of the various types of physiques may vary significantly in different groups of mankind. A higher incidence of the "elongated type" is found among Arab desert dwellers, especially the bedouin of the Libyan Desert, or among the Nilotic peoples of Equatorial Africa. The "stocky build," on the other hand, is typical of certain variants of the arctic race (Eskimo). It is believed that such physiques are better adapted to maintaining physiological functions in a hot (or cold) climate through thermoregulation. As a general principle, the "ecological gradient" (the ratio of body weight to surface area) increases among inhabitants of colder climates and decreases among equatorial groups. Consequently, groups from colder climatogeographical zones are heavier and have a relatively smaller skin area.

The most clearly discernible forms of physiological adaptation are also observed under extreme living conditions, found primarily in northern, equatorial, and alpine regions. There is, for example, a decrease in the basal metabolic rate from northern to equatorial regions; the opposite tendency is observed for blood immunoglobulins, whose quantity increases in equatorial groups. Among mountain populations there is an increase in hemoglobin content. The origin of these traits is quite complex, although some of them are apparently genetically determined. For example, an effective method for stabilizing cholesterol has evolved among the East African Masai, whose food is generally very fatty but who nevertheless have low levels of cholesterol and virtually never suffer from atherosclerosis. Yet another example is the presumed decrease in tissue sensitivity to the metabolic effects of the growth (somatotropic) hormone among the nanitic Pygmies of Africa. The phenotype has also been found to depend on a whole range of external factors, the foremost of which are socioeconomic (nutrition, illness).

A specific feature of the interrelationship between man and his environment is the fundamentally new form of adaptation that he has created, in the course of which man alters his environment, causing simultaneous changes in human social relationships. This process takes place without a restructuring of man's morphofunctional organization. But man's biological adaptation is also of a specific kind for it involves the preservation of both his biological and social functions and is affected by the increasingly important

social factor. In contrast to animals, man preserves the morphofunctional characteristics of his species regardless of changes in his natural environment by means of sociohistorical labor activity. As a result of man's long-term influence on his surroundings a new, "artificial" environment has been created which, in turn, exerts a significant influence over various aspects of his vital activity. This process has gained momentum under the conditions of the scientific and technological revolution, in connection with further industrialization, urbanization, and the creation of artificial ecosystems. Since the middle of the 20th century the question of man's interrelationship with the environment has become a vital issue and has essentially been treated as the problem of man and the biosphere.

Sexual dimorphism and a uniform growth and biomorphosis are typical of all ethnoracial groups of *H. sapiens*. Sexual differences, manifested from the earliest stages of the postnatal period, are first expressed in the rate of development, inasmuch as indicators of biological growth show girls to be in the lead. Moreover, various harmful influences have a lesser effect on the growth processes of women than those of men, which is sometimes attributed to the "protective" action of the two X chromosomes in women. Sexual dimorphism is clearly manifested morphologically in overall bodily dimensions, proportions (relatively broader hips in women and wider shoulders in men), the development of "bodily components" (the better development of subcutaneous fat in women and of muscles and bones in men), microstructural features (muscle fiber diameter, dimensions and total number of fat cells), and certain histochemical characteristics. At all ages, there is a larger percentage of athletic types among men and of pyknic types among women. Studies also show that the athletic type in men and the pyknic type in women are characterized by relatively high levels of secretion of the sex hormones, androgens in males and estrogens in females. Finally, sexual differences also affect many physiological and biochemical traits. Thus, for example, body temperature, arterial pressure, pulse rate, red and white blood cell indexes, basal metabolism, and other factors exhibit a marked periodicity in women (in contrast to men) associated with the reproductive cycle.

A specific characteristic of man's individual development is his relatively long childhood with a comparatively slow rate of growth, followed by a leap in the growth rate in connection with sexual maturation. Chimpanzees and certain other apes exhibit a similar type of growth process, but with them the interval between rearing and sexual maturity is shorter. For this reason, these principles of growth may be viewed as being characteristic of a certain stage in the evolution of the primates, particularly of the hominids, in whose emergence the longer period of instruction of young individuals played an important role. This type of growth is characteristic of modern man, although there may be certain variations in the rates of development of groups and particularly of individuals.

Individual variations in the rate of development are apparent in any group of growing individuals, where there is always morphophysiological differentiation at a particular chronological age that determines, in the final analysis, the "biological age" of an individual. Criteria used to establish biological age include various morphological, physiological, and biochemical tests, including those showing the development of the skeleton (skeletal age) and dental system (dental age), sexual development, and hormonal status. Biological age is also determined on the basis of certain indexes of higher nervous activity that depend mainly on age, as well as indexes of the cardiovascular and muscular systems. All of these indexes can change either more or less synchronously or asynchronously, and they can reveal a tendency toward acceleration or retardation of development. The indexes of skeletal, sexual, and general somatic development, which are particularly closely interrelated, are most often used as criteria of biological age. The various indexes are of different diagnostic value, however, depending on age.

Rates of development, and consequently biological age, are influenced by many factors. Studies of twins have shown the importance of hereditary factors in determining the skeletal and dental ages, the quantity of sex hormones secreted, and the age at which menstruation begins. A very important role is also played by the socioeconomic factor; environmental factors (climatic, geochemical) have a lesser effect on biological age.

The "secular trend," which has been observed in many countries, especially during the last century, and which is manifested primarily as an acceleration of the developmental processes, an increase in physical dimensions, and some redistribution of physique types, is evidently just a variational phase within the limits of the *H. sapiens* species complex. Similar secular, or even epochal, changes may also have occurred much earlier. Indeed, anthropologists have determined that body length and the shape of the face and head have been changing since the Neolithic and even earlier. The dynamics of these phenomena has been thoroughly investigated by Soviet scientists. The processes of brachycephalization (an increase in the relative breadth of the head, expressed in cephalic indexes) and debrachycephalization (the opposite tendency) have been especially well studied. The Japanese researchers S. Morita and F. Otsuki (1973) point out, for example, that just over the past 50 years the cephalic index of Japanese men has increased by 3.3 as a result of a widening of the head. Studies by the Soviet anthropologist V. V. Bunak (1968) show that the average height of young Russian men increased by 3 cm in 40 years. Epochal variations have also been noted in indexes of sexual maturity, and they are possible for many other characteristics as well. All of these changes have been random, and the rate of change has varied with location and the period of human development.

The main reasons for these microevolutionary phenomena within the *H. sapiens* species are evidently of a genetic nature, associated chiefly with the interbreeding of the planet's populations, changes in gene frequencies, and alterations in dominance, although the manifestation of such phenomena also depends on a series of other factors, including socioeconomic ones. Nevertheless, the freeing of Neoanthropinae from the species-forming type of natural selection, the stabilizing form that natural selection takes in modern society, and the development of panmixia, which conteracts the natural mutational process, make it impossible to predict at this time any important changes in the *H. sapiens* species complex that emerged in the Upper Paleolithic.

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MANDIBULAR ARCH, a supporting element of the visceral skeleton in gnathostomatous vertebrates, including humans. The mandibular arch is situated directly in front of the sublingual arch. In the course of evolution, the mandibular arch differentiated into the primary upper jaw (palatoquadrate cartilage) and primary lower jaw (Meckel's cartilage). [29–156–1]

MANGE, a disease in animals caused by various itch mites parasitic to the animals. Various types of mange are distinguished according to the mite species and its location on the skin, for example, acaridic mange, psoroptic mange, feather mange, chorioptic mange, and otodectic, or ear, mange. Itch mites are host specific species. For example, among the psoroptic mites, *Psoroptes equi* parasitizes horses, *P. bovis* parasitizes cattle, and *P. ovis* parasitizes sheep.

For symptoms, treatment, and prevention of mange diseases, *see* ACARIASIS; DEMODETIC MANGE; and CHORIOPTIC MANGE.

[29–342–2]

MARASMIUS SCORODONIUS, a capped basidiomycetous fungus of the family Tricholomataceae. The cap, which measures 1–3 cm across, is reddish, yellowish, or brownish. Initially bell-shaped, the mushroom eventually becomes flattened. The stalk, which reaches 4 cm in height and 0.5–2 mm in diameter, is red-brown below and lighter above. *M. scorodonius* grows from July to September in the edges and glades of coniferous and hardwood forests on fallen leaves (needles) and branches, especially after a rain. *M. scorodonius* has the odor and taste of garlic; it is used as a seasoning. The mushroom dries well and retains its odor. [29–342–1]

MARRUBIUM (horehound), a genus of plants of the family Labiatae. The plants are perennial or, less commonly, annual woolly herbs with opposite entire leaves. The pink, violet, white, or yellow flowers are gathered into dense false whorls in the axils of the uppermost leaves. The corolla has a flat upper lip. The fruit consists of four nutlets.

There are about 40 species, distributed in North Africa and the temperate and subtropical belts of Eurasia. The USSR has 15 species, growing mainly on dry slopes in the Caucasus. The most common species is the white-flowered common horehound (*M. vulgare*), which occurs in the western and southern regions of the European portion, in the Caucasus, and in Middle Asia. The plant usually grows near roads, in crops, on long-fallow land, and in wastelands. The common horehound contains a substantial amount of nectar. Many species contain tannin. [29–832–4]

MATRIX BALANCE SHEET (Russian, *shakhmatnaia oborotnaia vedomost'*), a form used to show bookkeeping entries in a profile of corresponding synthetic accounts and to provide periodic summaries. It lists totals for economic operations of a similar nature. A matrix balance sheet consists of a table in which debits are entered in horizontal rows and credits are entered in vertical columns. All operations pertaining to the given corresponding accounts have their totals (turnovers) entered at the points where the columns and rows intersect. A single entry thus gives two indications of an operation.

Unlike a simple consolidated balance sheet, a matrix balance sheet not only gives totals for the turnovers of each account but also lists the components of the turnovers. This makes it possible to verify the completeness and accuracy of entries in the various accounts, to ascertain the primary economic factors of operations as reflected in the debit and credit side of each account, and to detect errors in the correspondence of accounts. A matrix balance sheet occasionally includes inventories for synthetic accounts in addition to turnovers; in such instances the term *shakhmatnyi balans* is sometimes used in Russian.

Although a matrix balance sheet is too unwieldy and complex to be used in all forms of accounting, the matrix principle is widely used to create accounting registers. Thus, in the summary-journal form of accounting, all basic registers are constructed in matrix form, thereby substantially reducing the volume of accounting operations. [29–894–1]

MATTE, an intermediate product or a by-product in nonferrous metallurgy. A matte is an alloy of variable chemical composition that consists of iron sulfide and sulfides of nonferrous metals.

Owing to the low solubility of sulfides of nonferrous metals in oxide melts, the relatively low melting point (below 1100°C) of such sulfides, and the high density (greater than 4 g/cm^3) of the sulfides, a molten matte separates from a slag upon smelting and forms a separate layer below the slag. A matte is a primary product into which copper, nickel, and cobalt go when a copper sulfide or nickel sulfide raw material is smelted or when oxide ores are processed by means of certain techniques. Mattes usually contain 10–50 percent Cu and Ni, 15–25 percent S, and Fe as the remainder. Mattes are also produced in lead smelting when copper and sulfur are present in the raw material. As a rule, noble metals and metal impurities in raw materials accumulate in mattes.

Mattes are processed in a converter (*see* CONVERTER BLOWING OF MATTE), where the sulfur is oxidized and the iron is converted from the sulfide form to the oxide form and, together with silica, yields converter slag. The copper sulfide and nickel sulfide are subjected to further processing after the iron is removed.

Nickel matte produced in smelting is sometimes called raw matte. A matte that is produced after converter blowing and has an iron content of less than 3 percent is referred to as converter matte. A matte with an intermediate iron content is known as furnace matte. Copper matte that is produced after the completion of the first blowing period and contains < 1 percent Fe is called white matte. I. D. REZNIK [29–1463–2]

MAY FOURTH MOVEMENT, a mass anti-imperialist movement in China in May and June 1919.

Influenced by the Great October Socialist Revolution in Russia, the May Fourth Movement developed in response to the decision of the Paris Peace Conference not to return to China the former German concessions in Shantung, which had been captured by the Japanese. It began on May 4, 1919, in Peking, where students demonstrated against the decision and the betrayal of Chinese national interests by the venal leaders of the Peking government. The police arrested several dozen demonstrators; the students of Peking responded the following day by boycotting classes and declaring a strike.

The action of the students in Peking was supported by students in other cities, and in early June workers, the urban petite bourgeoisie, and the nationalist bourgeoisie joined the struggle. The principal center of the movement shifted from Peking to Shanghai, where 50,000–70,000 workers and nearly all the merchants went on strike. Under pressure from the popular masses, the Peking government was forced to dismiss the three officials who had compromised themselves most by their ties with the Japanese imperialists. The May Fourth Movement provided a strong impetus to the development of the working-class and national liberation movement in China and fostered the dissemination of Marxism throughout the country.

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V. P. ILIUSHECHKIN [29–351–3]

MELITAEA AND EUPHYDRYAS, two closely related genera of butterflies of the family Nymphalidae. The wingspread is 2–5 cm. The wings are brown above, with transverse parallel stripes of many black spots. The underwings are usually light yellow with an intricate black pattern. The caterpillars, which have spines distributed in rows along the body, feed on the leaves of herbaceous plants, trees, and shrubs. They spend the autumn and winter in groups in weblike nests. Those that have wintered live singly.

Melitaea and *Euphydryas* are distributed in Europe, nontropical Asia, and northern Africa. Of the approximately 150 species, about 50 occur in the USSR. Among the most common species is *M. maturna*, which flies from May to July and whose caterpillars live on leafy trees and shrubs (poplars, willows, lilacs, honeysuckle) and herbaceous plants (plantain, wood sorrel, violets, scabious). The butterfly is distributed in the central and steppe belts of the European USSR, in southern Siberia, and in the Far East. Also common are *M. cinxia* and *M. athalia*, which are distributed in the European USSR, in the Caucasus, in Siberia, and in the Far East. Their caterpillars feed on herbaceous plants (plantain, hawkweed, cowwheat). [29–920–1]

MEROPIDAE, a family of birds of the order Coraciiformes. The body measures 15–35 cm in length. The bill is compressed and slightly curved. The wings are long and pointed, and the flight is rapid. The legs are short and the birds walk clumsily. The plumage is dense, shiny, and alike in both sexes. Dark blue, green, and yellow tones predominate.

The family comprises seven genera, which include 21 species. The Meropidae are distributed in the temperate and tropical parts of Europe, Africa, Asia, and Australia. Some species are migratory. There are two species in the USSR: the common bee-eater (*Merops apiaster*), which is found in the south, from Moldavia in the west to as far east as the Altai and as far north as Kazan and Ufa, and the blue-cheeked bee-eater (*Meropidae superciliosus*), which lives in the arid parts of the Caspian Region and Middle Asia. Both species are migratory.

The Meropidae inhabit open spaces, shunning forests. They nest in colonies in burrows dug in cliffs or flat areas. The clutch contains two to nine white eggs, which are incubated by both the male and female. The young are bare upon hatching. The diet consists of insects, including wasps and bees, which, like the swallows, the Meropidae catch on the wing, taking off from a branch or edge of a cliff. The Meropidae are harmful to apiculture, since they feed on bees. [29–1620–5]

MINE, UNDERGROUND (in Russian, *shakhta*), a mining enterprise that extracts minerals by underground methods and ships them to a consumer or an ore-enrichment plant. An underground mine includes both surface structures—for example, headframes, headhouses, and storehouses—and all the underground mining excavations that are used to work a deposit within a mine area. Such a mine is a mechanized and automated enterprise equipped with efficient machinery and devices for the extraction and hauling of minerals, for the sinking of mining excavations, for the removal of mine water, and for ventilation. Underground mines that work large deposits have lives of 50–70 or more years.

The largest underground coal mine in the USSR is the Raspadskaia Mine, which is in the Kuznetsk Coal Basin and has a projected eventual output of more than 7 million tons a year. The largest underground iron mine in the USSR is the Gigant Mine, which is in Krivoi Rog and has a projected eventual output of 12 million tons a year. The deepest underground mine in the USSR is the Academician A. A. Skochinskii Mine, which is in the Donets Coal Basin and is 1.2 km deep.

The deepest underground mines in the world are gold, silver, and diamond mines; they are 4–4.5 km deep. They include the Champion Reef gold mines in India and the Witwatersrand gold mines in the Republic of South Africa. [29–907–1]

MINE AREA, a mineral deposit or the portion of a deposit that is assigned for working by a single mine. A mine area is delineated according to the strike, rise, and dip of the seam or stratum; that is, the area is bounded on the sides, from above, and from below.

When a deposit is divided into mine areas, the boundaries of the areas are fixed during the planning stage either on the basis of technological and economic considerations or in accordance with major geological disturbances and barrier pillars. If a deposit's strata are undisturbed, the mine area is shaped as a rectangle with the long side following the strike.

A mine area contains mineral reserves whose extent predetermines the production capacity and life of the mine. [29–912–2]

MINE HOIST, a set of machines and devices that are used to raise or lower personnel and loads in vertical or inclined shafts.

A mine hoist (Figure 1) includes a hoisting machine, hoist cables, receptacles, and sheaves; the sheaves are mounted on the headframe. Useful minerals are loaded into the receptacles by means of a loading chute and are discharged into a bin. The hoisting machine (Figure 2) comprises a winding drum or driving sheave, a brake, reduction gears, an electric motor, and a control console.

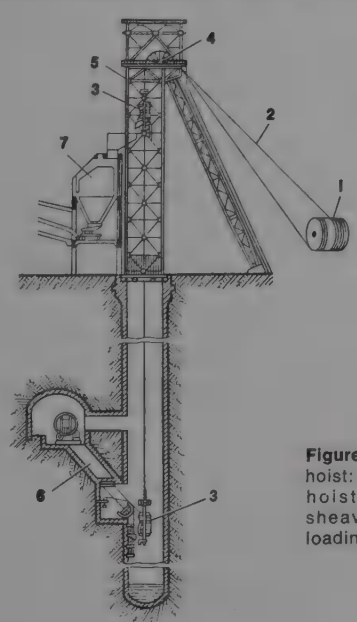

Figure 1. Diagram of a mine hoist: (1) hoisting machine, (2) hoist cables, (3) skips, (4) sheaves, (5) headframe, (6) loading chute, (7) bin

Depending on their purpose, various types of mine hoists are distinguished. Main hoists are used to raise useful minerals and barren rock to the surface. Auxiliary hoists are employed to raise or lower personnel and various loads. Sinking hoists are used in the sinking or deepening of shafts. Inspection or emergency hoists are employed to inspect shafts or to raise personnel in emergencies.

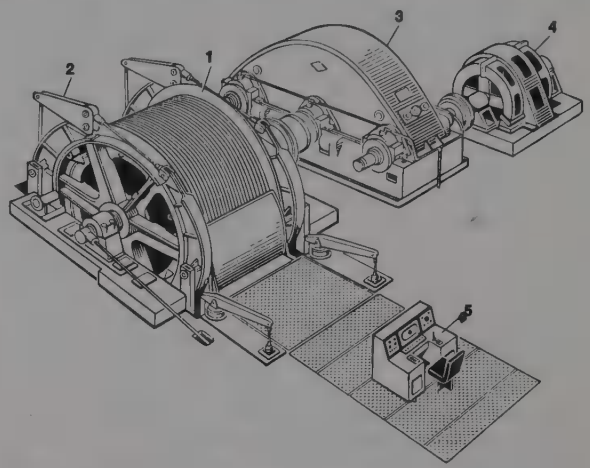

Figure 2. A hoisting machine with a cylindrical drum: (1) winding drum, (2) brake, (3) reduction gears, (4) electric motor, (5) control console

The receptacles used in mine hoists may be cages, skips, or buckets. Depending on whether or how the weight of the hoist cables is balanced, the hoisting may be unbalanced, statically balanced, or dynamically balanced. The winding drum or driving sheave may have a single radius or a large and a small radius. Cylindrical drums and Koepe sheaves have a single radius; bicylindroconical drums have a large and a small radius.

Electric motors with an output of up to 5,000 or more kilowatts (kW) are used in hoisting machines. AC induction motors are widely employed. The output of such motors is 1,800–2,000 kW for skip hoists or 800–1,000 kW for hoists that raise and lower cages. DC motors are usually employed in high-capacity hoists.

From the viewpoint of engineering and economy, the best maximum cable speeds range up to 20 m/sec for hoisting loads and up to 12 m/sec for hoisting personnel.

Multirope friction winders are promising. Such hoisting machines are tower mounted over shafts and are used to hoist two skips or two cages or to hoist a single receptacle balanced by a counterweight. In particular, hoists driven by multirope friction winders are used to service several levels at the same time.

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N. G. KARTAVYI and E. A. PROKHODTSEVA [29–914–4]

MINE PROBE, a pointed, steel-tipped rod that is 2–3 m long and is used for detecting antipersonnel and antitank mines buried at a shallow depth. In searching for mines, the probe is thrust into the ground every 20 cm at an angle of 20°–45° and to a depth of up to 15 cm. If the probe strikes a hard object beneath the surface, the spot is examined thoroughly. [29–1619–2]

MINE TELEPHONE, a mine rescue wired-communications device that provides direct two-way communication with loudspeakers between an underground base and a mine rescue squad.

The Sh-1 mine telephone, which is used in the USSR, consists of a base set and two squad sets. The squad sets may be held in the hand or fastened to the work outfit with a spring hook. Semiconductor devices and printed wiring are used in the electrical components of the telephone sets, which are designed to operate with general-purpose cable drums.

The Sh-1 mine telephone is designed for continuous operation at temperatures of 0° to 50°C, at relative humidities of up to 90 percent, and under conditions of exposure to coal dust, foul air, and underground water. The telephone has a communications range of 5 km and operates continuously for 100 hr without replacement of the power source. It is sparkless and, together with its carrying case, weighs 4.8 kg. [29–916–1]

MONTENEGRINS, a nation in Yugoslavia, numbering 508,800 persons (1971 census), most of whom live in Montenegro (355,600) and Serbia (125,300). Montenegrins speak the Štokavian dialect of Serbo-Croatian. The majority of believers belong to the Orthodox Church, and the rest are predominantly Muslims.

In terms of culture and way of life, the Montenegrins have much in common with the Serbs. However, the geographic isolation of their mountainous homeland, the centuries of struggle for independence from the Ottoman Empire, and the resultant militarization of life hindered Montenegro's socioeconomic development and helped preserve the patriarchal clan social order. Although the ethnic composition of the Montenegrin clans (Vasojevići, Piperi, Kući, Belopavlići) was somewhat mixed owing to the influx of refugees from other parts of the country and groups of Albanian origin, it was popularly believed that all the members of a clan had a common ancestor and were blood relatives. Livestock raising and farming were the traditional occupations.

After the proclamation of a socialist Yugoslavia in 1945 and the creation of the republic of Montenegro, mechanization and new techniques were introduced in agriculture, and industrial enterprises were established. The former cultural backwardness of Montenegro has been overcome. The indigenous applied arts, notably wood and stone carving, metalworking, and embroidery, are flourishing. Oral poetry, music, and dance continue to develop vigorously. (For more information about the history, economy, and culture of the Montenegrins see MONTENEGRO.)

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M. S. KASHUBA [29–276–1]

MONTENEGRO (Crna Gora), Socialist Republic of Montenegro (Socijalistička Republika Crna Gora), a republic in Yugoslavia. Situated in the southeastern part of the Dinaric Alps and washed by the Adriatic Sea, Montenegro covers an area of 13,800 sq km and has a population of 575,000 (1977). Montenegrins, who speak Serbo-Croatian, constitute more than two-thirds of the population, which also includes Bosnians, Serbs, and Albanians. The capital is Titograd.

A socialist republic, Montenegro has voluntarily joined with other, equal socialist republics to form a federated state, the Socialist Federal Republic of Yugoslavia. Its present constitution was adopted in 1974. The supreme governing body is the republic Skupština (assembly), which consists of three chambers—the Council of Associated Labor, the Sociopolitical Council, and the Council of Communes. The government (cabinet) of the republic is the Executive Council.

Natural features. A large part of Montenegro is occupied by the Dinaric Alps, which rise to 2,522 m on Mount Durmitor. The Montenegrin Karst Plateau lies in the southwest. The marginal ridges of the highland descend precipitously toward the Adriatic, leaving only a narrow strip of coast. The northern shore of Lake Scutari is fringed by a lacustrine plain. The prevailing temperate continental climate gives way to a Mediterranean climate along the coast. The precipitation ranges from 1,600 mm to 1,800 mm annually, increasing to 3,000 mm near the coast. The mountain slopes are covered with coniferous and mixed forests. Mediterranean shrub vegetation grows along the Adriatic coast.

Historical survey. Inhabited from Paleolithic times, Montenegro was settled in the Bronze and Iron ages by Illyrians, who were conquered by the Romans in the first century B.C. In the next century the territory became part of the Roman province of Dalmatia, and in 297 it was included in the province of Praevalitana. (Called Dioclea until the 11th century, when it was renamed Zeta, the land acquired its present name in the 15th century.) In 493 some of the area was absorbed into the Ostrogothic state, and in 536 it fell under Byzantine control. In the seventh century Montenegro was settled by Slavs, who were converted to Christianity in the ninth century.

During the reign of Prince Vladimir (c. 970–1016) the area came under the rule of the Bulgarian king Samuil, but in 1018 Byzantium reasserted its hegemony. Under Prince Vojislav (1031–51), Montenegro freed itself from Byzantine control and annexed Travunija and Zahumlje. In 1077, Prince Mihailo assumed the royal title. During the reign of King Bodin (c. 1082 to c. 1101), all of Serbia was incorporated into Zeta. Feudal relations developed in the country, and the coastal cities of Kotor, Budva, Bar, and Ulcinj prospered. Montenegro was absorbed into the Serbian Nemanja state under Stefan Nemanja (ruled c. 1170–96), regaining its independence only in 1366 after the death of Stefan Dušan.

The succeeding native rulers—the Balšić princes (1361–1421) and the Crnojević princes (1422–1528)—were compelled to fight against Venice and the Ottoman Empire. Between 1396 and 1443 Venice gained control over the Montenegrin coastal cities, and in 1479 Turkish forces seized Scutari and established themselves in the plains region. In 1499, Montenegro was officially included in the Ottoman Empire, but the Montenegrins stubbornly refused to recognize the authority of the conquerors. Feudalism had made little headway in the country, where much of the land was controlled by extended families called *zadrugas*. The *zadrugas* banded together to form clans, which in turn formed tribes ruled by elders called *knezes* and *vojvodas*.

In an effort to assert their independence, the Montenegrins sided with Venice in the Venetian-Turkish War of 1645–69 and in the Holy Alliance's war against the Ottoman Empire (1683–99). Bishop Danilo Petrović-Njegoš (ruled 1697–1735), who founded the Njegoš dynasty, killed or expelled the pro-Turkish feudal lords, that is, Montenegrin noblemen who had converted to Islam. Under Danilo a judicial body was created for all of Montenegro, called the Court of Bishop Danilo, and the country established closer ties with Russia. In 1711 the Montenegrins responded to Tsar Peter I's call to join the war against the Ottoman Empire. By the Treaty of Passarowitz (Požarevac, 1718), which concluded the war between the Ottoman Empire on the one hand and Austria and Venice on the other, Venice received a number of coastal communities, depriving Montenegro of access to the sea.

During the reign of Petar I Petrović-Njegoš (1781–1830), Montenegro's ties with Russia were greatly strengthened. After the Austro-Russo-Turkish War of 1787–91, the Montenegrins began their drive for independence by defeating the army of the Scutari vizier Mahmud Pasha Bušatli at the battle of Kruse on Sept. 22, 1796. During the Napoleonic wars and the rise of the national liberation struggle of the Serbian people (1804–15), the Montenegrins sided with Russia and Serbia. In 1813 they gained control of Boka Kotorska, which was returned to Austria at the Congress of Vienna (1814–15). Petar II Petrović Njegoš (ruled 1830–51) strengthened the central government and established the Administrative Senate (1831). Petar's successor, Danilo (ruled 1851–60), proclaimed Montenegro a hereditary principality in 1852.

During the Bosnia-Hercegovina uprising of 1875–78, Montenegro gave the rebels military and material aid, and in 1876 it joined Serbia in declaring war on the Ottoman Empire. Achieved as a result of the Russo-Turkish War of 1877–78, Montenegro's independence was confirmed by the Berlin Congress of 1878, which recognized Montenegro's jurisdiction over the areas of Podgorica, Kolašin, Nikšić, Žabljak, Bar, and Ulcinj but significantly reduced the territory awarded to Montenegro earlier that year by the Treaty of San Stefano.

Capitalist development, which began in the first half of the

19th century, gained momentum in the last third of the century. Several changes took place in the superstructure: in 1879 the Senate was replaced by the State Council, ministries, and the High Court, and in 1888 the Property Code was adopted, introducing some norms of bourgeois law. The first labor organization, the Workers' Alliance, was formed in 1903. Under the influence of the Russian Revolution of 1905–07, opposition to the autocratic regime of Prince Nikola (ruled 1860–1918) mounted, leading to the formation of the People's Party in 1906. The constitution of 1905 established the Skupština (assembly) as a permanent body. Proclaimed a monarchy in 1910, Montenegro joined the Balkan League in 1912 and took part in the Balkan Wars of 1912–13. As an ally of the Entente in World War I, Montenegro was occupied by Austro-Hungarian forces from January 1916 until the autumn of 1918. Looking to Russia and France for support, the majority of bourgeois émigrés formed in March 1917 the Montenegrin Committee of National Unification, which in August accepted the Corfu Declaration.

Under the impact of the October Revolution of 1917 in Russia, Montenegrins launched a mass movement for national and social liberation and for unification with Serbia on a democratic basis. Meeting in Podgorica in November 1918, the Great People's Skupština adopted a resolution calling for union under the aegis of the Serbian king. On Dec. 1, 1918, Serbia, Montenegro, and the Yugoslav (South Slav) areas of former Austria-Hungary united to form the Kingdom of the Serbs, Croats, and Slovenes, renamed Yugoslavia in 1929. In the new state Montenegro was a backward agrarian hinterland. Bent on creating a Greater Serbia, the ruling elite hindered the economic growth of Montenegro and tried to impose Serbian customs on the inhabitants. After the coup of 1929 and the establishment of a military-monarchist dictatorship in Yugoslavia, Montenegro ceased to exist as an independent administrative unit.

In April 1941, Montenegro was overrun by fascist troops along with the rest of Yugoslavia. The Italian occupying forces designated the area a governorate. During the National Liberation War in Yugoslavia (1941–45), led by the Communist Party of Yugoslavia (founded 1919), Montenegro became one of the centers of armed resistance. The July 13, 1941, uprising against the occupying forces is now celebrated as the Day of the Uprising of the Montenegrin People. A national democratic governing body, the National Liberation Committee, was formed on July 21, 1941. The Regional Antifascist National Liberation Council of Montenegro and Boka, formed in November 1943 in Kolašin, was reorganized as the Antifascist National Liberation Skupština of Montenegro in July 1944. Montenegro was completely liberated from the fascist occupying forces and their accomplices by the National Liberation Army of Yugoslavia on Dec. 31, 1944. The People's Government of Montenegro and a supreme legislative and executive body, the People's Skupština of Montenegro, were established in April 1945.

When the Federal People's Republic of Yugoslavia (FPRY) was proclaimed on Nov. 29, 1945, Montenegro became one of its six national constituent republics. The status and sovereign rights of the People's Republic of Montenegro (PRM) as an equal member of the federation were guaranteed by the constitution of the FPRY, adopted in January 1946, and by the constitution of the PRM, promulgated in December 1946. Like the rest of Yugoslavia, Montenegro underwent profound socioeconomic transformations that enabled it to embark on socialist construction. The achievements in socialist construction, based on self-government, have been recorded in two successive constitutions of the Socialist Federal Republic of Yugoslavia and the Socialist Republic of Montenegro, promulgated in 1963 and 1974. The leading ideological and political force of the SRM is the League of Communists of Montenegro, an integral part of the League of Communists of Yugoslavia. The Socialist Alliance of the Working People of Montenegro belongs to the Socialist Alliance of the Working People of Yugoslavia.

A. E. MOSKALENKO (through the 18th century) and I. G. IANU

Economy. With 2.6 percent of Yugoslavia's population, Montenegro in 1975 accounted for 1.8 percent of the national income, 1.5 percent of the country's gross industrial output, and 1.5 percent of its agricultural output. According to the 1971 census, 21.3 percent of the economically active population was engaged in industry and construction, compared to about 3 percent in 1939, and 43.3 percent was employed in agriculture, forestry, and fishing, as against more than 80 percent in 1939. Industry provides more than half and agriculture one-sixth of the national income. The industrial output increased by a factor of 14 from 1945 to 1974.

Most of the industries are engaged in the extraction and refining of mineral raw materials and the processing of agricultural products. The bauxite mines near Nikšić yield approximately one-fifth of Yugoslavia's output. Lead and zinc ore is extracted near Pljevlja and Ivangrad, and lignite and salt (along the coast) are also mined. Hydroelectric power plants have been built on the Zeta River. Other industrial facilities include a metallurgy combine in Nikšić (steel, rolled metal), an aluminum combine in Titograd, wood-products combines in Mojkovac, Ivangrad, and Titograd, electrical engineering plants in Cetinje, shipyards in Kotor, and textile, food, and tobacco enterprises in Titograd, Kotor, and Bar.

The chief branch of agriculture is pasture livestock raising, chiefly sheep and low-yield cattle. The republic's more than 500,000 sheep account for about 6 percent of the country's total number. Mountain pastures and meadows cover 40 percent of Montenegro's area and arable land, 6 percent. Corn, wheat, barley, and potatoes are grown in the Scutari Basin, the river valleys, and the intermontane basins. The republic produces large quantities of plums, figs, pomegranates, and almonds, about four-fifths of the country's oranges, some two-thirds of its tangerines, and half of its lemons. There are also olive groves and vineyards.

Montenegro's largest seaports are Bar and Kotor. The main railroad runs from Belgrade to Bar (opened in 1976), and there is a good network of highways. The principal airport is in Titograd. The republic has seaside health resorts and other tourist attractions.

S. N. RAKOVSKII

Cultural affairs and public health. In 1975, 97 percent of the Montenegrin population was literate. In the 1974–75 school year the republic's 643 basic eight-year schools had a combined enrollment of about 91,500 pupils. That year more than 9,400 students were enrolled in the republic's 16 *Gymnasiums*, which offer a complete secondary education. Vocational schools, technical schools, and other special schools were training more than 15,700 students, and some 5,500 students were attending the republic's five higher educational institutions. A university was founded in Titograd in 1973.

The majority of research institutions are located in Titograd. They include the republic's highest scientific institution, the Montenegro Academy of Sciences and Arts (founded 1976), the History Institute, the Institute of Geological and Chemical Research, the Institute of Hydrometeorology, and the Seismological Station. In Kotor there is an institute of marine biology.

In 1975, Montenegro had 11 research and specialized libraries, 19 public and 476 school libraries, one museum, four drama theaters (one professional, one amateur, and two children's theaters), and 30 motion-picture theaters. A radio station and a television studio operate in Titograd. In 1975 the republic issued 46 newspapers with a total circulation of 5,077,000, 15 magazines with a total circulation of 229,000, and 140 book and pamphlet titles with a total printing of 552,000 copies.

In 1974 health care was provided by eight hospitals, 94 outpatient clinics, 52 dental offices, 13 tuberculosis dispensaries, 24 gynecological clinics, 20 polyclinics for preschool children, and 14 polyclinics for schoolchildren. There were 31 pharmacies. Montenegro's best-known seaside health resorts are Herceg Novi and Bar.

Literature. The development of Montenegrin literature has not been adequately elucidated in Yugoslav literary scholarship. Whereas some literary scholars regard Montenegrin literature as an integral part of Serbian literature, others insist that it developed along separate lines. In general, Montenegrin literature developed through close interaction with other Yugoslav, particularly Serbian, literature, a circumstance fostered by ethnic and linguistic kinship, common historical and cultural traditions, and the ties between Montenegrin and Serbian cultural and literary figures. However, the extent of literary interaction has not been uniform at different stages of the literary process: the striving for

autonomy was more marked in the second half of the 19th century, and the tendency toward fusion with Serbian literature was more pronounced in the first half of the 19th century and the period between the two world wars. In socialist Yugoslavia the further consolidation of the national literary forces has been accompanied by a strengthening of the multifaceted contacts with other Yugoslav literatures.

Montenegro's rich folklore tradition originated in the distant past. Religious works, saints' lives, and prayer books have survived from the Middle Ages. The most important works of the 17th and 18th centuries are the manuscripts of A. Zmajević (1624–94) and I. A. Nenadić (1709–84), the *History of Montenegro* (1754) by V. Petrović (1709–66), and the *Epistles* of Petar I Petrović-Njegoš (1747–1830).

Most scholars date the beginning of modern Montenegrin literature from the end of the 18th and first half of the 19th centuries. Its founder was the poet and statesman Petar II Petrović-Njegoš (1813–51), whose works continued the heroic tradition of the folk epic. Njegoš evoked a poetic picture of Montenegrin life and extolled the struggle of the Montenegrins and Serbs for liberation from Ottoman oppression. His finest work, the dramatic epic *Mountain Garland* (1847), is animated by the idea of the unification of the South Slavs. Njegoš also played a prominent role in the development of early romanticism in Serbian literature.

Romantic poetry flourished from the second half of the 19th century until World War I. Its leading exponents were S. Perović-Cuca (1830–57), Nikola I Petrović (1841–1921), and M. Šobajić (1836–1917). Prose was largely limited to ethnographic fiction, such as the *Stories of Montenegro and the Coast* (1875) by S. Mitrov Ljubiša (1824–78), and memoirs, of which the best known were those of M. Miljanov (1833–1901). Two noteworthy historical plays were written: *Balkan Empress* by Nikola I Petrović (1884) and *Emperor's Way* (1894) by R. Roganović Crnogorac (1859–1900). The literature of the period, essentially folkloric and romantic, celebrated the patriarchal way of life, the historical past, and heroism.

Despite the national conflicts that existed in the military-monarchist dictatorship that was established in Yugoslavia in January 1929, the number of Montenegrin writers grew steadily. The genre and thematic framework of literature expanded, and prose underwent intensive development. In the early 1930's, Montenegrin literature, like the other Yugoslav literatures, came under the influence of "social realism," a literary movement that championed realism and drew inspiration from revolutionary ideology. Social realist poetry reached a high level in the collections *Kulak* (1936) and *Fiery Doves* (1937) and the narrative poem *Newcomers* (1937) by R. Zogović (born 1907), the collections *Forests* (1938) and *Fiery Mornings* (1941) by M. Banjević (1905–68), the collection *Two Rivers* (1938) by J. Djonović (born 1909), and the narrative poem *Through Blue Twilight* (1929) and the collection *Land* (1934) by M. Vuković (1910–46).

The social and psychological palette of prose also became richer, and the first novels appeared. The life of the Montenegrin people was realistically portrayed by R. Ratković (1903–54), noted for his novel *Nevidbog* (1933), D. Djurović (born 1901), whose short-story collection *Among the Mountain People* (1936) and novel *The Land of Duklja* (1939) were widely acclaimed, and N. Lopičić (1909–45), best known for his short-story collection *Peasants* (1939). Many Montenegrin writers took part in the War of National Liberation in Yugoslavia.

After Montenegro's liberation from the fascist occupying forces and their collaborators on Dec. 31, 1944, and the establishment of a people's government the next year (a socialist republic was created in 1963), literature entered a remarkably fruitful period of development. The intensive growth and further consolidation of Montenegro's literary forces was reflected in the founding of the literary magazines *Creation* (1946) and *National Culture* (1951) and in the formation of the Society of Montenegrin Writers (1956).

The main literary figure since the 1950's, M. Lalić (born 1914) has vividly depicted the national liberation struggle and revolution in his novels *The Wedding* (1950), *Vicious Spring* (1953), *The Rupture* (1955), *The Round-up* (1960), and *Leleja Mountain* (1962). The national problems of the late 19th and early 20th centuries are treated in Lalić's historical novel *Military Luck* (1973). Other outstanding prose works of this period include the short-story collections *Long Moments* (1956) and *Playing With Fire* (1966) by S. Asanović (born 1931), the novels *Fast and Deep* (1959) and *Watershed* (1968) by Č. Vuković (born 1920), and the short-story collection *Facing the Truth* (1961) and the novella *Mouthful of Dirt* (1974) by Branimir Šćepanović (born 1937). These works deal with the national liberation war and contemporary life, focusing on moral, ethical, and psychological problems.

Among the finest public achievements of the postwar period are Zogović's collections *Stubborn Stanzas* (1947), *Articulated Word* (1965), and *Personal, Purely Personal* (1971), Djonović's collections *Mountain Streams* (1947) and *Yearning for the Road* (1961), and Banjević's narrative poem *Sutjeska* (1946) and his collection *Till It Sparks* (1961). Other important verse collections include *Poems* (1947), *Nets* (1955), and *Forgotten Snows* (1958) by D. Kostić (born 1917) and *Whirlpool* (1950) and *Ribbons in the Valley* (1955) by R. Vešović (born 1921). A quest for new themes and forms distinguishes the poems of M. Kralj (born 1933), S. Perović (born 1932), Blažo Šćepanović (1934–66), and J. Brković (born 1933). The leading contemporary playwrights are Brković, V. Ivanović, Ž. Komanin (born 1935), and B. Radović. Literary criticism is represented by B. Milačić (born 1920), M. Stojović (born 1927), and R. Rotković (born 1931).

Architecture and art. The Neolithic pottery discovered at Crvena Stijena, with its simple modeled ornamentation or painted geometric designs, closely resembles the Neolithic ware found in Serbia and Rumania. Archaeological investigations have uncovered Illryian fortified settlements and necropolises dating from the late Bronze Age and early Iron Age. In the period of Greek and Roman conquests, Montenegro fell within the orbit of classical culture, whose traditions survived in a simplified form during the Byzantine period (sixth century A.D.) and after the coming of the Slavs in the seventh century. There are remains of Roman fortifications, dwellings, basilicas, and architectural fragments with fine carving at Duklja (Dioclea), near Titograd.

In medieval Montenegro, Italian and Dalmatian cultural influences coalesced with those of Serbia and Byzantium. In the ninth and tenth centuries modest single-aisled cruciform or three-apse churches were constructed of cut or broken stone. The Romanesque churches of the 11th century preserved traits of pre-Romanesque architecture. The churches built in the coastal regions in the 12th and 13th centuries were either three-aisled basilicas with flat wooden ceilings or cross vaults (Cathedral of St. Tripun in Kotor, from 1166) or single-aisled structures with semicircular vaults (Church of St. Paul in Kotor, 1263–66), sometimes surmounted by a dome resting on a low drum supported by squinches or pendentives (Church of St. Luke in Kotor, late 12th century). Covered with pitched tile roofs, such churches often had blank walls, an arched bell tower on the western facade, and a carefully delineated western portal with a rose window above it. The altar section was separated from the rest of the church by a stone barrier decorated with fine carving in which interlace patterns were mingled with zoomorphic and floral motifs echoing classical traditions (Ulcinj, Bar).

While Montenegro was part of the Nemanja kingdom, its interior regions were influenced by the Raška architectural school (*see* SERBIA). The severe single-aisled churches that were built in the Raška style in the 12th and 13th centuries had lateral additions resembling low transepts and domes set on a cubical base (church of the Morača Monastery, 1252). Among the Montenegrin architects who worked in Serbia was Vit of Kotor, who designed the church of the Dečani Monastery. In the coastal architecture of the 14th to 16th centuries individual Gothic elements, such as contours of windows and vaults, were combined with Romanesque forms (churches and houses in Svač, Bar, and Kotor).

The influence of Carolingian art may be seen in the earliest examples of Montenegrin monumental painting, the frescoes in the Church of St. Michael near Ston (11th and 12th centuries), incorporating portraits of the Zeta princes. The pictorial art of the 13th and 14th centuries, blending Romanesque and Gothic elements with Byzantine iconographic motifs, is best exemplified in the Evangelistary of Prince Vukan (1202) and the ciborium in the Cathedral of St. Tripun in Kotor (1362). The frescoes in the church of the Morača Monastery (1252), similar to Serbian art, are notable for their refined and expressive linear style.

The Ottoman invasion and centuries of national oppression had a detrimental effect on the development of Montenegrin culture. Down to the 20th century most towns consisted of a crowded mass of low stone buildings. The Renaissance and baroque styles had little impact on secular architecture, being discernible only in certain details of such structures as the palaces in Kotor, Bar, Perast, and Dobrota. The baroque reached its peak in the 17th and 18th centuries in the churches of Boka Kotorska, designed chiefly by Italian architects. A noteworthy example is the Church at Prčan, begun in 1790. Local architects tended to graft baroque traits onto the Romanesque and Byzantine traditions, as illustrated by the church of the Sava Monastery near Herceg Novi (1777–99, N. Foretić).

The leading painters of the 15th and 16th centuries, Lovro Marinov and Vicko Dobričević, working mainly in Dalmatia, assimilated Renaissance trends. Another major painter of this period was T. Vuković. Baroque sculpture, both altar reliefs and statues, was generally produced by foreign artists. Outstanding local painters of the 17th to 18th centuries included Dj. Mitrofanović, A. Vujičić, and T. Kokolja, who executed wall paintings, pictures, and portraits in the style of the late Venetian Renaissance. The painters of the Rafailović family combined late Byzantine traditions with baroque techniques. Even miniature painting followed late Byzantine canons down to the 19th century.

After the liberation of Montenegro from Ottoman oppression in 1878, the local nobility built imposing urban mansions in the late Empire style (Danilov Palace in Cetinje, 1894–95). In the 1870's Podgorica (present-day Titograd) was built on a grid layout. The eclectic style was best represented in the neo-Byzantine Church of St. Nicholas in Kotor (1910). In the cities, architects continued to build simple and severe two- or three-story dwellings of rough stone with tile roofs and small windows and doors.

A national school of art emerged in the second half of the 19th and first third of the 20th centuries. In the portraits, compositions on themes from national history, and genre scenes of P. Poček, A. Bokarić, M. Gregović, and the watercolorist I. Šobajić naïve realism coexisted with academicism. In the 1920's and 1930's, M. Milunović and P. Lubarda produced landscapes and genre scenes in the style of post impressionism. The line engravings and paintings of I. Novaković reflected a critical view of society. Stylized generalization marked the sculpture of R. Stijović.

A radical change took place in Montenegrin culture after the establishment of people's rule. A new capital, Titograd, was built on the ruins of Podgorica, destroyed during World War II. Town planning was initiated, and model plans for housing projects were developed with the participation of architects from other Yugoslav republics. The housing construction of the late 1950's and 1960's is best exemplified in the five-story modular panel buildings in Titograd. Schools, hospitals, and consumer services establishments were built using prefabricated reinforced-concrete frames.

Along the Adriatic old cities have been modernized, and new cities with comfortable spa facilities have been built, among them Budva, Trsteno, Jaz, Mogren. The old island city of Sveti Stefan has been converted into a hotel-city. Successes have been achieved in the construction of hotels, motels, and administrative buildings using standardized structural elements; examples include the hotels in Cetinje and Herceg Novi, the administrative building in Kotor, and the Beko department store in Titograd. A quest for national distinctiveness characterizes the buildings of the architect S. Radević, noted for their expressive detail, their textural contrasts, achieved by combining concrete with local stone and river pebbles, and their organic link with the landscape (Podgorica Hotel in Titograd).

Significant postwar artworks include the stylistically free landscapes and still lifes of M. Milunović, V. Leković, and A. Prijić; the monuments of L. Tomanović and V. Stanić; and the dynamic and colorful landscapes and historical compositions of P. Lubarda.

Music. Down to the end of the 19th century, Montenegro had only folk music, and to this day the people have preserved the ancient traditions of singing folk epics, heroic songs (to the accompaniment of the *gusle*), lyric songs, and ritual songs. Especially impressive are the dramatic ritual laments, particularly the women's *tužbalice*, and the poetic pastoral lyric songs. There are various types of round dances accompanied by singing, known locally as *oro*. The melodies of Montenegrin songs are characterized by a narrow range, a predominance of archaic tunes in natural modes, a frequent use of mixed or variable meter, and a free rhythmic structure. Most of the singing is polyphonic, often featuring dissonant second intervals.

The first musical societies and performing groups were founded in Montenegro in the last quarter of the 19th century. Army bands were organized by A. Šulc in 1871 and F. Vimer in 1889; the Branko Choral Society was formed in Podgorica (present-day Titograd) in 1892; the Njegoš Choral Society was created in Cetinje in 1908; and the Zahumlje Choral Society was established in Nikšić in 1898. One of Montenegro's first professional musicians was the late 19th-century composer J. Ivanišević, who studied in Prague with Z. Fibich. A music school operated in Cetinje in 1924–25 and from 1932 to 1941.

After World War II a number of music schools were opened, including the Njegoš Music School in Cetinje (founded in 1947 as a primary school and reorganized the next year as a secondary school), the M. Miljanov Music School in Titograd (1950), and the music school in Kotor (1951). Musical life was enriched by the founding of the symphony orchestra and mixed chorus of Radio Titograd and the Oro State Folk Song and Dance Ensemble. Several more music organizations were founded in the 1960's: the amateur Stanko Dragojević Chorus in Titograd, the amateur Nikola Djurković Chorus in Kotor, the Association of Composers and Performing Musicians of Montenegro, and the Union of Cultural and Artistic Societies of Montenegro (Titograd).

E. I. GORDINA

Theater. Traces of ancient dramatized rituals, the exact nature of which is not known, survived in certain folk customs that were practiced down to the first half of the 20th century. An important contribution to Montenegro's theatrical culture was made by Petar II Petrović-Njegoš. His dramatic poem *The Mountain Garland* (1847) and his narrative poem *Tsar Stepan Mali, the Imposter* (1951), based on episodes from Montenegro's historical past, were performed by amateur groups. In addition to amateur productions, Cetinje enjoyed performances by touring companies from Serbia, Croatia, and other regions.

After the liberation of Montenegro from the fascist occupying forces and their collaborators (Dec. 31, 1944), the Montenegro National Theater, comprising an opera and a drama company, was founded in Titograd in 1953. The drama company's repertoire includes Yugoslav and foreign classics, plays by Petar II Petrović-Njegoš, and works by the contemporary Montenegrin playwrights V. Radović and Z. Komanin and by other Yugoslav writers. The company has also staged works by the Russian playwrights N. V. Gogol, A. N. Ostrovskii, and A. P. Chekhov and the Soviet writer A. N. Arbuzov. The company's principal directors are B. Eraković and N. Vavić, and its leading performers are V. Mandić, D. Tomas, Z. Raičević, G. Lengold, P. Begović, D. Malović, B. Vuković, Č. Vukanović, and Z. Stoimirov. Directors from the other Yugoslav republics also participate in the theater's productions.

N. M. VAGANOVA

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MOORING EQUIPMENT, the set of fittings and mechanisms aboard a ship that are used to warp and secure the ship when it is moored at a dock, at the wall of a lock, to buoys, or alongside another vessel. A ship's mooring equipment includes mechanisms, such as winches and capstans, that are used to take in and pay out mooring lines, which are ropes or steel cables. It also includes the following fittings: bitts and cleats, around which the mooring lines are made fast; stoppers, which temporarily hold the mooring lines; mooring chocks, rollers, and mooring pipes, which are used to change the direction of the mooring lines; manually operated or mechanized reels, on which the mooring lines are stowed; and line throwers, which throw the mooring lines from the ship.

The present-day level of mechanization in the operations of warping a ship and of taking in, paying out, and making fast the mooring lines is achieved by means of warping winches, which provide constant line tautness and have remote control. Such winches automatically take up slack or, if a mooring line is too taut, pay out line when a ship's position relative to a dock changes during cargo handling, during tides, or because of waves.

The dimensions of individual pieces of mooring equipment and the rate at which mooring lines are taken in are regulated by classification societies. They depend on a ship's area of operation and on the dimensions of the ship and of the ship's superstructures, deckhouses, and other deck structures.

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MORUS (mulberry), a genus of trees of the family Moraceae. The trees are 16–35 m tall. The crown is spherical, broadly ovate, and very dense. The bark is brown and cracked. The bare or pubescent ovate leaves have stipules that shed early; their edges are lobate or crenate. The plants are usually dioecious. The flowers are bisexual and gathered in catkins. The fruit—a succulent compound false drupe—measures 1–5 cm in length and is white, pink, dark violet, or almost black.

There are about 24 species, distributed in eastern and southeastern Asia, in southern Europe, in the southern parts of North America, in the northwestern parts of South America, and in parts of Africa. The USSR has four species, in the southern European portion and in Middle Asia. The mulberry tree is cultivated for its leaves, which are used to feed silkworms, and for its fruit. The fruits are sweet or tart, with a sugar content of at least 10 percent. They are eaten fresh or dried, or they are processed into wine. Mulberry wood is strong, resilient, and heavy; it is used as a building and woodworking material.

In the USSR the white mulberry (*M. alba*), *M. bombycus*, and *M. multicaulus* are raised for silkworm cultivation, and the black mulberry (*M. nigra*) is cultivated for fruit. In the USSR local forms, for example, Khasak, Kaichi, and Dzhir, are cultivated as forage crops, as are the new highly productive varieties SANIISh-5, SANIISh-6, SANIISh-7, SANIISh-14, SANIISh-15, SANIISh-17, Tadzhikskaia seedless, Irtyshar, Uzbekskaia, Pionerskaia, Iveriia, Tbilisuri, Ukrainskaia-9, and Ukrainskaia-107. A significant portion of the feed plantings consists of hybrids. For spring feeding of mulberry silkworms the annual branches are cut annually. For summer and fall feedings, the upper third of new shoots is cut. Every four or five years the trees are given a year of rest.

Mulberry trees are drought resistant, relatively undemanding of soils, and salt tolerant. They are not resistant to flooding. Propagation is by seeds, grafts, and layers. The most widespread diseases are bacteriosis, *Cylindrosporium* disease, mildew, root rot, and curl. The most common insect pests are *Apocheima cinerarius, Pseudocaccus comstocki*, mole crickets (*Gryllotalpa*), chafers, wireworms, the mulberry longicorn beetle, and spider mites. (*See also* MULBERRY CULTIVATION.)

REFERENCE

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MOVING COIL, in low-frequency measurement technology, a component of moving-coil measuring systems that is used in light-beam oscillographs and moving-coil galvanometers. A moving coil is a light coil of wire that is located between the poles of a permanent magnet. In a galvanometer, the moving coil is suspended from very thin metallic ribbons; in an oscillograph, it consists of a very thin wire to which a small mirror is attached.

When a current flows through a moving coil, the coil is deflected in the magnetic field. In moving-coil galvanometers, the magnitude of the deflection is read by means of a microscope. In light-beam oscillographs, it is read on the basis of the deflection of a light beam reflected from the mirror.

REFERENCES

See references under STUB. R. I. PERETS [29–1282–2]

MOVING-TARGET INDICATION (MTI), a method of discriminating radio signals reflected from a target against a background of passive interference (*see* RADAR COUNTERMEASURES). The method, which is based on the use of a difference in the speeds of the target and the source of the interference, is employed in coherent-pulse radar sets (*see also* RADAR). When both a useful signal and interference signals are received by an MTI system, the difference in speeds makes it possible to cancel or suppress the interference and preserve the useful signal at the output.

MTI systems are based on the use of memory units. The memory may be an ultrasonic delay line, a visual storage tube, or a shift register. In a very simple system, a difference between signals received in consecutive pulse repetition periods is obtained at the output by means of, for example, an ultrasonic delay line and a subtractor. The subtraction may be carried out at either an intermediate frequency or a video frequency. If the signals are subtracted at a video frequency, phase detection of the signals is used before subtraction. In this case, the signal level at the detector output depends on the phase of a signal with respect to reference oscillations, the phase of which is fixed relative to the phase of the scanning pulses.

Target signals do not appear at the subtractor output, or are canceled, if the target is stationary—that is, is a source of passive interference—or if it moves at a blind speed—that is, moves a distance equal to an integral number of half-waves toward or away from the radar set in a pulse repetition period. However, signals from a target that moves at a speed other than a blind speed are not canceled and will be detected. If the source of the interference is moving, the interference signals may be canceled by introducing the required additional phase shifts into the MTI system.

Besides the blind-speed effect, the factors that reduce the effectiveness of video-frequency MTI include unwanted pulse-amplitude modulation at the system's output. In this case, the modulation frequency is equal to the Doppler frequency if the Doppler frequency is less than half the repetition rate of the scanning pulses. Such modulation is eliminated by means of two quadrature networks with reference oscillations that differ in phase $\pi/2$. The blind-speed effect is controlled by using a variable scanning-pulse repetition period, that is, by wobbulation of the scanning-pulse repetition rate.

The effectiveness of MTI, which is evaluated from the improvement of the signal-to-interference ratio, depends on the speed of the target and the spectrum of the interference. For narrow interference spectra, the effectiveness may be raised by using

several interference cancellation stages. An even higher effectiveness is provided by systems that combine multiple subtraction and weighted signal processing.

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See references under RADAR.

L. N. KISLIAKOV [29–218–1]

MUGWORT (*Artemisia vulgaris*), a perennial herbaceous plant of the family Compositae. The usually dark red-brown stems are 30–200 cm tall. The twice- or thrice-pinnatisect leaves are 3–15 cm long and 2.5–20 cm wide; they are broadly ovate or elliptical, white-tomentose beneath, with small auricles at the base. The lower leaves are on petioles; the upper ones are sessile and smaller than the upper ones. The obovate or elliptical heads measure 2–3 mm across and are gathered into a dense panicle. All the flowers are tubular and reddish. The marginal flowers are pistillate, and the middle ones are bisexual. The mugwort is found in forests and steppes in Europe and Western Asia. It grows as a weed along roads and river banks, in wastelands and dumps, amid shrubbery, and—less commonly—in forest glades and margins. In the USSR the plant occurs in the European portion, the Caucasus, Western Siberia, and Middle Asia. Mugwort contains an essential oil, carotene, and ascorbic acid; the apices of the flowering plants and roots are used in folk medicine. [29–252–4]

MUKDEN (also Shenyang), a city in Northeast China, on the Hun Ho (a left tributary of the Liao Ho). Capital of Liaoning Province. Population, 4.2 million (1975). Mukden is the largest railroad hub in Northeast China; two international lines run through the city: Peking-Moscow (via Manchuria station) and Peking-Pyongyang.

Mukden is one of China's most important industrial centers, with a diversified industry. Heavy machine building, including the production of construction and railroad equipment and equipment for the mining, metallurgical, chemical, textile, and food-processing industries, has undergone the most extensive development. The electrical engineering industry produces electric motors, transformers, turbines, diesel engines, electric cable, and electron tubes. In the area of transportation machine building, the city manufactures locomotives, railroad cars, streetcars, and motor vehicles. Other machine-building industries include tractor building, agricultural machine building, and the manufacture of machine tools and electronic equipment.

Metallurgy has undergone extensive development: Mukden has the largest nonferrous metal plant in China and a steel plant. The chemical industry, which produces soda, acids, mineral fertilizers, paints, varnishes, and industrial rubber goods, is also highly developed. As of 1978, a petrochemical plant to be supplied with petroleum from the Tach'ing field was under construction near Mukden, to which a petroleum pipeline has been laid from Tach'ing. The city also has some light industry and paper, printing, wood-products, and food-processing industries. Mukden houses a university. IU. I. GAVRILOVA

Mukden was founded in the second century B.C. as Houch'eng. From the eighth to 13th centuries it was called Shenchou, and under the Yüan Dynasty (13th–14th centuries) it was renamed Shenyang. The Manchus captured the city in 1621, and it bore the Manchu name Mukden from 1625 to 1912; during this period it was known in Chinese as Shengching or Shenyang. The city was the capital of the Manchu state from 1625 to 1644, and under the Ch'ing Dynasty (1644–1911) it was considered the second capital of China. In 1658 it became the capital of Fengt'ien Province and was given the name Fengt'ien.

Mukden was the capital of three northeastern provinces (Manchuria) from 1908 to 1931 and the political and military center of the Fengt'ien clique from 1916 to 1928. Its capture on Sept. 18, 1931, by the Japanese marked the beginning of the Japanese occupation of Northeast China (*see* MUKDEN INCIDENT OF 1931). The city was liberated by the Soviet Army on Aug. 20, 1945. On Nov. 2, 1948, it was liberated from the Kuomintang by the People's Liberation Army of China.

Mukden has a rectilinear street plan. The inner, or Chinese, city (Neich'eng) is a center of commerce and handicrafts with narrow streets that are lined by pisé houses; the remains of a fortress wall have been preserved. West of the inner city is the administrative center, with five- to seven-story European-style buildings and houses surrounded by gardens and parks. In the northern part of the city is the T'iehhsichu, an industrial district in which factory buildings alternate with residential blocks. Palaces and temples of the ninth to 14th centuries are located in the approaches to the city. The Tungpei Museum is located in Mukden. [29–1563–1]

MUKDEN INCIDENT OF 1931, the capture by Japanese troops of the city of Mukden (Shenyang) on Sept. 18, 1931, an event that marked the beginning of the Japanese occupation of Northeast China (Manchuria). As part of a deliberate plan to capture Manchuria, the Japanese imperialists published a false report on Sept. 18, 1931, that the Chinese had destroyed the roadbed of the South Manchurian Railway near Mukden. The same day, under the pretext of protecting the railroad, the Japanese Kwangtung Army seized the city. Taking advantage of the capitulationist policy of China's Kuomintang government and the policy of noninterference of the USA, Great Britain, and the other capitalist powers, the Japanese militarists were able to occupy Manchuria in a few months. They established the puppet state of Manchukuo on the captured territory. Northeast China was liberated from the Japanese by the Soviet Army in August 1945. [29–1564–1]

MUSEUM OF SCIENCE AND INDUSTRY, a cultural and educational institution in Chicago, USA. The museum was founded in 1926 by the American businessman J. Rosenwald, who modeled it after the German Museum. The museum's exhibits demonstrate the latest scientific achievements and their applications in various branches of industry. Special rooms, with a floor space of 500–1,000 sq m, are set aside for exhibits devoted to particular subjects, such as the automobile, electricity, or hardwoods. Notable exhibits include a full-scale coal mine, an operating foundry, an atomic power plant, and a model farm with living quarters, a barnyard, a milking room, a silo, and a hatchery. Many large industrial companies and firms supply exhibits for the museum, which attracts several million visitors annually. [29–561–1]

MUTE SWAN (*Cygnus olor*), a bird of the order Anseriformes. The body measures about 1.5 m in length. The plumage of the adult is white, and of the young, gray. The bill is red, except for the knob at the base and the tip, which are black. The mute swan is found sporadically in Europe, Asia Minor, Middle Asia, and Central Asia. In the USSR it is found in Estonia and Lithuania, along the lower courses of the Danube, Dnestr, and Volga rivers, in southwestern Siberia, and in Kazakhstan, Middle Asia, and Transbaikalia. The mute swan inhabits large lakes with reed thickets. It winters on the Mediterranean, Black, and Caspian seas and in Middle Asia. The clutch contains seven to nine eggs, which are incubated for 35 days. The diet consists of aquatic vegetation. The mute swan is a protected species and hunting is prohibited by law. Domesticated mute swans are found in parks. [29–1220–1]

MUTILATION, in Soviet criminal law, a type of crime committed for the purpose of evading a regular call to active military service (Criminal Code of the RSFSR, art. 80, part 2). In addition, it may be committed by a person subject to military service in order to evade training courses or military registration (Criminal Code of the RSFSR, art. 198-1, part 2), and it may be committed by a person in military service in order to evade the performance of military duties (Criminal Code of the RSFSR, art. 249).

Mutilation is accomplished by the infliction of bodily injury. The guilty person intentionally damages his own health—either by deliberately causing himself some physical injury (for example, by amputating an extremity or harming the organs of sight or hearing) or by unnaturally complicating an existing condition (for example, by irritating a wound). Another form of the crime is requesting or agreeing to the infliction of an injury by someone else; in such cases, those who inflict the harm are held to be accomplices.

The law equates other methods of evading military service with mutilation. Such methods include malingering, exaggerating the

seriousness of a condition, forging documents or using other means of deception, and refusing to bear the obligations of military service.

Evasion of service by military personnel through mutilation or any other means carries the severe penalty of deprivation of freedom for a term of three to seven years. The same act committed in wartime or under combat conditions is punishable by death or deprivation of freedom for five to ten years. Mutilation for the purpose of evading a call to active service carries a sentence of deprivation of freedom for one to five years (Criminal Code of the RSFSR, art. 80, part 2). Mutilation in order to evade military training or registration is punishable by deprivation of freedom for a term of up to three years (Criminal Code of the RSFSR, art. 198-1, part 2). [29–671–2]

NATIONAL LIBERATION FRONT (Ethnikon Apeleutherotikon Metopon; EAM), an organization uniting the patriotic forces of Greece during World War II.

EAM was founded on Sept. 27, 1941, at the initiative of the Communist Party of Greece (CPG). Its principal aims were to liberate Greece from the fascist German occupiers, secure the country's complete independence, and form a provisional government in which each of its constituent political parties would be represented. It wanted the question of the ultimate form of government of Greece to be decided by the Greeks themselves.

EAM organized the Greek resistance movement and, in December 1941, formed the Greek National Popular Liberation Army (ELAS). It was also responsible for the Athens General Strike of 1943. In the same year it laid the foundations for a popular democratic regime in the liberated areas of the country. On Mar. 10, 1944, in accordance with a resolution of the Central Committee of EAM, the Political Committee of National Liberation was established; it in effect performed the functions of a provisional democratic government. By October 1944, when Greece was liberated from the fascist German occupation forces, more than 1.8 million people were united in support of EAM.

On Apr. 24, 1945, EAM became a political bloc of left-wing parties, such as the CPG, the Agrarian Party, and the Democratic Party. An antidemocratic law of Dec. 27, 1947, banned the EAM bloc. [29–1627–3]

NECK, the part of the body between the head and the trunk in man and land vertebrates. The neck is responsible for the mobility of the head, permits orientation in space, and facilitates the grasping of food, defense, and attack.

The framework of the neck consists of cervical vertebrae. The neck muscles are primarily modified portions of the truncal musculature. In amniotes, a compressor of the neck has developed—a derivative of the voluntary visceral musculature. The neck contains the initial sections of the respiratory system (larynx, trachea) and digestive system (pharynx, some salivary glands, part of the esophagus), several blood vessels (for example, the carotid arteries and jugular veins) and lymphatic vessels, the thyroid and parathyroid glands, and nerves. The initial segment of the spinal cord lies in the cerebrospinal canal, enclosed by arches of the cervical vertebrae.

In amphibians, the neck is not outwardly noticeable (there is only one vertebra), and the head can move only up and down and a little to the sides. In amniotes, the cervical portion has several vertebrae, and the development of the atlas and epistropheus (axis) enables the head to bend and rotate. In birds, the number of cervical vertebrae varies from nine to 25, and the combination of their movements makes it possible for some birds to rotate their heads 270° in one direction. In mammals, the cervical portion, regardless of the length of the neck, usually contains seven vertebrae. This is also true of the whale, whose neck is not outwardly separate, and of the giraffe. In the case of secondary limitation of neck mobility, the vertebrae of the cervical segment fuse (in cetaceans, armadillos, jerboas, and some other animals). [29–1170–5]

NEMIROVICH-DANCHENKO SCHOOL-STUDIO (full name, Vl. I. Nemirovich-Danchenko School-Studio of the M. Gorky Moscow Art Theater of the USSR), the highest theatrical educational institution in Moscow. The school-studio was organized in 1943 to train actors using the ideological-creative principles of the school of the Art Theater and the system of K. S. Stanislavsky. I. M. Moskvin, N. P. Khmelev, V. G. Sakhnovskii, and I. Ia. Gremislavskii were important in its founding. The school has two departments—one to prepare actors for work in motion pictures and the theater and one to train stage designers and technicians; an evening division of the latter department was opened in 1961.

Outstanding teachers at the school have included M. N. Kedrov, V. Ia. Stanitsyn, A. K. Tarasova, V. O. Toporkov, I. M. Raevskii, V. A. Orlov, A. M. Karev, G. A. Gerasimov, B. I. Vershilov, and A. N. Gribov. The current teaching staff includes A. I. Stepanova, P. V. Massal'skii, O. N. Efremov, E. N. Mores, V. P. Markov, S. S. Piliavskaia, E. A. Evstigneev, V. V. Shverubovich, and professors V. Z. Radomyslenskii, A. Ia. Zis', and V. Ia. Vilenkin.

The school has produced such highly qualified teachers as V. K. Moniukov, V. N. Bogomolov, I. M. Tarkhanov, O. G. Gerasimov, N. P. Alekseev, A. N. Petrova, O. Iu. Frid, M. M. Kunin, E. P. Freze, A. N. Ponsov, K. N. Golovko, and E. V. Radomyslenskii.

In the 1977–78 academic year the school-studio had 251 students and 57 teachers, including 11 professors and doctors of sciences and 21 docents and candidates of sciences. Graduates of the acting department, including A. V. Batalov, E. Ia. Urbanskii, L. I. Gubanov, and V. S. Davydov, have formed the core of the companies of the Moscow Art Theater, the Sovremennik Theater, and the young people's New Drama Theater-Studio and have contributed several artists to the company of the Mayakovsky Theater and many theaters of Moscow, Leningrad, and other cities of the USSR.

The school has a scientific research section, which studies and publishes the legacy of Stanislavsky and Nemirovich-Danchenko, the founders of the Moscow Art Theater. The section has prepared and published such works as *The Collected Works of K. S. Stanislavsky* (vols. 1–8, 1954–61), *The Life and Works of K. S. Stanislavsky: A Chronicle in Four Volumes, 1863–1938* (1971–76), and *The Days and Years of Vl. I. Nemirovich-Danchenko: A Chronicle of His Life and Works* (1962).

N. P. ALEKSEEV [29–1266–3]

NET OUTPUT, the part of the gross product that remains after subtracting the means of production consumed in the production process—raw materials, supplies, fuel, and power—and the amortization of fixed production assets. From the standpoint of the formation of value, net output is value newly created in the branches of material production ($v + m$). The total net output of all branches of material production constitutes the national income of society.

Net output is calculated for the various branches of material production, such as industry, construction, and agriculture. In industry, it is calculated as the difference between gross output and material production costs. In this calculation, the gross product of industry is based on industry's prices, that is, the turnover tax is included. Net output is needed to calculate national income and to compile the balance of the national economy of the USSR. The net output of some branches of industry and enterprises may also be calculated on the basis of wholesale prices of enterprises —that is, exclusive of the turnover tax.

Net output in construction is calculated as the difference between the gross product of construction on the one hand and the material costs of construction and the capital repair of buildings and structures on the other. The gross product of construction is the value of work performed in new construction, in the expansion and modernization of existing enterprises, and in the capital repair of buildings and other structures. The material costs of construction include the cost of construction materials used, such as structures and units, fuel, and electric energy; the capital repair of buildings and structures involves the amortization of construction machinery and other fixed capital of construction organizations.

The net output of agriculture is the difference between the gross product of agriculture, calculated on the basis of gross turnover (including the value of output produced and consumed on

the farm), and material production costs, whose value includes both raw materials and supplies purchased from outside sources and products produced on the farm, such as seed and fodder. Net output in other branches of material production is calculated as the difference between gross output and material production costs, with allowance made for the specific features involved in calculating these indicators in a given branch.

The net output of various branches of material production is calculated by state statistical agencies: the Central Statistical Board of the USSR and the central statistical boards of the Union republics. The calculations are made in terms of the prices actually in effect in a given year and in terms of comparable prices. Expressing net output in comparable prices provides a picture of its development. In the production method of calculation, a figure for net output in comparable prices is arrived at by subtracting material production costs (in comparable prices) from the gross product. In the distribution method, net output is calculated as the sum of wages (and other types of remuneration for labor), profits, the turnover tax, and other elements that make up net income. This method of calculation tests the accuracy of calculations based on the production method.

In 1976 the net output of industry, including the turnover tax, accounted for 52.6 percent of the national income created in branches of material production; the net output of agriculture, 16.5 percent; the net output of construction, 11.2 percent; the net output of transportation and communications, 6.3 percent; and the net output of the remaining branches, 13.4 percent.

M. R. EIDEL'MAN [29–638–2]

NET PROFIT, in capitalist society, the profit left over after income taxes. Net profit, whose amount depends on the amount of gross profit and the magnitude of income taxes, is used by businessmen and monopolies for the expansion of production and for parasitic consumption. By maintaining secrecy in commercial operations, exaggerating the depreciation rate of fixed assets, and using sophisticated methods to falsify accounts, capitalists are able to understate their net profit and thereby pay lower taxes.

The net profit of socialist enterprises is the profit shown on the balance sheet—that is, the amount left over after subtracting payments made to the state from profits: capital charges, fixed (rent) payments, payments from the free profit remainder, and interest payments on loans. Net profit is used to form incentive funds, to augment the circulating capital of enterprises, and to finance certain capital investments. [29–638–1]

NET SOCIAL INCOME, a part of national income that takes the form of surplus product. The division of national income into necessary and surplus product is an objective economic necessity irrespective of the mode of social production. The ways of forming the net social income and the principles underlying its distribution and use are determined, however, by the socioeconomic conditions of reproduction.

Under capitalism, the net social income takes the form of surplus product and a corresponding surplus value. K. Marx, analyzing the reproduction of the total social product and its individual elements, revealed the essence of the net social income, under the capitalist mode of production, as an economic category. "The net . . . income is the surplus value—and therefore the surplus product—that remains after deducting wages; it represents the surplus value realized by capital and to be divided with the landlord and the surplus product measured by this surplus value" (K. Marx and F. Engels, *Soch.*, 2nd ed., vol. 25, part 2, p. 409).

Under capitalism, the net social income is a product of exploitation of the working people. As Marx noted, "Surplus labor in general, as labor performed over and above the given requirements, must always remain. In the capitalist as well as in the slave system it merely assumes an antagonistic form and is supplemented by complete idleness of a stratum of society" (*ibid.*, pp. 385–86). In the process of distribution, the net social income of capitalist society appears in two basic monetary forms: profit and rent.

Under socialism, the net social income, as an expression of the surplus product, does not become surplus value but is used in the interests of the society as a whole. "Even though all surplus value is represented in some surplus product, the surplus product in itself, on the contrary, does not represent surplus value" (*ibid.*, vol. 26, part 3, p. 383). In accordance with the two forms of socialist ownership, the net social income comprises the net income of the state (public) sector and the net income of the cooperative and collective-farm sector. Both net incomes are created at socialist enterprises and in socioeconomic terms are essentially the same.

The net social income created in the state sector takes the following monetary forms: the turnover tax, the profit of enterprises (associations) from production and economic activity, and the payments of enterprises (associations) to the social insurance fund. In the cooperative and collective-farm sector, unlike the state sector, the net social income has both a monetary and physical aspect. The monetary part of net income is profit realized from the sale of commodity output. The other part of net income represents payments in kind consumed within the kolkhoz economy: seed, fodder, young livestock to be fattened, and insurance funds.

As the net income of socialist society is distributed, redistributed, and used, it is broken down into two parts—centralized and decentralized net income—with the help of the financial mechanism and prices. The centralized net income of the state includes the turnover tax, payments by state enterprises (associations) from profits (for example, capital charges, fixed payments, rent payments, and payments from the free profit remainder), and payments into the social insurance fund.

Kolkhozes and cooperatives augment the centralized fund through their income tax payments and insurance payments. The state disburses the centralized net income on a planned basis to meet public needs: the financing of the national economy, the defraying of expenditures on defense and administration, and the creation of social consumption funds and reserve funds. Some of the net social income remains at the disposal of state enterprises, cooperatives, and kolkhozes and is used, on a decentralized basis, to finance some capital investments, to augment current capital, to pay loan interest, to improve production technology, to augment indivisible funds, and to form incentive funds. Such a system of distribution, redistribution and utilization of the net income of socialist society is in keeping with the principles of democratic centralism and the profit-and-loss method of management.

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D. A. ALLAKHVERDIAN [29–645–6]

NIELLO, an alloy of silver, lead, sulfur, and other elements used to decorate metal articles, mainly of silver. The alloy, in powder form, is placed on the engraved surface of the metal; the object is fired, and then a black or dark gray pattern, firmly fixed to the base, appears on the object.

Niello on silver and other metals was used in antiquity. Thematic, landscape, and purely ornamental pictures were executed in niello on separate plates in Italy in the 15th and 16th centuries. Niello was used in Western Europe, India, and the Baltic region to decorate everyday objects (dishes, cutlery, boxes), weapons, and jewelry. Ornamental niello tracery was commonly used to decorate silver in the countries of the Middle East and the Caucasus. Russian craftsmen of the tenth to 13th centuries decorated silver pendants, bracelets, and lunulae with niello. The art was widely used by Russian craftsmen of the 15th and 16th centuries; niello was particularly popular in the 18th century in Velikii Ustiug (*see* VELIKII USTIUG NIELLO WORK IN SILVER). Niello is currently widely used in Kubachi for artistic metalworking.

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NIGELLA, a genus of annual herbaceous plants of the family Ranunculaceae. The leaves are usually twice or thrice pinnati-

sect, with narrow lobes. The flowers are generally solitary and regular. There are five petaloid sepals; the petals are small and in the form of two-lipped nectaries. The multiple fruit consists of five (or ten) fused follicles. The seeds are black.

There are approximately 25 species, distributed mainly in the Mediterranean region and Southwest Asia. The USSR has 11 species, growing in steppes, in weedy areas, and amid crops in the European portion, the Caucasus, and Middle Asia. The most common species are the fennel flower (*N. sativa*) and love-in-a-mist (*N. damascena*). The former is raised for its seeds in the Middle East, the Mediterranean region, the southern portion of Western Europe, and the USSR (central regions of the European USSR and—less commonly—the Northern Caucasus). The seeds are used as a spice. Love-in-a-mist, an ornamental with blue-violet or white flowers hidden among slightly dissected apical leaves, is also grown in many countries for its seeds. Many species of *Nigella* are nectar-bearers. [29–304–2]

NOISE, random vibrations of varying physical nature, which are distinguished by a complex temporal and spectral structure. In everyday life "noise" implies various undesirable acoustical disturbances during the apperception of speech or music, as well as any sounds that interfere with rest or work. Noise plays a significant role in many areas of science and technology, such as acoustics, radio engineering, radar technology, radio astronomy, information theory, computer technology, optics, and medicine.

Regardless of its physical nature, noise differs from periodic vibrations in the random change in the instantaneous values of the quantities characterizing a given process. Often, noise is a mixture of random and periodic vibrations. Depending on the temporal, spectral, and spatial structure of noise, various mathematical models are used to describe it. Averaged parameters determined on the basis of statistical laws that take into account the structure of noise at the source and the properties of the medium in which the noise is propagated are used for the quantitative evaluation of noise.

Noise is subdivided into statistically stationary and nonstationary noise. The theory and methods of measuring stationary noise, the classical model of which is white noise, are most highly developed. Stationary noise is characterized by the constancy of the average parameters: intensity (power), spectral distribution of intensity (spectral density), and the autocorrelation function (the time-averaged product of the instantaneous values of two noises shifted by the delay time). The noise observed in practice, which results from the action of many independent sources, such as the noise of a crowd of people, the sea, tools, or a vortex air flow or the noise at a radio-receiver output, is quasi-stationary. Noise that lasts for short time intervals (shorter than the averaging time in the measuring devices) is called nonstationary noise. Such noise includes, for example, the street noise of passing traffic, individual sounds in production processes, and infrequent impulse noise in radio engineering.

The investigation of noise pursues varied objectives: the study of noise sources in order to reduce their adverse effect on man and various systems; the search for methods and means of optimal reception, detection, and measurement of the parameters of various signals in the presence of noise; and the improvement of the accuracy of measurements in analog and digital data-processing devices. Sound-level meters, frequency analyzers, correlators, and other devices are used to measure the characteristics of noise.

Any vibrations in solids, liquids, and gases may be sources of audible and inaudible acoustical noise. In technology, the main sources of noise are various engines and machinery. An elevated noise level in machinery and mechanisms is often an indication of malfunction or design inefficiency. The precise fabrication and adjustment of parts and the dynamic balancing of all moving parts lead to a reduction in noise and, in general, to the reduced wear of parts and increased operating life and precision of operation.

Radio-electronic noise—random fluctuations of currents and voltages in electronic devices—results from the nonuniform emission of electrons in electronic vacuum devices (shot noise, the flicker effect), from the nonuniformity of the processes of generation and recombination of charge carriers (conduction electrons and holes) in semiconductor devices, from the thermal motion of charge carriers in conductors (thermal noise), and from the heat radiation of the earth, the earth's atmosphere, the planets, the sun, stars, the interstellar medium, and other objects (cosmic noise). Noise limits the sensitivity of radio receivers.

In many cases, noise is used as a source of information. For example, in naval technology, submarines and surface vessels are detected and their positions fixed from the noise they generate when moving. In radio astronomy, the radio-frequency radiation of stars and other cosmic formations is investigated on the basis of noise in certain frequency ranges. Noiselike signals are used in the technology of radio and acoustical measurements, for example, in architectural acoustics. Some sounds in music are by their physical nature noise or have noiselike features. The voiced consonants encountered in speech are also noise in their properties.

The qualitative features of sensation during the perception of acoustical noise by the hearing organs and the organism as a whole depend on the intensity (*see* LOUDNESS) and spectral composition of the noise. The adverse effect of noise on the human organism is manifested in specific damage to the hearing organs and nonspecific changes in other organs and systems of the body. The character, level, and frequency composition of noise are major factors, as are the length of exposure to noise and individual sensitivity. Prolonged exposure to intense noise may considerably disrupt the activity of the central nervous system, vascular tonus, and the functions of organs of the gastrointestinal tract and endocrine system, as well as gradually lead to hardness of hearing owing to neuritis of the vestibulocochlear nerve. An initial disruption of the perception of high frequencies (4,000–8,000 Hz) is characteristic of occupational hardness of hearing. The nonspecific action of noise may be manifested before any actual changes in hearing occur and is expressed as neurotic reactions, asthenia, and disruption of the functions of the autonomic nervous system. Coordination of movements is disrupted and labor productivity is reduced under the influence of noise. The term "noise disease" has appeared in the medical literature in connection with the unified etiology of the clinical disturbances.

A number of organizational, technical, and medical measures are implemented to prevent the adverse effects of acoustical noise on the human organism. The factors that produce noise are eliminated or weakened at the source. The propagation of noise from noise sources is prevented by insulation of noisy machinery assemblies against noise, installation of shock absorbers, and sound absorption, which attenuates noise by reducing reflections from surrounding design elements lined with sound-absorbing porous materials. Aerodynamic noise (for example, exhaust and noise in air ducts) is reduced by eliminating the causes of vortex formation, insulating air ducts against noise, and employing noise suppressors. It is important to alternate efficiently the work and rest periods of persons working under noisy conditions, to limit the length of their exposure to noise, and to monitor their health. The control of street noise is effected by replacing streetcars with trolleys and buses, restricting the use of horns, and other measures. Zones where noise levels reach 85 decibels are marked with warning signs, and people working in these zones are provided with individual sound-insulating earmuffs. Apart from the adverse effects of noise on man, some acoustical noise, such as the noise of the surf and forests, is known to have a healthful, relaxing effect.

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S. G. GERSHMAN and G. A. SUVOROV [29–1529–3]

NOISE, ATMOSPHERIC, electrical fluctuations in a receiving antenna caused by the heat radiation of the earth's atmosphere in the radio spectrum (*see* FLUCTUATIONS, ELECTRICAL).

Atmospheric noise worsens the quality of radio reception by engendering acoustical noise and false signals and decreasing measurement accuracy. A quantitative characterization of atmospheric noise is provided by noise temperature, which is equal to the product of the average physical temperature of the atmosphere (≈300°K) and the coefficient of absorption of the atmosphere. The latter depends on the state of the atmosphere (humidity, dust content, and the like), the shape of the antenna radiation pattern, the working length of the wave λ, and the orientation of the antenna in space. Ordinarily, when $\lambda > 10$ cm and altitudes of the main lobe of the radiation pattern are more than 20°, atmospheric noise is negligibly small. [29–1547–1]

NOISE, RECEIVER, the electrical fluctuations that occur mainly in the input circuits (for example, amplifiers and filters) of radio-receiving apparatus (*see* FLUCTUATIONS, ELECTRICAL).

When combined with noises from external sources, such as atmospheric noise, terrestrial noise, and cosmic noise, a total noise is produced that acts as a natural threshold of the sensitivity of the radio receiver. The quantitative characteristic of receiver-noise intensity is its noise temperature. For example, until the 1950's, the input devices used in superhigh-frequency radio receivers had noise temperatures of more than 2000°K, which was many times higher than the noise temperatures of the external sources. Subsequently, low-noise, superhigh-frequency amplifying devices were invented, such as tunnel diodes, parametric amplifiers, and quantum mechanical amplifiers, which made it possible to lower the receiver-noise temperatures, respectively, to values of the order of 300°, 30°, and 3°K, thereby improving the sensitivity of superhigh-frequency radio receivers by about 10 to 50 times.

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I. M. AINBINDER [29–1546–5]

NOISE, TERRESTRIAL, electrical fluctuations in a receiving antenna caused by the heat radiation of the earth in the radio spectrum, which, like atmospheric noise, worsen the quality of radio reception (*see* FLUCTUATIONS, ELECTRICAL).

A quantitative characterization of terrestrial noise is given by the noise temperature, which is equal to the product of the physical temperature of the absorbing layer of the earth (≈300°K) and the coefficient of absorption of this layer. The latter depends on the orientation of the antenna with respect to the earth. Terrestrial noise is comparatively great at small altitudes of the main lobe of the radiation pattern of a high-directional antenna placed on the earth and in those cases where an antenna mounted on a low-flying object is directed at the earth. If the main lobe is directed at the zenith, terrestrial noise is usually negligible.
[29–1547–2]

NOISE CONTROL, the aggregate of measures (technical, architectural, acoustical, and the like) that provide protection from noise and limit noise levels in rooms, buildings, and populated areas in accordance with established medical standards. Effective noise control can greatly enhance the public service planning of populated areas and make the living, working, and recreational conditions healthier for the inhabitants. (*See also* ACOUSTIC MATERIALS; SOUNDPROOFING; SOUND-ABSORBING STRUCTURES; and CONSTRUCTION ACOUSTICS.) [29–1543–1]

NOISE FIGURE (or noise factor), the numerical characteristic of a radio receiver that indicates how much its sensitivity to an incoming signal is decreased by the effects of its internal noise (*see* FLUCTUATIONS, ELECTRICAL).

The noise figure F is equal to the ratio of the total noise power at the output of an actual receiver P_{act} to the output noise power of a similar ideal (noiseless) receiver P_{id} under the condition that the only source of input noise in both cases is the thermal noise of the matched impedance (dummy antenna) at the temperature $T_0 = 290°K$ (*see* NYQUIST FORMULA):

$$F = P_{act}/P_{id} = P_{act}/kT_0\Delta fG \quad (1)$$

Here, k is Boltzmann's constant, Δf is the receiver's passband in hertz, and G is the receiver's power gain. The noise figure is also expressed in decibels: $F\,(dB) = 10 \log F$. For an ideal receiver, $F = 1$ (or 0 dB), while for an actual receiver, $F > 1$. Often, the noise figure is described by the noise temperature T_n.

The noise figure is measured by means of standard noise generators or standard signal generators by determining how much the total power of the receiver's output signal is increased with a calibrated signal P_{gen} at its input compared with the output power without the signal. When measuring by the "twofold excess" method, P_{gen} is adjusted so that the output-signal power is doubled. Then, $P_{act} = GP_{gen}$, and the noise figure is calculated from equation (1).

Quantum mechanical amplifiers and cooled parametric amplifiers using semiconductor diodes, for which $F \approx 1.1$ and $T_n \approx 30°K$ (when not cooled, $F \approx 1.3$ and $T_n \approx 100°K$), have the lowest noise figures. For amplifiers using traveling-wave tubes and tunnel diodes, $F \approx 3$ to 10 and $T_n \approx 600°$ to 3000°K. Radio and television receivers have noise figures ranging from several units to several tens.

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I. T. TROFIMENKO [29–1532–3]

NOISE TEMPERATURE, an effective quantity that serves as a measure of the noise power in radio receivers. The noise temperature T_n is equal to the temperature of the matched impedance (the dummy antenna) at which its thermal noise power is equal to the noise power of the given device. The ratio T_n/T_0 ($T_0 = 290°K$) is called the relative noise temperature.

The concept of noise temperature is used in radio engineering to estimate the noise of electronic and semiconductor devices that are designed for the amplification and conversion of electric signals. In radio astronomy it is used to describe sources of cosmic radio-frequency radiation. It is also used to determine the noise contribution made by a radio receiver to the useful signal in the course of its processing. The noise figure (or noise factor) F, which is related to T_n by the equation $T_n = (F - 1)T_0$, is also used in the last case.

The noise temperature of an actual object is usually determined by comparing it with the noise temperature of a given standard noise generator.

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NOTOSTRACA, a suborder of invertebrates of the order Phyllopoda. Almost the entire body is covered with a broad carapace. A pair of closely placed compound eyes and an unpaired simple eye are grouped in the front of the carapace. There are no fewer than 40 pairs of thoracic phylloid appendages, the first two pairs of which are equipped with long filiform tactile processes. The abdomen consists of many segments and ends in a pair of long filiform processes.

The Notostraca inhabit shallow bodies of fresh water that dry up seasonally. They feed on decaying organic remains, plants, and small animals. The females lay eggs into pouches on the 11th appendages and release the eggs on the bottom. The eggs can withstand high and low temperatures in the course of several years. Males are considerably less common than females.

The subphylum embraces nine genera. In the USSR the most

common are *Lepidurus apus*, which measures as much as 12 mm in length, and *Triops cancriformis*, which measures as much as 7.5 cm in length. Some species serve as food for fish and swimming birds. Others are pests in rice fields, uprooting seedlings and eating shoots.

The Notostraca are considered very old. They have been in existence since the Triassic.

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[29–1608–2]

NUMBER, in linguistics, the grammatical category indicating the number of participants in an action—subjects and objects—through morphological means. The primary distinction in the category of number is between singular and plural. Some languages also have a dual number and, more rarely, a triple number. In the historical development of a language, the dual may weaken and be absorbed by the plural, as happened in the Slavic languages; for example, in the second person personal pronoun Old Church Slavonic distinguished singular (*ty*, "thou"), dual (*va*, "you two"), and plural (*vy*, "you").

The forms and meanings of the plural include the distributive plural, which indicates that plurality is thought of as consisting of individual objects (*listy*, "leaves"), and the collective plural, which indicates that plurality is thought of as a single aggregate (*list'ia*, "leaves"). Collective meaning can also be expressed by a singular form (*triap'e*, "rags," *voron'e*, "crows"). Plural forms can also indicate the concept of class (generic plural) (*v etoi mestnosti vodiatsia volki*, "there are wolves in this area"). Plural forms may sometimes be used with the meaning of the singular, such as the polite, or honorific, form of the second person personal pronoun (*vy*, "you," in addressing one person) and the plural form in the first person (*my*, "we") as used in the speech of sovereigns.

Number is an independent category in nouns and personal pronouns. Other parts of speech, including verbs, adjectives, and the other types of pronouns, acquire marking for number through agreement (syntactic number). Number agreement is obligatory in the Indo-European languages (*on rabotaet*, "he works," *oni rabotaiut*, "they work"). However, as morphology becomes simpler, agreement may also disappear. For example, in English there is no number agreement between adjective and noun ("clever child," "clever children"). There are various ways of expressing plural number: affixation (*stol*, "table," *stoly*, "tables"), suppletion (*chelovek*, "person," *liudi*, "people"), internal inflection (Arabic *radžulun*, "man," *ridžālun*, "men,"), in which the root vowel changes, and reduplication (Indonesian [Malay] *orang*, "person," *orang-orang*, "people"). In Indo-European languages the plural form is required if a noun is modified by a word denoting quantity (*desiat' knig*, "ten books," *mnogo knig*, "many books"); in other languages the noun may have the form of the singular in such constructions (Hungarian *könyv*, "book," *tiz könyv*, "ten books," *sok könyv*, "many books"). In many Asian and American languages the plural of nouns used in constructions containing a numeral is expressed by means of special classifiers, which differ according to the lexical group to which the noun belongs. In such instances the nouns do not change their form (Vietnamese *hai con meo*, "two cats," where *con* is the classifier).

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V. A. VINOGRADOV [29–636–1]

NUMBER, the most important mathematical concept. The concept of number arose in simplest form in primitive society and over the ages has undergone changes, gradually growing richer in content with the expansion of the range of human activities and the range of problems requiring quantitative description and investigation. In the first stages of development, the concept of number was determined by the requirements of counting and measurement in man's daily activities. Subsequently, number became the basic concept of mathematics, and the further development of the concept has been determined by the needs of mathematical science.

The concept of natural number, or positive integer, arose as far back as prehistoric times in connection with the need to count objects. In general, its formation and development proceeded as follows. At the lower stage of primitive society, the concept of abstract number was nonexistent. This did not mean that primitive man was unable to ascertain the number of objects in a given set, such as the number of people involved in a hunt or the number of lakes in which fish could be caught. However, the consciousness of primitive man still could not perceive that which was common to various groups of objects, such as "three people" or "three lakes." Analyses of the languages of primitive peoples have shown that different phrases were used in counting different objects. The word "three" was conveyed differently in the contexts of "three people" and "three boats." Of course, such named number series were very short and terminated in a nonindividualized concept ("many") of a large number of some object, which was also named, that is, expressed by different words for different kinds of objects, such as "crowd," "herd," and "pile."

The concept of abstract number emerged out of the primitive way of counting objects, consisting in comparing the objects of a given specific set with objects of some defined set that acts as a standard. Among most peoples, fingers served as the first such standard ("finger counting"), confirmed by linguistic analyses of the names of the first numbers. At this stage, number becomes abstract, independent of the nature of the objects being counted, and at the same time acts as a fully concrete embodiment associated with the nature of the reference set. The expanding needs of counting forced people to use other counting standards, such as notches on sticks. For recording comparatively large numbers, a new idea came to be used—the designation of some specific number (ten among most peoples) by a new symbol, for example, a notch on a different stick.

With the development of writing, the possibilities of reproducing numbers expanded significantly. At first, numbers were denoted by lines on the writing material, such as papyrus or clay tablet. Later, other symbols were introduced to denote large numbers. The Babylonian cuneiform notations for numbers, like the Roman numerals that have been preserved to this day, clearly show that it was precisely in this manner that number notation developed. A major step forward was the Hindu positional numeration system, which made it possible to write any natural number by means of ten symbols—digits (*see* NUMERATION SYSTEM). Thus, as writing developed, the concept of natural number assumed increasingly abstract form. Also, the abstract concept of number, expressed by special words in speech and denoted by special symbols in writing, became increasingly entrenched.

An important step in the development of the concept of natural number was the recognition of the infiniteness of the sequence of natural numbers, that is, the possibility of its unlimited continuation. A clear understanding of the infiniteness of the sequence of natural numbers is reflected in Greek mathematical works (third century B.C.), specifically in Euclid's and Archimedes' works. The unlimited continuability of the sequence of prime numbers is established as early as Euclid's *Elements*, and the principles for the construction of names and symbols for any large number, particularly numbers larger than the "number of grains of sand in the world," are given in Archimedes' book *Sandreckoner*.

Operations on numbers came into use with the development of the concept of natural number in connection with the counting of objects. The operations of addition and subtraction originally arose as operations on sets themselves, in the form of the joining of two sets into one and the separation of part of a set. Multipli-

cation, apparently, arose as a result of counting in equal parts (by twos or threes, for example), and division arose as the division of a set into equal parts (*see* MULTIPLICATION and DIVISION). The abstract nature of these operations became evident after centuries of experience, as did the independence of the quantitative result of an operation from the nature of the objects forming the set, for example, that two objects and three objects will add up to five objects, regardless of the nature of the objects. Only then did mathematicians begin to develop the rules of operations, to study the operations, and to devise methods of solving problems; in other words, only then did the development of the science of numbers—arithmetic—begin (*see* ARITHMETIC). Arithmetic developed above all as a system of knowledge with an overt practical orientation. However, in the very process of its development, it became evident that there was a need to study the properties of numbers as such and to elucidate the increasingly complex regularities in their interrelations brought about by the very existence of the operations. The refinement of the concept of natural number began, and various classes, such as even and odd numbers and prime and composite numbers, became distinguished. The study of the deep-seated regularities of the natural numbers continues and constitutes the branch of mathematics known as number theory (*see* NUMBERS, THEORY OF).

Natural numbers, in addition to their primary function of characterizing the number of objects, have another function, that of characterizing the order of objects in a sequence. The concept of ordinal number (first, second, and so on), which arises in connection with this function, is closely linked with the concept of cardinal number (one, two, and so on). In particular, the most frequently used method of counting objects since time immemorial has been the placement of the objects being counted in a sequence and then counting them using ordinal numbers (for example, if the last object being counted is seventh, then the total number of objects is seven).

The question of substantiating the concept of natural number is rather recent. The concept is so familiar and simple that the need for its definition in terms of some simpler concepts never arose. It was only in the mid-19th century, under the influence of the development of the axiomatic method in mathematics, on the one hand (*see* AXIOMATIC METHOD), and the critical reassessment of the foundations of mathematical analysis, on the other, that the time became ripe for substantiating the concept of cardinal natural number. A clear definition of the concept of natural number based on the concept of set (an aggregate of objects) was provided in the 1870's by G. Cantor. First, Cantor defines the concept of the equivalence of sets. Specifically, two sets are said to be equivalent if the objects of the sets can be put into one-to-one correspondence. Then the number of objects within a given set is defined as that which the given set and any other set of objects equivalent to it have in common. The definition reflects the essence of the natural number as that which results from counting the objects composing the given set. Indeed, at all historical levels, counting has consisted in comparing one by one the objects being counted with the objects constituting a "reference" set (in the early stages, the fingers of the hands and notches on sticks; today, words and symbols representing numbers). Cantor's definition was the starting point for the extension of the concept of cardinal number from finite to infinite sets.

Another substantiation of the concept of natural number is based on an analysis of the relation of succession, which, it turns out, can be axiomatized. A system of axioms constructed on the basis of this principle was formulated by G. Peano.

It should be noted that the extension of the concept of ordinal number to infinite sets (transfinite ordinal numbers and, more generally, ordinal types) diverges sharply from the generalized concept of cardinal number, since quantitatively identical (equivalent) sets can be ordered by different methods. (*See* TRANSFINITE ORDINAL NUMBER and SET THEORY.)

Historically, the first extension of the concept of number was the introduction of fractions. The first use of fractions was connected with the need to carry out measurements. The measurement of some quantity consists in comparing it with another qualitatively similar quantity, which is taken as the unit of measurement. This comparison is performed by means of the operation—specific to the method of measurement—of "applying" the unit of measurement to the quantity being measured and counting the number of such applications. Length is measured in this way by applying a segment that is taken as the unit of measurement, and the amount of a liquid is measured by means of a measuring vessel. However, the unit of measurement does not always fit the quantity being measured a whole number of times, a fact that cannot always be ignored, even in the most primitive practical activity. Herein lies the source of the simplest and most "convenient" fractions, such as one-half, one-third, and one-fourth. It was only with the development of arithmetic as the science of numbers that the idea emerged of considering fractions with any natural denominator, as well as the concept of fractional number as a quotient in the division of two natural numbers, of which the dividend is not divisible by the divisor (*see* FRACTION).

The further extension of the concept of number was now no longer connected with the direct needs of counting and measurement but was a direct consequence of the development of mathematics.

The introduction of negative numbers was brought about of necessity by the development of algebra as the science providing general methods for the solution of arithmetic problems, regardless of content or given numerical data. The need for negative numbers in algebra arose in the solution of problems that reduce to linear equations with one unknown. A possible negative answer in problems of this kind may be interpreted by using as examples very simple directed quantities (oppositely directed segments, motion in the direction opposite to the direction chosen, property-debt). However, in problems that involve the repeated application of the operations of addition and subtraction, a great many cases must be considered in the course of a solution if negative numbers are not used, which may prove to be so burdensome a task that the advantage of an algebraic solution over an arithmetic solution is lost. Thus, the extensive use of algebraic methods in solving problems is extremely difficult unless negative numbers are used. In India negative numbers were used systematically as early as the sixth to 11th centuries in problem solving and were interpreted basically as they are today.

In European science the use of negative numbers did not become firmly established until the time of R. Descartes, who provided geometrical interpretation of negative numbers as directed line segments. Descartes's creation of analytic geometry, which made it possible to consider the roots of an equation as the coordinates of the points of intersection of some curve with the axis of abscissas, at long last eliminated the fundamental difference between the positive and negative roots of an equation, since their interpretation proved to be essentially the same.

Integers and fractions, both positive and negative, as well as the digit zero, were grouped under the general term "rational numbers." The set of rational numbers is said to be closed with respect to the four arithmetic operations. This means that the sum, difference, product, and quotient (except the quotient in division by zero, which is meaningless) of any two rational numbers is also a rational number. The set of rational numbers is ordered with respect to the concepts of greater than and less than. Furthermore, it has the property of density: there are infinitely many rational numbers between any two different rational numbers. This makes it possible to carry out various measurements, for example, of the length of a line segment using a selected unit of measurement, to any degree of accuracy by means of rational numbers. Thus, the set of rational numbers turns out to be sufficient to satisfy many practical needs. The formal substantiation of the concepts of fraction and negative number was accomplished in the 19th century and, in contrast to the substantiation of the concept of natural number, posed no fundamental difficulties.

The set of rational numbers proved insufficient for the study of continuously changing variables, which necessitated a further extension of the concept of number, consisting in the transition from the set of rational numbers to the set of real numbers. This transition involved the addition to the rational numbers the irrational numbers. A discovery of vast fundamental importance was made by the ancient Greeks: not all precisely defined line segments (the term "precisely defined" itself is an idealization inherent in geometry) are commensurable; that is, the length of a line segment cannot always be expressed by rational numbers if an-

other line segment is taken as the unit. A classic example of incommensurable line segments is the side of a square and its diagonal. That incommensurable line segments exist was not an impediment to the development of geometry. The Greeks worked out a theory of the ratios of segments, presented in Euclid's *Elements*, that takes into account the possibility of incommensurability. The Greeks knew how to compare the magnitude of such ratios and to perform arithmetic operations on them (in purely geometrical form); that is, they treated them as numbers. However, they did not fully perceive the idea that the ratio of the lengths of incommensurable line segments may be considered as numbers. This may be attributed to the idealist separation of theoretical mathematics from practical problems prevalent in the school to which Euclid belonged. In Archimedes' works we find greater interest in practical problems, particularly approximate calculations of the ratios of incommensurable line segments, but even Archimedes did not develop the concept of irrational number as a number that expresses the ratio of the lengths of incommensurable line segments.

In the 17th century, the era of the birth of modern science, particularly modern mathematics, a number of methods of studying continuous processes and methods of approximate calculations were developed. A clear definition of the concept of real number is given by I. Newton, one of the founders of mathematical analysis, in *Arithmetica universalis*: "By number we mean not so much a set of units as the abstract ratio of some quantity to another quantity of the same kind that we have taken as unity." This formulation gives a unified definition of a real number, whether rational or irrational. Later, in the 1870's, the concept of real number was refined on the basis of a detailed analysis of the concept of continuity in the works of R. Dedekind, G. Cantor, and K. Weierstrass.

According to Dedekind, the property of continuity of a straight line consists in the fact that if all the points that make up a straight line are divided into two classes such that every point of the first class lies to the left of every point of the second class (that is, if the straight line is "broken" into two parts), then either the first class contains a rightmost point or the second class contains a leftmost point In either case, the "extreme" point is the point at which the "break" of the straight line occurred.

The set of all rational numbers does not possess the property of continuity. If the set of all rational numbers is divided into two classes such that every number of the first class is smaller than every number of the second, then upon such a subdivision (a Dedekind cut) it may turn out that there will be no largest number in the first class and no smallest number in the second. This will be the case, for example, if all negative rational numbers, zero, and all positive (rational) numbers whose square is less than 2 are placed in the first class and all positive (rational) numbers whose square is greater than 2 are placed in the second class. Such a cut is said to be irrational. Then the following definition of an irrational number is given: with every irrational cut in the set of rational numbers we associate an irrational number assumed to be larger than any number of the first class and smaller than any number of the second class. The set of all real numbers, both rational and irrational, already has the property of continuity.

Cantor's substantiation of the concept of real number differs from Dedekind's, although it too is based on an analysis of the concept of continuity. Both Dedekind's and Cantor's definitions use the abstraction of the actual infinite. For example, in Dedekind's theory an irrational number is defined by means of a cut in the set of all rational numbers, which is conceived as being given in its entirety.

Recent years have seen the development of the concept of computable numbers, that is, numbers approximations to which can be given by means of some algorithm. This concept is defined on the basis of a refined concept of algorithm and without resorting to the abstraction of the actual infinite.

The final stage in the development of the concept of number was the introduction of complex numbers (*see* COMPLEX NUMBERS). The concept of complex number emerged in the course of algebra's development. Apparently, it first arose among 16th-century Italian mathematicians (G. Cardano, R. Bombelli) in connection with the discovery of the algebraic solution of third- and fourth-degree equations. It is known that even the solution of a quadratic equation can sometimes lead to the operation of extracting the square root of a negative number, which cannot be performed in the domain of real numbers. This occurs only in cases when the equation does not have real roots. A practical problem that reduces to the solution of such a quadratic equation turns out to have no solution. The following fact was observed in connection with the discovery of the algebraic solution of third-degree equations. If all three roots of the equation are real numbers, then it proves necessary, in the course of calculations, to extract the square root of a negative number. The "imaginariness" that arises in this case disappears only if all subsequent operations are performed. This fact was the first stimulus to the study of complex numbers. However, mathematicians were slow to accept the use of complex numbers and operations performed on them. The remnants of disbelief in the legitimacy of complex numbers are reflected in the term "imaginary," preserved to this day. This disbelief was dissipated only after the establishment, in the late 18th century, of the geometrical interpretation of complex numbers as points in a plane and the establishment of the indisputable benefit derived from the introduction of complex numbers in the theory of algebraic equations, especially after the celebrated work of K. Gauss. Even before Gauss, in the works of L. Euler, complex numbers played a significant role not only in algebra but also in mathematical analysis. They acquired particular importance in the 19th century, in connection with the development of the theory of functions of a complex variable.

The set of all complex numbers, like the set of real numbers and the set of rational numbers, is closed with respect to the operations of addition, subtraction, multiplication, and division. Moreover, the set of all complex numbers has the property of algebraic closure, which means that every algebraic equation with complex coefficients has roots that are also in the domain of all complex numbers. The set of all real numbers, especially the rational numbers, does not have the property of algebraic closure. For example, the equation $x^2 + 1 = 0$, with real coefficients, does not have real roots. As established by Weierstrass, the set of all complex numbers cannot be enlarged by the inclusion of new numbers in such a way that all laws of operation that are valid in the set of complex numbers are preserved in the enlarged set.

In addition to the main line of development of the concept of number (natural numbers→rational numbers→real numbers→complex numbers), the specific requirements of certain branches of mathematics have engendered various generalizations of the concept of number in essentially different directions. For example, in branches of mathematics associated with set theory, the aforementioned concepts of cardinal and ordinal transfinite numbers are of major importance. *p*-adic numbers, systems of which are obtained from systems of rational numbers by the inclusion of new entities different from irrational numbers, have assumed major importance in modern number theory. Various systems of entities possessing properties that are more or less close to those of the set of integers or rational numbers—groups, rings, fields, and algebras (*see* GROUP; RING, ALGEBRAIC; and FIELD)—are being studied in algebra. (*See also* HYPERCOMPLEX NUMBERS.)

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NUMBERS, THEORY OF, the science of the integers, or whole numbers. The concept of integer and the concept of arithmetical operations on numbers have been known since antiquity and are one of the first mathematical abstractions.

The natural numbers, that is, the positive integers, $1, 2, 3, \ldots$, the properties of natural numbers, and the operations on such numbers occupy a special place among the integers, that is, the numbers $\ldots, -3, -2, -1, 0, 1, 2, 3, \ldots$. All natural numbers greater than unity fall into one of two classes; the first class includes numbers that have exactly two natural divisors, namely unity and themselves, while the second class includes all other

numbers. The numbers of the first class have come to be called prime numbers, and the numbers of the second class, composite numbers. The properties of prime numbers and their relationship to all natural numbers were studied by Euclid (third century B.C.). If the prime numbers are written in sequence, it can be seen that their relative density decreases: there are four prime numbers, or 40 percent, in the first ten numbers; 25, or 25 percent, in the first hundred; 168, or about 17 percent, in the first thousand; 78,498, or about 8 percent, in the first million, and so forth; however, there are infinitely many prime numbers (Euclid).

The prime numbers include some pairs the difference between whose members is equal to two (twin primes), but whether such pairs are infinite or finite in number has not been proved.

Euclid believed it obvious that all the natural numbers could be obtained by multiplying only prime numbers and that every natural number could be represented uniquely (to within the order of the factors) as the product of prime numbers. Thus, the prime numbers form the multiplicative foundation of the natural numbers. The first problems of prime numbers were concerned with how frequently primes occur in the natural sequence and how far they are from each other. The study of the distribution of prime numbers led to the creation of an algorithm (rule) that makes it possible to compile tables of primes. The sieve of Eratosthenes (third century B.C.) is such an algorithm. In *Elements*, Euclid indicated a method of finding the greatest common divisor of the two numbers (Euclid's algorithm), a consequence of which is the theorem of the unique factorization of the natural numbers into prime factors.

The problem of integral solutions of different types of equations also dates to antiquity. The simplest equation in integral values of the unknowns is the linear equation

$$aX + bY = c$$

where a, b, and c are pairwise relatively prime integers. The solution of the equation $aX + bY = 1$ is found by using Euclid's algorithm, from the solution of which all solutions of the original equation are then obtained. Another equation in integral values of the unknowns is $X^2 + Y^2 = Z^2$ (the solutions $X = 3$, $Y = 4$, $Z = 5$ are Pythagorean numbers), all of whose solutions in integers were given in *Elements* (Book X, Proposition 29):

$$X = r^2 - q^2 \qquad Y = 2rq \qquad Z = r^2 + q^2$$

where r and q are integers. Euclid was also familiar with the equation $aX^2 + 1 = Y^2$, which subsequently became known as Pell's equation (*see* PELL'S EQUATION). In *Elements* (Book X, Proposition 9), Euclid provided all the solutions of this equation, beginning with the smallest solution, for the case $a = 2$. A systematic exposition of the theory of equations in integral values of the unknowns known at the time was given by Diophantus in *Arithmetica* (mid-third century B.C.). This book played a major role in the subsequent development of the branch of number theory concerned with the solution of equations in integral values of the unknowns that are now called Diophantine equations (*see* DIOPHANTINE EQUATIONS).

The next stage in the development of number theory is linked with P. de Fermat, who contributed a number of outstanding discoveries in the theory of Diophantine equations and the theory of the divisibility of integers. Fermet advanced the hypothesis now called Fermat's last theorem and proved the theorem known as Fermat's theorem, which plays an important role in the theory of congruences and its most recent generalizations (*see* CONGRUENCE). Continuing Fermat's studies of the theory of the divisibility of numbers, L. Euler proved a theorem that generalizes Fermat's theorem. He also contributed the first proofs of Fermat's last theorem for the exponent $n = 3$.

By the turn of the 18th century, the science of integers had amassed many facts that made it possible to construct orderly theories and general methods of solving various problems of number theory.

Euler was the first mathematician to create general methods and to apply other branches of mathematics, particularly mathematical analysis, to the solution of problems of number theory. While investigating the problem of the number of nonnegative, integral solutions $X_1, \ldots, X_n$ of linear equations of the type

$$a_1X_1 + \cdots + a_nX_n = N$$

where $a_1, \ldots, a_n$ are natural numbers, Euler constructed the generating function $\Phi(z)$ in the variable z such that the coefficients of its expansion in a power series in z are equal to the number of solutions, for different values of N, of the indicated equation. The function $\Phi(z)$ is defined as the formal product $\Phi(z) = \Phi_1(z) \cdot \ldots \cdot \Phi_n(z)$ of the series

$$\Phi_1(z) = \sum_{k=0}^{\infty} z^{a_1k}, \ldots, \Phi_n(z) = \sum_{k=0}^{\infty} z^{a_nk}$$

each of which converges when $|z| < 1$ and has a rather simple form, being the sum of the terms of an infinite geometric progression:

$$\Phi_1(z) = \frac{1}{1 - z^{a_1}}, \ldots, \Phi_n(z) = \frac{1}{1 - z^{a_n}}$$

Consequently,

$$\Phi(z) = \frac{1}{(1 - z^{a_1}) \ldots (1 - z^{a_n})} = \sum_{N=0}^{\infty} I(N)z^N$$

where $I(N)$ is the number of solutions of the equation being studied. Euler's method of generating functions was the source for the Hardy and Littlewood circle method, a far-reaching development of which was I. M. Vinogradov's method of trigonometric sums.

Another problem of number theory that stimulated the creation of a powerful method was the problem of prime numbers. In proving Euclid's theorem that the number of prime numbers is infinite, Euler considered the product over all prime numbers p

$$\prod_p \left(1 - \frac{1}{p^s}\right)^{-1} = \prod_p \left(1 + \frac{1}{p^s} + \frac{1}{p^{2s}} + \cdots\right)$$

for $s > 1$. This product converges, and if it is expanded, by virtue of the unique factorization of the natural numbers into prime factors, it turns out that this product is equal to the sum of the series

$$\sum_{n=1}^{\infty} \frac{1}{n^s}$$

whence Euler's identity follows:

$$\prod_p \left(1 - \frac{1}{p^s}\right)^{-1} = \sum_{n=1}^{\infty} \frac{1}{n^s} \qquad s > 1$$

When $s = 1$ the series on the right diverges (a harmonic series), and consequently Euclid's theorem follows from Euler's identity. Euler's idea thus became the basis for the modern theories of the zeta function (*see* ZETA FUNCTION). Euler and C. Goldbach contributed the first formulations of additive problems, that is, problems connected with addition, involving prime numbers.

By the mid-19th century, the theory of numbers was basically constructed through the efforts of K. Gauss, J. Lagrange, A. Legendre, P. Dirichlet, P. L. Chebyshev, J. Liouville, and E. Kummer.

Gauss created the theory of congruences, also known as the arithmetic of residue classes, which was used to prove the theorem that a prime number is the sum of two squares if and only if it has the form $4n + 1$, and the theorem of the representability of every natural number as the sum of four squares of integers. Furthermore, the theory of congruences led to the important number-theoretic concepts of character and trigonometric sum (*see* CHARACTER). The Legendre symbol is the simplest character (*see* LEGENDRE SYMBOL).

Gauss studied the properties of quadratic residues and nonresidues (*see* QUADRATIC RESIDUE). The fundamental theorem in this area is the quadratic reciprocity law, in proving which Gauss considered finite sums of the type

$$S(a) = \sum_{n=1}^{p} e^{2\pi i an^2/p} \qquad 0 < a \leq p - 1$$

where a is an integer. Sums of this $n = 1$ type and their generalizations have come to be called trigonometric sums, since by virtue of Euler's formula $e^{i\phi} = \cos \phi + i \sin \phi$ they can be represented as the sum of sines and cosines.

Gauss, and later Dirichlet, continuing Euler's studies, created

the theory of quadratic forms, in other words, the theory of the representation of natural numbers by forms of the type $ax^2 + 2bxy + cy^2$, where a, b, and c are integers.

Gauss and Dirichlet were the first to consider the problem of the number of lattice points in regions on a plane. Gauss proved that the number of lattice points in the circle $X^2 + Y^2 \leq R^2$ is equal to $\pi R^2 + O(R)$, and Dirichlet in turn proved that the number of lattice points with positive coordinates under the hyperbola $xy = N$ is equal to $N(\ln N + 2C - 1) + O(\sqrt{N})$, where C is Euler's constant. Generalizations of these two propositions and the finding of optimal remainders in the formulas written above (Gauss' problem of lattice points in a circle and Dirichlet's problem of divisors) were the source for a major chapter in number theory.

Theorems on the infinite number of prime numbers in arithmetic progressions of the type $4k \pm 1$ and $6k \pm 1$ had long been known, but Dirichlet was the first to prove the general theorem that there is an infinite number of primes in progressions of the type

$$nk + l \qquad n = 0, 1, 2, \cdots$$

where k (the difference of the progression) and l (its first term) are relatively prime. Dirichlet considered the following analogue of Euler's product over all primes:

$$\prod_p \left(1 - \frac{\chi(p)}{p^s}\right)^{-1}$$

Here $\chi(p)$ is not equal to zero and is periodic $\chi(n + k) = \chi(n)$ with a period k and completely multiplicative, that is, $\chi(nm) = \chi(n)\chi(m)$ for any integral n and m. This function is called a Dirichlet character. Dirichlet characters can be used to "cut out" an arithmetic progression. For every natural k there are $\phi(k)$ Dirichlet characters [$\phi(k)$ is Euler's ϕ-function]. If the sum of the numbers $\chi(n)$ over all possible characters corresponding to k is considered, it will be equal to $\phi(k)$ if n upon division by k gives a remainder of 1; otherwise it is equal to 0. If $s > 1$, an analogue of Euler's identity is obtained:

$$\prod_p \left(1 - \frac{\chi(p)}{p^s}\right)^{-1} = \sum_{n=1}^{\infty} \frac{\chi(n)}{n^s}$$

where the series on the right is a Dirichlet series (*see* DIRICHLET SERIES). By studying the behavior of such series as $s \to 1 + 0$, Dirichlet proved his theorem of the infinite number of prime numbers in an arithmetic progression.

Dirichlet characters are of considerable importance in both number theory itself and other branches of mathematics, such as algebra and topology, while Dirichlet series constitute a major branch of the modern theory of functions.

A new approach to the problem of the distribution of prime numbers was proposed by Chebyshev. Let $\pi(X)$ be the number of prime numbers that do not exceed X. Euclid's theorem asserts that $\pi(X) \to +\infty$ as $X \to +\infty$. Chebyshev proved the more exact result that

$$a \frac{X}{\ln X} < \pi(X) < b \frac{X}{\ln X}$$

where $a > \frac{1}{2} \ln 2$ and $b < 2 \ln 2$, and that if

$$\frac{\pi(X) \ln X}{X}$$

tends to a limit as $X \to \infty$, then this limit is equal to 1. Chebyshev also made another discovery in the theory of prime numbers. It had been noted in calculations that a prime number lies in the interval $(X, 2X)$, $X \geq 2$, a hypothesis known as Bertrand's postulate. Chebyshev proved Bertrand's hypothesis in 1852 but obtained a more exact result by decreasing the length of the interval considered. Thus, together with the problem of twin primes, that is, the problem of the least difference $p_{n+1} - p_n$, the problem of finding upper bounds for this difference arose and began to be solved.

The study of indeterminate equations and, first and foremost, of Fermat's equation led to the creation of a new branch of number theory—the theory of algebraic numbers. Attempting to prove Fermat's last theorem, Kummer arrived at the equation

$$x^n = z^n - y^n = \prod_{i=1}^{n} (z - \alpha_i y)$$

where the α_i are the nth roots of unity. Considering numbers of the type $z + \alpha_i y$, where z and y are integers, as "new integers," Kummer constructed the arithmetic of integers of the algebraic number field generated by α_i, that is, the set of numbers that is obtained from α_i by applying all four arithmetical operations to it. If the theorem of the unique factorization of integers into prime factors were valid in such a field, then the above equation would yield a contradiction. However, this is not always the case. In order to preserve the validity of the theorem, Kummer introduced ideal factors. A number of problems arose the solution of which led to the theory of algebraic numbers, with its many new concepts and results.

A new branch in number theory—the study of the arithmetic of the number line—emerged with the study of the properties of integers. Euler had already noted that the square roots of integers and the logarithms of integers fundamentally differ from one another. This fact was given an exact mathematical formulation after the work of Liouville (1844), who introduced the concepts of algebraic number and transcendental number (*see* ALGEBRAIC NUMBER and TRANSCENDENTAL NUMBER). It turns out that algebraic numbers are approximated "poorly" by rational fractions. Liouville proved that if an algebraic number is a root of an equation of degree n, then it is impossible to approximate it substantially closer than to within Q^{-n} by fractions of the type P/Q, where P and Q are relatively prime integers (Liouville's theorem). From here directly follows the existence of an infinite number of nonalgebraic numbers, which came to be called transcendental numbers. For example, the number

$$\sum_{n=1}^{\infty} 2^{-n!}$$

will be such a number. However, the question of whether specific numbers are algebraic or transcendental is difficult, and the classical constants π and e were the first to be so examined. Number theory continued to develop in many directions in the late 19th and early 20th centuries. General methods applicable to a broad range of problems, sometimes quite far removed from the original problems, were devised to solve individual problems. The methods and concepts developed often stimulated the development of new fields.

Two trends emerged in the theory of algebraic numbers: the study of specific numbers with a view to proving their transcendentality, and the study of the degree of approximation of algebraic numbers by rational or algebraic numbers. In the first trend, general methods were devised by C. Hermite (1873), who proved the transcendentality of the number e, and by the German mathematician C. L. F. von Lindemann, who proved the transcendentality of the number π and thus solved the problem of squaring the circle. In the second trend, A. Thue proposed (1909) a method of proving that in Liouville's inequality an algebraic number cannot be approached substantially closer than to within $Q^{-n/2}$. A consequence of this was Thue's theorem on the finiteness of the number of solutions in integers x and y of the equation

$$a_0 x^n + a_1 x^{n-1} y + \cdots + a_{n-1} x y^{n-1} + a_n y^n = A$$

where $a_0, a_1, \ldots, a_n$ and A are integers and $n \geq 3$.

The further study of prime numbers led to a new method in number theory connected with the function $\zeta(s)$. B. Riemann proved that the zeta function $\zeta(s)$ can be continued analytically to the entire complex plane, is analytic at every point of the plane except $s = 1$, where it has a pole of order 1 with a residue of 1, and satisfies the functional equation $\xi(s) = \xi(1 - s)$ with

$$\xi(s) = \frac{1}{2} s(s - 1)\pi^{-s/2}\Gamma\left(\frac{s}{2}\right)\zeta(s)$$

and $\Gamma(s)$ the gamma function. The zeta function has infinitely many zeros in the strip $0 \leq \operatorname{Re} s \leq 1$ (these zeros are said to be nontrivial, and the strip is called the critical strip). Riemann es-

tablished the close relationship between the nontrivial zeros of $\zeta(s)$ and the asymptotic behavior of $\pi(x)$. The study of the asymptotic formula for Chebyshev's function

$$\psi(x) = \sum_{n \le x} \Lambda(n)$$

where $\Lambda(n) = \ln p$ if $n = p^k$ and $\Lambda(n) = 0$ if $n \neq p^k$, is equivalent to the same problem for the function $\pi(x)$. The function $\psi(x)$ can be expressed in terms of the integral of the generating function $\zeta'(s)/\zeta(s)$:

$$\psi(x) = \frac{1}{2\pi_i} \int_{2-i\infty}^{2+i\infty} \left(-\frac{\zeta'(s)}{\zeta(s)} \right) \frac{x^s}{s}\, ds$$

Riemann advanced the hypothesis that all nontrivial zeros of $\zeta(s)$ lie on the line $\operatorname{Re} s = \frac{1}{2}$, from which it follows that

$$\psi(x) = x + O(\sqrt{x} \ln^2 x)$$

$$\pi(x) = \int_2^x \frac{du}{\ln u} + O(\sqrt{x} \ln x)$$

The Riemann hypothesis follows from the validity of any one of the last two equations. Dirichlet's L series were studied in a similar manner. In 1896, C. de La Vallée Poussin and J. Hadamard proved that $\zeta(s) \neq 0$ in the region $\operatorname{Re} s \geq 1$, whence followed the formula (the asymptotic law of the distribution of prime numbers)

$$\pi(x) \sim \frac{x}{\ln x}$$

Furthermore, La Vallée Poussin proved that $\zeta(s) \neq 0$ in the region

$$\operatorname{Re} s \geq 1 - \frac{c}{\ln(|t| + 2)}$$

and that

$$\pi(x) = \int_2^x \frac{du}{\ln u} + O(xe^{-c_1\sqrt{\ln x}})$$

where c and c_1 are positive constants. He also obtained the same result for prime numbers in arithmetic progressions: if $\pi(x, k, l)$ is the number of primes of the type $kn + l$, $n \leq x$, and k and l are relatively prime, then

$$\pi(x, k, l) = \frac{1}{\phi(k)} \int_2^x \frac{du}{\ln u} + O(xe^{-c_1\sqrt{\ln x}})$$

The method of obtaining asymptotic formulas for $\pi(x)$, $\psi(x)$, and $\pi(x, k, l)$, which is called the complex integration method, has found numerous applications. The basis of this method is the formula

$$\frac{1}{2\pi i} \int_{b-i\infty}^{b+i\infty} \frac{X^s}{s}\, ds = \begin{cases} 1 & \text{if } 0 < X < 1 \\ 0 & \text{if } X > 1 \end{cases}$$

The theory of quadratic forms, originated by Euler, Gauss, and Dirichlet, was further developed by A. N. Korkin, E. I. Zolotarev, and A. A. Markov. In particular, Korkin and Zolotarev proved the theorem that the variables of any positive quaternary quadratic form with determinant D can be assigned integral values such that the value of the form will not exceed $\sqrt[4]{4D}$, and there exist forms whose minima are equal to $\sqrt[4]{4D}$. The following is an example of such a form:

$$\sqrt[4]{4D}\,(x_1^2 + x_2^2 + x_3^2 + x_4^2 + x_1x_2 + x_1x_3 + x_1x_4)$$

Markov's research dealt with the minima of binary quadratic forms with positive determinant and led to a number of new discoveries.

The problems of lattice points in regions on a plane were developed further in the work of G. F. Voronoi, who devised (1903) a method to prove that the remainder term in Dirichlet's asymptotic formula for the number of lattice points under a hyperbola is of the order of the cube root of the main term. Later (1966), W. Sierpinski applied Voronoi's method to Gauss' problem of lattice points in a circle, with the same result. At the same time, attempts were undertaken to find solutions of the additive problems of number theory, particularly the Waring problem, solved by D. Hilbert in 1909 (*see* WARING PROBLEM).

The second, third, and fourth decades of the 20th century were exceptionally rich in new ideas and methods in number theory. H. Weyl, in solving problems connected with the stability of the solar system, arrived at the concept of the uniform distribution of the fractional parts of functions on the integers: the fractional parts of the real-valued function $F(x)$ are said to be distributed uniformly over $[0, 1)$ for $x = 1, 2, 3, \ldots$ if the number of times the fractional parts of $F(x)$ occur in any interval of $[0, 1)$ is proportional to the length of the interval. Weyl proved that for a uniform distribution of the fractional parts of $F(x)$, it is necessary and sufficient that the following equation be fulfilled for any fixed $|m| > 0$:

$$S(F) = \sum_{0 < x \le p} e^{2\pi i m F(x)} = o(P)$$

He obtained nontrivial estimates of $|S(F)|$ in the case where $F(x)$ is a polynomial whose leading coefficient is an irrational number. Vinogradov, studying the distribution of the values of the Legendre symbol on segments of short length compared with the modulus, proved (1914) the inequality

$$\left| \sum_{n \le x} \left(\frac{n + a}{p} \right) \right| < \sqrt{p} \ln p \qquad X > 0$$

from which it follows that the numbers of quadratic residues and nonresidues on any segment whose length is slightly greater than $\sqrt{p} \ln p$ are asymptotically equal. Furthermore, he advanced the hypothesis that this would be true when $X > p^{\epsilon}$, where $\epsilon > 0$ is an arbitrarily small number. In 1917, Vinogradov proved that the number of lattice points in the region $0 < y \leq f(x)$, $a < x \leq b$, under certain restrictions on the order of growth of the second derivative of $f(x)$, is equal to the area of this region to within a term of the order of the cube root of the main term. The Czech mathematician V. Jarník later established that under the assumptions made with respect to $f(x)$, the accuracy of this formula cannot be improved significantly.

The Norwegian mathematician V. Brun proved (1919) a number of theorems that in a sense approached the problem of twin primes and Euler's problem. Specifically, he proved the infiniteness of the number of pairs u_1 and u_2 such that $u_2 - u_1 = 2$ and such that the number of prime divisors u_1 and u_2 does not exceed nine; he also proved the solvability of the equation $u_1 + u_2 = 2N$, under the same conditions on u_1 and u_2.

G. Hardy and J. Littlewood published (1922–23) a series of monographs under the general title *Partitio numerorum*, in which they developed a general method of solving additive problems of number theory, which subsequently came to be called the circle method. This method, using the Waring problem as an example, consists in the following. Let

$$\Phi(z) = \sum_{x=0}^{\infty} z^{x^n} \qquad |z| < 1$$

then,

$$\Phi^k(z) = \sum_{N=1}^{\infty} I_k(N) z^N$$

Here $I_k(N)$ is the number of solutions of Waring's equation and is given by

$$I_k(N) = \frac{1}{2\pi i} \int_{|z| \le R < 1} z^{-N-1} \Phi^k(z)\, dz$$

Hardy and Littlewood studied the last integral as $R \to 1 - 0$. The circle of integration is broken in a specific way into "major" and "minor" arcs (hence the method's name). Here, the integrals over "major" arcs give the main term of the asymptotic formula for $I_k(N)$, and the integrals over the "minor" arcs give the remainder term. The result is the asymptotic formula

$$I_k(N) = \sigma(N) \frac{\Gamma(1 + 1/n)^k}{\Gamma(k/n)} N^{k/n-1} + O(N^{k/n-1-\delta})$$

where $\sigma(N)$ is a certain "singular series," $\sigma(N) \geq c > 0$, $\delta > 0$, and $k \geq (n-2)2^{n-1} + 5$. Using this method, Hardy and Littlewood obtained several results. They obtained a new solution of the Waring problem, a solution in a form more exact than Hilbert's solution. They also obtained a conditional solution of the Goldbach problem and formulated and wrote out hypothetical formulas for the number of solutions of a large number of equations with prime numbers.

In the early 1930's, Vinogradov developed the method of trigonometric sums, which made it possible to solve many problems in number theory. For example, working on the Waring problem, Vinogradov observed (1929) that the Hardy and Littlewood result would be much simpler if trigonometric sums of the type

$$\sum_{0<x\leq p} e^{2\pi i F(x)}$$

where $F(x)$ is a real function, were considered instead of generating functions and if the following relation were used:

$$\int_0^1 e^{2\pi i \alpha m}\, d\alpha = \begin{cases} 1 & m = 0 \\ 0 & m \neq 0 \end{cases}$$

where m is an integer. Then, $I_k(N)$ in the Waring problem will be written as

$$I_k(N) = \int_0^1 S^k(\alpha) e^{-2\pi i \alpha N}\, d\alpha$$

where

$$S(\alpha) = \sum_{0<x<N^{1/n}} e^{2\pi i \alpha x^n}$$

Then, the integration interval [0, 1] is divided by rational irreducible fractions of the type a/b, $0 \leq a < b \leq \tau$, where τ is a parameter that depends on N, into subintervals similar to the "major" and "minor" arcs of the circle method. Intervals corresponding to fractions with small denominators and the sum of the integrals over them give the main term of the asymptotic formula for $I_k(N)$. Other intervals correspond to minor arcs; for them, Vinogradov estimated $|S(\alpha)|$ by Weyl's method and obtained the remainder term. Other problems of number theory also reduce to trigonometric sums, such as the problem of the distribution of fractional parts of functions, the problem of lattice points in regions on a plane and in space, and the problem of the order of growth of the zeta function in the critical strip. What is important in such problems is whether a more exact evaluation of the modulus of a trigonometric sum is possible.

Vinogradov proposed two methods of estimating trigonometric sums. The first method (1934) made it possible to obtain new estimates of Weyl sums, and the current estimates were obtained by way of this method. In addition, an asymptotic formula was derived in the Waring problem for $k \geq 4n^2 \ln n$, and it was proved that no more than $3n \ln n + 11n$ terms suffice for Waring's equation to be solvable when $N \geq N_0(n)$. A new remainder term was also obtained in the asymptotic formulas for $\pi(x)$ and $\psi(x)$ (Vinogradov, 1957) of order

$$O(xe^{-c(\ln x)^{0.6}}) \qquad c > 0$$

and the Hilbert-Kamke problem was solved (K. K. Mardzhanishvili, 1953).

Vinogradov's second method (1937) made it possible to evaluate trigonometric sums in which summation is carried out over prime numbers:

$$T = \sum_{p\leq N} e^{2\pi i \alpha p}$$

This led to the proof of the asymptotic formula for the number of representations of an odd number by the sum of three primes, from which it followed that all sufficiently large odd numbers are the sum of three primes. The Goldbach problem was thus solved (*see* GOLDBACH PROBLEM). Vinogradov's second method also led to the solution of other general problems of number theory, such as the Waring problem in prime numbers and the problem of the distribution of quadratic residues and nonresidues in sequences of the type $p + a$, where p assumes prime values.

The development of Thue's ideas (construction of an auxiliary polynomial with a root of high multiplicity) and G. Pólya's ideas (United States; an entire analytic function that assumes integral values at positive lattice points and that grows more slowly than $2^{\gamma|S|}$, $\gamma < 1$, is a polynomial) led A. O. Gel'fond and the German mathematician T. Schneider (1934) to the solution of Hilbert's seventh problem, which asserts the transcendentality of numbers of the type α^β, where $\alpha \neq 0, 1$ and β is an algebraic number of degree ≥ 2. K. Siegel proved a series of theorems on the transcendentality of the values of functions of the type e^x (E functions) at algebraic points.

In algebraic number theory, a number of theorems that generalize theorems of the theory of integers to the integers of algebraic number fields have been proved; some of them have also led to purely arithmetic results, including the theory of the representation of numbers by complete and incomplete decomposable forms (Pell's equation is the simplest of these problems). The theory of solutions of congruences of two or more variables has also been developed. It follows, for example, from this theory that the congruence

$$F(x, y) \equiv 0 \pmod{p}$$

where F is an absolutely irreducible polynomial, has $p + O(\sqrt{p})$ solutions (the Hasse-Weyl theorem).

Between the late 1940's and the present (1978), many papers have appeared in number theory in quite varied areas. Research is being conducted in classical number theory and in various new branches of number theory. The Soviet mathematicians B. N. Delone and D. K. Faddeev investigated in detail (1940) the Diophantine equation $x^3 - ay^3 = 1$. In the theory of the Riemann zeta function, A. Selberg (Norway, 1942) proved that a nonzero fraction of all zeros of $\zeta(s)$ lies on the critical line $\operatorname{Re} s = \frac{1}{2}$. Iu. V. Linnik proved that the smallest prime number in an arithmetic progression with a difference k does not exceed k^c, where c is a constant, and worked out the dispersion method (1958–61), which he used to derive the asymptotic formula for the number of representations of a natural number N by the sum of a prime number and two squares (the Hardy-Littlewood problem). Linnik also used this method to obtain an asymptotic formula for the number of solutions of an indeterminate equation of the type $p - a = xy$, where $p \leq N$, $xy \leq N$, and a is a fixed integer (Titchmarsh's problem of prime divisors). Vinogradov's method of trigonometric sums was developed further by Vinogradov himself and by his students. Unsuccessful attempts to prove Riemann's hypothesis led to a number of methods that obviate it and at the same time make it possible to solve certain problems of number theory that are derived from the hypothesis. These include the problem of estimating the difference $p_{n+1} - p_n = \Delta_n$, which reduces to estimating the number of zeros of the zeta function in rectangles of the type $\sigma \lesssim \operatorname{Re} s \leq 1$, $\sigma > \frac{1}{2}$, and $|\operatorname{Im} s| \leq T$. It follows from such "density" theorems and the bound on the zeros of $\zeta(s)$ obtained on the basis of Vinogradov's method that $p_{n+1} - p_n = O(p_n^{0.6})$. Similar results have also been obtained in the theory of the distribution of prime numbers in arithmetic progressions and in its application to additive problems involving prime numbers.

In the theory of transcendental numbers, the British mathematician K. Roth strengthened (1955) Thue's method and proved that an algebraic number cannot be approximated by a rational fraction P/Q much more accurately than to within $Q^{-2-\epsilon}$, where $\epsilon > 0$ is arbitrarily small; the British mathematician A. Baker obtained (1966) an estimate from below for a linear form of the logarithms of algebraic numbers. This led to an effective proof of Thue's theorem of the finiteness of the number of solutions of the equation

$$a_0x^n + a_1x^{n-1}y + \cdots + a_{n-1}xy^{n-1} + a_ny^n = A$$

(bounds on these solutions are given) and to an effective strengthening of Liouville's theorem of the approximation of algebraic numbers by rational fractions. A large number of problems of number theory have yet to be solved, including the problems of twin primes, the infiniteness of prime numbers of the type $n^2 + 1$, lattice points in a circle and under a hyperbola, the distribution of the zeros of the zeta function, and the transcendentality of the numbers $\pi + e$ and Euler's constant.

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A. A. KARATSUBA [29–619–3]

NUMERAL, a nominal, the general lexical meaning of which is a quantity of persons or things. Grammatically, numerals are marked for the category of case (in languages with a developed morphology) and for gender (in languages with grammatical gender, some numerals possess marked forms; for example, Russian *dva*, "two" [masculine and neuter], and *dve*, "two" [feminine]) and are not marked for the category of number.

In Russian, numerals may be definite (*dva*, "two," *desiat'*, "ten") or indefinite (*mnogo*, "many," *malo*, "few"), depending on the nature of the quantitative expression. Collective numerals designate quantity as a group (*dvoe*, "two," *troe*, "three," *piatero*, "five," *oba*, "both"); they constitute a special group. The structure of Russian numerals may be simple (*dva*, "two," *tri*, "three," *odinnadtsat'*, "eleven"), compound (*piat'desiat*, "fifty," *sem'desiat*, "seventy"), or complex (*tridtsat' shest'*, "thirty-six," *sto desiat'*, "one hundred ten"). Many scholars consider ordinals and the word *odin* ("one") as adjectives; such words have forms marked for both number and grammatical gender. The words *desiatok* ("a group of ten"), *sotnia* ("a group of one hundred"), and *tysiacha* ("[a group of] one thousand") are nouns, inasmuch as they have all the formal characteristics of a noun. In the development of the Slavic languages, some numerals originated from other parts of speech; for example, Russian *piat'* ("five") was classified as a noun. Numerals should be distinguished from other words with quantitative meaning.

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V. A. VINOGRADOV [29–629–3]

NUMERICAL METHODS, in mathematics, methods of approximate solution of mathematical problems through the performance of a finite number of elementary operations on numbers.

The elementary operations used are arithmetic operations, generally carried out approximately, and subsidiary operations, such as recording intermediate results and extracting information from tables. Numbers are expressed by a limited set of digits in some positional numeration system, for example, the decimal or binary system. The number line is thus replaced by a discrete system of numbers, sometimes called a net. A function of a continuous variable accordingly is replaced by a table of the function's values in this discrete system of numbers (*see* MATHEMATICAL TABLE). Operations of analysis that act on continuous functions are replaced by algebraic operations on the function's values in the table. Numerical methods reduce the solution of mathematical problems to computations that can be performed manually or by means of calculating machines. The development of new numerical methods and their use in computers have led to the rise of computer mathematics. [29–629–1]

NUMERICAL SOLUTION OF EQUATIONS, the process of finding approximate solutions of algebraic and transcendental equations. The numerical solution of equations reduces to performing arithmetic operations on the coefficients of equations and on the values of their constituent functions; the process makes it possible to find solutions of equations to any predefined accuracy. Many problems of mathematics and its applications reduce to the numerical solution of equations.

Although I. Newton (17th century) was the first to develop a general method of numerical solution of equations, in the early 13th century L. Fibonacci calculated a root of the equation $x^3 + 2x^2 + 10x = 20$ with an error of less than $\frac{1}{3} \times 10^{-10}$. In the late 16th century J. Bürgi of Switzerland calculated a root of the equation $9 - 30x^2 + 27x^4 - 9x^6 + x^8 = 0$, which defines the length of a side of a regular nonagon. At approximately the same time F. Vieta gave a method of calculating roots of algebraic equations that was similar to Newton's method.

The numerical solution of an algebraic equation may be divided into the following stages: (1) identification of multiple roots, which reduces the problem to solving an equation with simple roots; (2) determination of boundaries between which roots of the equation may lie; (3) isolation of roots, that is, the determination of intervals such that each contains no more than one simple root (*see* STURM'S THEOREM); (4) rough determination of the approximate value of a root, which is performed graphically or by some other method—for example, by studying the changes in sign of the left-hand side of the equation; (5) calculation of the root to the specified accuracy. Among the most widely used methods for the numerical solution of algebraic equations are the method of false position, Newton's method, Lobachevskii's method, the method of successive approximations, and expansion in series.

The numerical solution of transcendental equations is limited to stages (4) and (5). The numerical solution of differential equations is discussed in APPROXIMATE SOLUTION OF DIFFERENTIAL EQUATIONS.

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[29–628–2]

NUX VOMICA (*Strychnos nux-vomica*), also strychnine tree a small tree (to 15 m high) of the family Loganiaceae. The leaves are opposite, leathery, and shiny. The small greenish white flowers are gathered into umbellate cymose inflorescences. The fruit is a berry, with two to eight very hard disk-shaped seeds with shiny, silky hairs.

The nux vomica is native to the tropical forests of Asia and northern Australia; it is cultivated in the tropics of Africa. Like several other closely related species, it contains poisonous alkaloids (strychnine, brucine), mainly in the seeds. Strychnine (nitrate) and galenicals (the dried extract and tincture of nux vomica) are used in medicine and veterinary medicine as tonics to treat lowered metabolism, rapid fatigability, hypotension, weakened cardiac activity (resulting from intoxication and infection), pareses and paralyses, and atony of the stomach. The genus *Strychnos* contains 150 to 200 species, which are common to the tropics of both hemispheres. Some species are used as a source of the arrow poison curare, which contains alkaloids called curarines; others are used to treat snakebites and to purify drinking water. [29–592–1]

OCCUPATION NUMBER, in quantum mechanics and quantum statistics, a number that indicates the extent to which quantum states are filled by the particles of a quantum-mechanical system consisting of many identical particles. For a system consisting of fermions, or particles with half-integral spin, the occupation numbers may take only two values: 0 for empty states or 1 for filled states. For a system consisting of bosons, or particles with integral spin, the occupation numbers may take any nonnegative integral values: 0, 1, 2, . . . For a given system, the sum of all occupation numbers should be equal to the number of particles in the system.

Occupation numbers may also be used to describe the numbers of elementary excitations, or quasiparticles, of quantum fields. In this case, the sum of the occupation numbers is not fixed.

The occupation numbers averaged over a state in statistical

equilibrium for ideal quantum gases are specified by either the Fermi-Dirac or the Bose-Einstein distribution function [*see* equation (19) in STATISTICAL MECHANICS]. The concept of occupation numbers underlies the method of second quantization, which is also called the occupation-number representation.

D. N. ZUBAREV [29–628–1]

OEDIPUS, in ancient Greek mythology, a king of Thebes.

In Sophocles' tragedy *Oedipus Tyrannus* (c. 425 B.C.), Oedipus' father, Laius, having received an oracle that he would be slain by his son, orders his wife Jocasta to abandon their new-born baby on Mount Cithaeron. The infant is saved by shepherds and is brought to Polybus, king of Corinth, who raises him as his own son. Upon reaching manhood, Oedipus is told by the Delphic oracle that he will slay his father and wed his mother. Afraid to return to Corinth, which he considers his homeland, Oedipus sets out on the road. While on the road he quarrels with and kills an unknown nobleman, who in fact is Laius. Subsequently, Oedipus solves the riddle of the Sphinx and frees Thebes; in return he is proclaimed king of Thebes and marries the widowed Jocasta. For 20 years he lives in happiness, unsuspecting that the prophecy of the Delphic oracle has come true. When a plague breaks out in Thebes and the Delphic oracle prophesizes that only the banishment of Laius' murderer will save the city, Oedipus learns of his crimes. In despair, he puts his eyes out with a clasp from the dress of Jocasta, who has hanged herself, and goes into exile, accompanied by his loyal daughter Antigone. Oedipus dies in Colonus, a suburb of Athens.

Versions of the myth appeared in the works of classical authors, including Euripides and Seneca, and in literature and music beginning with the Renaissance, for instance, in the works of P. Corneille, J. Cocteau, T. S. Eliot, and I. F. Stravinsky.

[29–1685–2]

OEDOGONIALES, an order or class of green algae that resemble branching or nonbranching filaments. The cells are uninucleate with parietal dissection or reticular chloroplast. The outer layer of the membrane contains chitin. The membranes of some cells have narrow zonules in the form of truncated cones; the zonules are traces of the tearing of the outer layer of the membrane during cell division. Reproduction is asexual (large zoospores equipped in front with a crown of flagella form singly in the cell) or sexual (oogamy). In some Oedogoniales the spermatozoids are formed in pairs in special disk-like cells. In others, disk-like cells produce small zoospores that germinate on or near oogoniums into dwarf male plantlets.

Oedogoniales are found widely in fresh waters, especially in warm and sluggish reservoirs. There are 470 species, making up three genera. About 100 species occur in the USSR. [29–1688–3]

OIL CAKE, a by-product of oil extraction obtained after the fat is extracted from the seeds of oil plants by organic solvents. Various types of oil cake (peanut, mustard, castor bean, hemp, corn) are distinguished according to the raw material from which they come. Oil cake is a valuable protein feed. One hundred kilograms of sunflower oil cake contains about 100 feed units and 37.6 kg of digestible protein; 100 kg of hemp oil cake contains 82 feed units and 24.8 kg of digestible protein. Oil cake contains vitamin E, B-complex vitamins, potassium, and phosphorus; it is low in sodium and calcium. It is fed to all types of farm animals, mainly as part of mixed feeds. [29–1443–1]

OIL MINING, SUBSURFACE, a method of petroleum extraction that is based on the digging of a system of underground mining excavations. The method is used to mine pools containing high-viscosity oils, or bitumens, and heterogeneous pools of medium-viscosity oil that are no longer productive by other methods. Oil may be mined either by washing or by drainage.

In washing, oil-bearing rock is shattered by, as a rule, drilling and blasting. At the working face, the rock is loaded into underground haulage cars by loading machines. The rock is then conveyed up the shaft to the surface, where it is processed in special installations to remove the petroleum fractions. Combined processing of the mineral raw materials is possible; after the petroleum fractions are removed, the containing rock may be used, for example, as a building material or as raw material for the chemical industry.

In drainage, oil is mined by means of boreholes drilled from previously dug mining excavations. Drainage is used in cases where the crude oil either is mobile or may be rendered mobile artificially, for example, by heating the productive formation. If the crude oil is made mobile by artificial means, the final production may be increased to 50–60 percent, as compared with the 5–6 percent achieved by other methods. Mine wells, which may be vertical, inclined, or horizontal, can be drilled to substantial depths. For example, the PBS-2T underground drill rig makes it possible to drill mine wells that are 300 m long and up to 370 mm in diameter. The oil is gathered in underground storage sumps and then pumped to the surface.

Subsurface oil mining has a number of technological advantages. Productive formations are directly accessible, so that losses of heat-transfer fluids before their injection into the formations are reduced to a minimum. In addition, a higher percentage of the oil in a formation is extracted, and fuller use is made of petroleum reserves. Finally, weather conditions do not affect any of the operations. However, subsurface oil mining requires that personnel work underground. Such mining is complicated by the presence of gas shows, a gas cap, bottom water or edgewater, and productive formations composed of loose ground or of quicksand.

In the USSR, the largest amount of experience in subsurface oil mining has been accumulated at the Iarega deposit in the Komi ASSR, where commercial subsurface oil mining has been carried out since 1939. The method of using a heat-transfer fluid to heat the deposit's productive formation has been tried and developed there since 1968. Mining conditions permit subsurface oil mining at certain fields in Azerbaijan, Kazakhstan, Groznyi Oblast (the Chechen-Ingush ASSR), and Krasnodar Krai.

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V. P. TABAKOV [29–908–1]

ONE STEP FORWARD, TWO STEPS BACK (subtitled *The Crisis in Our Party*), a work by V. I. Lenin that develops a Marxist theory of the proletarian party, elucidates the organizational principles of Bolshevism, and defines the political significance of the division of the RSDLP into Bolsheviks and Mensheviks at the Second Party Congress. Written between February and May 1904 and published in May 1904 in Geneva, *One Step Forward, Two Steps Back*, is included in the fifth Russian edition of Lenin's works (*Poln. sobr. soch.*, vol. 8, pp. 185–414).

With the approach of revolution in Russia, it became of paramount importance to explain to the party's masses the reasons for the split at the Second Congress of the RSDLP in 1903 and the nature of Bolshevism's struggle against Menshevism after the congress. Although they assured the party of their agreement with the Bolsheviks on matters of principle, the Mensheviks stepped up their divisive activities. In addition to distorting the nature of disagreements within the party, they declared the Leninists' victory at the Congress a chance occurrence and stated that there was no obligation to carry out the resolutions of the congress and the party's central bodies. They viewed the subordination of the minority to the majority as a crude, mechanical suppression of the will and freedom of the party members, and they referred to party discipline as serfdom. In essence, they worked against the creation of a single, united party built on the principles of centralism, arguing instead that party organizations should remain independent of the Central Committee.

Lenin showed that the division into Bolsheviks and Mensheviks was a direct continuation of the division of Social Democrats into revolutionary and opportunist wings, which had surfaced during *Iskra*'s struggle against economism. Lenin pointed out that "the new division is based on a difference over questions of *organisation*, which began with the controversy over principles of

organisation (Paragraph 1 of the Rules) and ended up with a 'practice' worthy of anarchists" (*ibid.*, p. 373). The success of the congress was a step forward in the creation of a revolutionary party, whereas the divisive activity of the Mensheviks represented two steps back, for the masses could be prepared for revolution only if there were ideological and organizational unity in the party and a centralized direction of party organizations.

The Bolsheviks regarded the party as the leader of a class; the Mensheviks made virtually no distinction between the party and the class as a whole. Unmasking the Mensheviks' organizational opportunism, which had cropped up at the congress during a discussion of the first paragraph of the Rules—pertaining to party membership—and had developed into a system of opportunist views, Lenin showed that the Mensheviks' attempt to give every striker the right to call himself a member of the RSDLP erased the boundary between the vanguard and the rest of the working class. In the final analysis, this approach would doom the party to accommodating the most backward elements of the proletariat. The party, as the vanguard of the working class, must not be confused with the class as a whole. The party is the section of the working class with the greatest political awareness; armed with a knowledge of the laws of social development and class struggle, it is equipped to lead the proletariat.

The party is not only the vanguard but the organized vanguard of the working class. It will be able to fulfill its role as leader only if it is highly organized and disciplined and if its members are united in their will and their actions.

The party is the highest form of the proletariat's class organization. Its mission is to lead all mass working-class organizations, including professional, cooperative, youth, and women's organizations, uniting their efforts in the struggle against the exploiting classes. The party embodies the tie between the vanguard of the working class and the broad millions of the proletariat and all working people.

The party can become a strong and united organization only if it is built on the principle of centralism. In other words, the party must be structured and must operate according to a single set of rules; leadership must come from a single source—the party congress or, between congresses, the Central Committee; there must be a single discipline for the party's rank and file and its leaders; and the minority must be subordinate to the majority, and lower organizations to higher ones.

Lenin pointed out that centralism in no way contradicts democratism, which was characteristic of the Marxist party from its inception, and that when operating as a legal organization the party must be built on the principle of democratic centralism. For underground work, however, Lenin advocated the principle of centralism, since only it could guarantee the ability of the party to fight when subjected to severe repression by the authorities. A centralized and disciplined Marxist party, to be sure, is based on democracy within the party, collective leadership, criticism, and self-criticism.

Lenin's main point, which runs through the entire book, is the crucial importance for the proletariat of organization. The strength of the working class lies in organization: without organization the proletariat is nothing; organized, it is everything. Lenin wrote: "In its struggle for power the proletariat has no other weapon but organisation. The proletariat can, and inevitably will, become an invincible force only through its ideological unification on the principles of Marxism being reinforced by the material unity of organisation, which welds millions of toilers into an army of the working class. Neither the senile rule of the Russian autocracy nor the senescent rule of international capital will be able to withstand this army" (*ibid.*, pp. 403–04).

One Step Forward, Two Steps Back was distributed widely in local party organizations. It exerted a tremendous influence on party cadres and was a powerful ideological weapon in the battle against Menshevism. In 1907 the book was republished in the collection *After Twelve Years*, printed by the Bolshevik publishing house Zerno in St. Petersburg.

Lenin's book occupies an important place in the development of Marxist-Leninist theory and in the history of the CPSU and of the entire world communist movement. The Leninist principles for building a revolutionary proletarian party are of permanent value and have been confirmed by the experience of the world revolutionary movement.

As of Jan. 1, 1977, *One Step Forward, Two Steps Back* had gone through 151 printings; a total of 9,150,400 copies had been produced in 43 languages of the USSR and other countries.

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Istoriia KPSS, vol. 1. Moscow, 1964. A. I. SEREDA [29–797–1]

OPTICAL SQUARE, a very simple geodetic instrument that is used to lay off angles that are multiples of 90° or of 45°.

In a prism square (see Figure 1), the direction of a ray originating from the flag on the right is changed by 90° after refraction and internal reflection. To lay off the angle by which the direction of the ray is changed, a second flag is set up in such a way that, when it is seen over the instrument, it is exactly above the image of the first flag in the instrument.

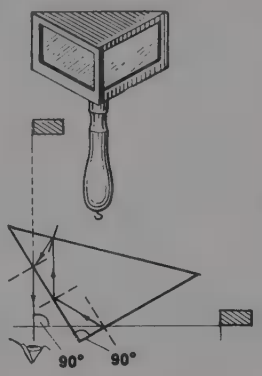

Figure 1. A prism square

Optical squares are used to solve geometric problems on a terrain and to carry out plane surveys. [29–1751–1]

OSCILLATION, FREQUENCY OF (also oscillation frequency), the number of complete oscillations per unit time. For harmonic oscillations, the frequency $f = 1/T$, where T is the period of the oscillations. The unit of frequency is one oscillation per second, which is called a hertz. A quantity that is often used is the angular frequency $\omega = 2\pi f$. [29–85–1]

OSCINELLA (frit flies), a genus of grain flies. There are several species, although the exact number is not known. Each species is usually injurious to one specific grain. The most common species are *O. frit*, which usually infests oats; *O. pusilla*, which infests barley; and *O. vastator*, which infests spring wheat. The last two species also infest winter rye, winter wheat, corn, and some herbs. The insects are widespread in regions where grains are cultivated. The body is black and measures 1.5–2 mm in length. Two or three generations are produced annually in the north, and as many as five in the south. The flies emerge in late April in the south and in late May or early June in the north. The eggs are deposited on young plants with no more than two or three leaves or in the spikelets. The larvae feed inside the stem on the embryo of the spike or on the developing caryopsis. The stems wither, and the central leaf dries up. Infested corn plants branch intensively, many stems become twisted, and the number of ears decreases sharply. The insects winter, usually in the larval phase, in the stems of perennial grasses and on the shoots of winter crops.

Measures to combat the flies include scuffling of the stubble, early fall-winter plowing of grain fields, early sowing of spike crops, sowing of corn and winter crops at the optimum time, early top-dressing of shoots with inorganic fertilizers, and treating of seeds and grain crops with pesticides.

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ÖSEL, BATTLE OF (1719), an engagement between the Russian and Swedish navies on May 24 (June 4), 1719, near the island of Ösel (now Saaremaa), during the Northern War of 1700–21.

A Russian squadron of six ships of the line and a *shniava* (a light double-masted vessel for reconnaissance and messenger service) under Commander N. A. Seniavin came upon a Swedish force consisting of one ship of the line, one frigate, and one brigantine under Commodore Admiral Wrangel. The Russians gave chase. Under heavy artillery fire, first the frigate and brigantine and then the ship of the line surrendered.

The Russians took 387 Swedes prisoner; 50 Swedes were killed, and 13 were wounded. Nine Russians were wounded. The battle of Ösel was the first battle on the high seas in which the Russian Navy achieved victory without boarding the enemy's ships. [29–1693–5]

ÖSEL EPISCOPATE (also Saare-Läänemaa or Ösel-Vikskim Episcopate), a feudal state that was located in northwestern Estonia and included the province of Läänemaa and parts of the islands of Saaremaa and Hiiumaa. The total area of the Ösel Episcopate was approximately 7,600 sq km.

The episcopate arose as a result of the conquest of Estonia in late 1227 or early 1228 by the Order of Knights of the Sword, which subsequently, in 1237, merged with the Teutonic Order to form the Livonian Order. The state, which assumed its definitive form in 1234, was headed by a bishop who was a vassal of both the Holy Roman emperor and the pope. The bishop's see was first located at Lihula, but it was moved to Pärnu in 1251 and then to Haapsalu circa 1265.

During the 13th and 14th centuries, the Livonian Order strove to establish a unified Livonian state that would include the Ösel Episcopate. After the order was defeated by Russia in the Livonian War of 1558–83, the bishop sold his holdings in 1559 to the Danish king, Frederick II, who granted them to his brother Duke Magnus in 1560. Although the Ösel Episcopate was subordinated to Denmark in 1561, it survived as a separate entity on the island of Saaremaa until 1573. [29–1694–1]

OSMUNDA, a genus of perennial ferns of the family Osmundaceae. The stems are massive and usually short; they are topped by a crown of large leaves measuring as much as 3 m long. The pinnate leathery or filmy leaves are divided into vegetative and spore-bearing parts. Sometimes there are separate vegetative and spore-bearing leaves. There are about 15 species, growing in humid and swampy regions, primarily in the subtropics of Eurasia, Africa (including Madagascar), and the Americas. The USSR has three species. The royal fern (*O. regalis*), with leaves up to 1.5 m long, occurs in western Transcaucasia; the two other species are found in the Far East. Some species are ornamental. [29–645–1]

ØVERLAND, ARNULF. Born Apr. 27, 1889, in Kristiansund; died Mar. 25, 1968, in Oslo. Norwegian poet.

Øverland, who took part in the socialist movement, spent the years 1941 to 1945 in the Sachsenhausen and other concentration camps. Feelings of melancholy and loneliness pervade the collections he published between 1910 and 1920. Such collections as *I Conjure Thee* (1934) and *The Red Front* (1937) protest against capitalism; they express sympathy for the USSR and the Spanish people's struggle for freedom. Øverland's poems of the war years (collected in *We Shall Live Through All*, 1945) called for a struggle against fascism. His later collections of verse include *The Smoking Candle* (1960) and *On Nebo Mountain* (1962). He also wrote short stories, plays, and works on linguistics.

Øverland opposed the modernist school in postwar Norwegian poetry. At the same time, however, the poet retreated from his socialist ideals. Øverland served as chairman of the Norwegian Writers' Union in 1952.

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N. I. KRYMOVA [29–1648–3]

OXALIC ACID, HOOC—COOH, the simplest dibasic carboxylic acid. A colorless crystalline compound, oxalic acid has a melting point of 189.5°C. Its solubility in water is 10 g per 100 g H_2O at 20°C and 120 g at 100°C. Oxalic acid is poorly soluble in alcohol and ether and is insoluble in benzene and chloroform. It is a relatively strong acid ($K_1^{25} = 3.6 \times 10^{-2}$). It forms the hydrate $C_2H_2O_4 \cdot 2H_2O$ (melting point, 101.5°C), as well as acid and neutral salts (oxalates), esters, amides, and other derivatives.

Salts of oxalic acid are found in plants—for example, its acid potassium salt is found in sorrel (genus *Oxalis*, hence the name). The acid forms in tissues as a metabolic product and, together with the oxalic acid in food, is excreted with urine as potassium oxalate. Oxalates participate in the formation of stones in the kidneys and urinary bladder in cases of disorders of mineral metabolism. Oxalic acid is formed in oxalic acid fermentation.

Oxalic acid was first synthesized in 1842 by F. Wöhler from cyanogen. It is produced industrially by the pyrolysis of sodium formate, HCOONa. It is used as mordant in cloth printing; it is also used in the production of dyes and inks, as a bleaching agent, and as a precipitating agent for rare earths. [29–1570–3]

PADUS, a genus of low trees and, rarely, shrubs of the family Rosaceae. The simple, alternate leaves have early-falling stipules. The white flowers are gathered into racemes. The fruit is a drupe.

There are about 15 species (according to other data, as many as 27), distributed in Eurasia and North America. The USSR has four native species and several others under cultivation. The bird cherry or cluster cherry (*P. avium*, formerly *P. racemosa*), a tree reaching 17 m in height and 40 cm in diameter, is found in the European USSR, Western Siberia, the Caucasus, and certain regions of Middle Asia. The tree grows mainly on rich soils, often in river forests. It is cultivated in orchards and parks. The flowers have a strong fragrance; the plant is a good nectar-bearer. The fruits are used as food and for coloring alcoholic beverages. Teas or infusions made from the fruits are used as binding agents to treat diarrhea. The bark yields dye, and the close-grained wood is used in the production of various articles. The closely related *P. asiatica* grows in Eastern Siberia and the Far East. *P. ssiori* and *P. maackii* grow in the Far East; the latter was used by I. V. Michurin to develop *Cerapadus*. The American chokecherry (*P. virginiana*) and wild black cherry (*P. serotina*) are commonly cultivated.

The genus *Padus* is closely related to the genus *Cerasus* and somewhat related to the genera *Laurocerasus*, *Prunus*, and *Amygdalus*. The five genera are often united in the single genus *Prunus*. [29–195–2]

PALE OF SETTLEMENT, the part of the Russian empire in which Jews were permitted to reside on a permanent basis. It included the provinces of Bessarabia, Vil'na, Volyn', Grodno, Ekaterinoslav, Kovno, Minsk, Mogilev, Podol'sk, Poltava, Tavrida, Kherson, Chernigov, and Kiev.

The pale of settlement was created in the late 18th century, when the Right-bank Ukraine, Byelorussia, and Lithuania—all with large Jewish populations—were ceded to Russia in the partitions of Poland. Only "local Jews" were permitted to live in Courland Province, the Caucasus, and Middle Asia. Within the pale of settlement, Jews were forbidden to live in the villages or in the cities of Kiev, Sevastopol', and Yalta. Those permitted to live outside the pale were merchants of the first guild, persons with higher and specialized education, artisans, and soldiers fulfilling compulsory military service; the descendants of persons in these three categories were also authorized to live outside the pale.

For the Jews the pale of settlement was the most onerous burden resulting from their unequal status as a nation (*natsiia*, nation in the historical sense). The pale of settlement was abolished by the law of Mar. 20 (Apr. 2), 1917, On the Abolition of Religious and National Restrictions.

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PALPUS, a segmented appendage of the jaws (mandibles and first and second maxillae) in crustaceans, myriapods, and insects, equipped with various sense organs (tactile organs and chemoreceptors). The palpi are well developed and completely represented in crustaceans; in myriapods and insects there are no palpi on the mandibles. In many insects, especially those with a sucking-type mouth apparatus, the palpi are reduced. [29–1620–3]

PANEL-GLUING MACHINE, a woodworking machine for the fabrication of panels of various sizes by gluing together planed or sometimes unplaned wooden beams, edgings, or scraps of boards. A distinction is made between static and continuous panel-gluing machines.

A static panel-gluing machine has supports on which clamping mechanisms are mounted. The clamping mechanisms, which may be screw, pneumatic, or hydraulic devices, tightly squeeze the parts being glued together against one another and prevent them from swelling. Static panel-gluing machines have steam or electric heaters to accelerate the hardening of the glue.

In continuous panel-gluing machines, panels are continuously glued together. Workpieces smeared with glue are squeezed tightly against one another, pass through a heating area, and are heated to harden the glue. After the workpieces emerge from the heating area, they are cut into the required sections.

Old manually operated fan-type and conveyor-type assemblers (*vaimy*) may also be classified as panel-gluing machines. In such machines, clamped panels complete one turn on a horizontal shaft or a conveyor chain; the glue hardens as the panels turn. The panels are then removed, and new workpieces are placed in the empty units. [29–1613–3]

PARALLEL RULE, a device for uniform hatching, used in drafting. The principal elements of a parallel rule are a straightedge with a protractor attachment, a fastening yoke, a rod, and a shift lever with a return spring. When the lever on the rod is pressed, the rod carrying the yoke with the straightedge is moved by a predetermined step ranging from 0.2 to 10 mm. The yoke may be fastened at any point on the rod up to a distance of 100 mm. The protractor attachment has a stop that allows the straightedge to be set at an angle from 0° to 180°. Self-contained parallel rules are attachable to any spot on the drawing by means of pins; other types are made in unit with drafting machines. [29–1496–1]

PARITY, a quantum-mechanical characteristic of the state of a physical microparticle, for example, a molecule, an atom, an atomic nucleus, or an elementary particle. Parity represents the symmetry properties of the wave function of such a microparticle with respect to mirror reflection. In processes resulting from strong interactions and from electromagnetic interactions, the law of parity conservation holds; that is, a physical system having mirror symmetry of a definite type in the initial state retains that symmetry at all later moments in time. The conservation of parity leads to a number of selection rules in the electromagnetic radiation of atoms and atomic nuclei, in nuclear reactions, and in reactions involving transformations of elementary particles.

The law of parity conservation may be demonstrated by using the Zeeman effect as an example. When a magnetic field is applied, the intensity of the radiation in individual spectral lines remains symmetric with respect to the plane perpendicular to the field but is no longer identical in all directions. The radiation in the direction of the magnetic field is the same as the radiation in the opposite direction. If we imagine a system—in the form of a current-carrying circular conductor with a specimen placed at the center of the circle—for observing the Zeeman effect, the mirror symmetry of the system becomes obvious, but only on the condition that all the elementary particles composing the system have mirror symmetry. Thus, the law of parity conservation is based on the assumption that all electrons, protons, and other particles are transformed into themselves under mirror reflection.

Instead of mirror symmetry with respect to a plane, it is more convenient to consider an operation that entails the inversion of coordinate axes: $\mathbf{r} \rightarrow -\mathbf{r}$ or $x \rightarrow -x$, $y \rightarrow -y$, $z \rightarrow -z$ (*see* SPACE INVERSION).

The law of parity conservation governs the transformation properties of physical quantities under the inversion of coordinate axes. Thus, from the assumption that a charged particle—for example, an electron—is transformed into itself under inversion, it follows that electric charge q is a scalar, current density $\mathbf{j}$ and electric field strength $\mathbf{E}$ are true (or polar) vectors, and magnetic field strength $\mathbf{H}$ is an axial vector (or a pseudovector): $q \rightarrow q'$, $\mathbf{j} \rightarrow -\mathbf{j}'$, $\mathbf{E} \rightarrow -\mathbf{E}'$, $\mathbf{H} \rightarrow \mathbf{H}'$.

The law of parity conservation is violated in weak interactions, which—in particular—are responsible for the beta decay of nuclei. The violation was predicted in 1956 by Tsung Dao Lee and Chen Ning Yang. It was confirmed experimentally in 1957 by Chien Shiung Wu and co-workers in the beta decay of nuclei and by the American physicists L. Lederman and R. Garwin, as well as other scientists, in the decay of muons. Parity is also not conserved in the decays of charged pions, kaons, and hyperons. The Soviet physicists Iu. G. Abov, V. M. Lobashev, and others discovered the nonconservation of parity in weak nucleon-nucleon interactions.

A diagram of Wu's experiment is shown on the left in Figure 1. A specimen containing the radioactive isotope ^{60}Co was placed in the magnetic field $\mathbf{H}$ of a circular current. The field $\mathbf{H}$ oriented the relatively large magnetic moments of the ^{60}Co nuclei in the direction parallel to $\mathbf{H}$. The short arrow on the left in Figure 1 indicates the direction of the electron velocities within the conductor. As in the example of the Zeeman effect, Wu's system was mirror symmetric with respect to the plane in which the circular current flowed. If the law of parity conservation held, the intensity of the electron (e^-) emission during β^- decay should have been the same on both sides of the plane in which the current flowed. However, a pronounced asymmetry was observed in the experiment: 40 percent more electrons were emitted on one side of the plane than on the other side.

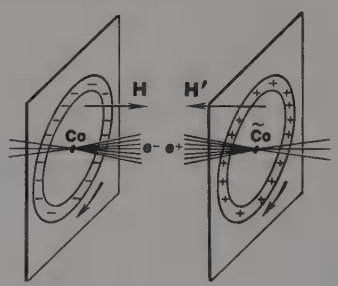

Figure 1. Diagram illustrating Wu's experiment (left) and its mirror image (right)

From Wu's experiment, it follows that magnetic field strength is a polar vector rather than an axial vector. This is not inconsistent with the equations of electrodynamics if we assume that current density and electric field strength are axial vectors and—at the same time—that electric charge is a pseudoscalar. The identification of charge as a pseudoscalar means that, under mirror reflection, electrons are transformed into positrons (e^+) and, in general, all particles are transformed into their respective antiparticles. The possibility of such an interpretation of reflection was pointed out by the American scientists E. Wigner, G. Wick, and A. Wightman as early as 1952.

L. D. Landau referred to mirror reflection accompanied by the replacement of all particles by their antiparticles as combined inversion. The hypothesis that the laws of nature are symmetric with respect to combined inversion is expressed by the law of the conservation of combined parity, which is usually called the law of CP conservation. When the law of parity conservation is replaced by the law of CP conservation, the scheme of Wu's experiment is no longer mirror symmetric, since the β^+ decay of an anticobalt nucleus, $\bar{C}o$, in the magnetic field of a circular positron current is the mirror image of her experiment (Figure 1, on the right); an anticobalt nucleus consists of antiprotons and antineutrons. Since the charge of the positron is positive, the sign of the current changes if the positrons move in the same direction as the

electrons. A change in the sign of the current leads to a change in the sign of the magnetic field ($\mathbf{H}'$).

Thus, the law of parity conservation is approximate and holds only when weak interactions are ignored. The conventional treatment—where, for example, $\mathbf{H}$ is an axial vector—of the transformation properties of electromagnetic quantities with respect to the inversion of coordinate axes is valid to the same extent to which the law of parity conservation holds.

In quantum theory, the parity of a state of a system consisting of n particles is defined as the eigenvalue of the parity operator P, which inverts space. The action of the operator P on the state vector $\psi(\mathbf{p}_1, \ldots, \mathbf{p}_n)$ consists in a change of the signs of the particle momenta $\mathbf{p}_i$ and in the multiplication of the parity of the state vector by the product $\Pi_1 \ldots \Pi_n$ of the intrinsic parities of the particles. Intrinsic parity is an inherent property of a particle and is equal to either $+1$ or -1. Particles for which $\Pi_k = 1$ are said to have even parity, while particles for which $\Pi_k = -1$ are said to have odd parity. For example, the intrinsic parity of neutral pions is odd. The intrinsic parities of antiparticles with half-integral spin are the opposite of those of the respective particles. For this reason, in particular, mesons consisting of a quark and an antiquark with zero orbital angular momentum—for example, pions, kaons, rho mesons, and omega mesons—have odd intrinsic parity. The operator P does not act on spin projections or on charges. The eigenvalues of the operator P are equal to ± 1. States with $P = 1$ are called states of even parity; states with $P = -1$ are known as states of odd parity.

The definition of parity leads to two rules for determining the parities of physical systems consisting of several particles. First, the parity of a system consisting of n particles with orbital angular momenta $\hbar l_1, \ldots, \hbar l_n$, where $\hbar$ is Planck's constant and l_i are integers, is equal to

$$\Pi_1 \ldots \Pi_2(-1)^l 1 + \cdots + l_n$$

Second, the parity Π_{12} of a complex system consisting of two subsystems with respective parities Π_1 and Π_2 is equal to $\Pi_1\Pi_2(-1)^L$, where $\hbar L$ is the orbital angular momentum associated with the relative motion of the subsystems.

Electromagnetic field quanta have neither intrinsic parity nor orbital angular momenta. The parity of a quantum of electromagnetic radiation, or a photon, is determined by the quantum's multipole order (*see* MULTIPOLE). The parity of an electric 2^l-pole is equal to $(-1)^l$, while the parity of a magnetic 2^l-pole is equal to $(-1)^{l+1}$. Therefore, the parity of a physical system is conserved when an electric multipole quantum with even l or a magnetic multipole quantum with odd l is emitted or absorbed. It is reversed when an electric multipole quantum with odd l or a magnetic multipole quantum with even l is emitted or absorbed. The parity selection rules for the electromagnetic radiation of atoms and nuclei result from the fact that, for identical multipole orders with all other conditions being equal, magnetic multipole radiation is substantially weaker than electric multipole radiation. The ratio of the probabilities of magnetic and electric multipole radiation is of the order of $(2\pi R/\lambda)^2$, where R is the linear size of the radiator and λ is the wavelength of the radiated quantum. As a rule, the ratio is much smaller than unity for both nuclei and atoms, so that the parity selection rules are markedly exhibited.

The law of parity conservation, which is also called P invariance, is formulated as the conservation of the quantity P in strong and electromagnetic interactions.

The concept of the intrinsic parity of a particle and, thus, of the parity of a state contains a certain degree of ambiguity, which is associated with the impossibility of comparing the parities of states that differ in the values of just one of the conserved charges, for example, electric charge or baryon charge. Therefore, in particular, the parity of the vacuum state and the parities of the proton, the neutron, and the electron are arbitrary and may be assigned positive values. However, in this case, the parities of, for example, a pion, the positron, and the antiproton become well defined and must be assigned negative values.

The fundamental question of the symmetry of real space with respect to mirror reflection is closely associated with the concept of parity. The methods of group theory have been used to prove that, if space has mirror symmetry, either the law of parity conservation or the principle of CP invariance must be strictly satisfied. The violation of both the law and the principle in weak interactions has been established experimentally. Therefore, grounds exist for postulating that either space does not have symmetry between left and right or such symmetry is broken in certain types of interactions. An example of such interactions is the interactions that result in the decay of the long-lived neutral kaon, $K^0_L \rightarrow 2\pi$.

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IU. M. SHIROKOV [29–356–5]

PARITY OF A STATE, the parity of an energy state of a physical system, that is, the parity of a wave function. Such a characteristic of energy states is possible for a system of particles in which electromagnetic or nuclear forces that conserve parity act between the particles.

When weak interactions are taken into account, a state with a given parity acquires a small admixture of the opposite parity. In atomic nuclei, the relative magnitude of the admixture is of the order of 10^{-6}–10^{-7}.

If an energy state is degenerate, so that wave functions with different parities are associated with the state (as is the case with, for example, excited states of the hydrogen atom), states described by the superposition of such wave functions are possible; that is, the degenerate state may not have a definite parity, even if the forces acting in the system conserve parity.

S. S. GERSHTEIN [29–359–1]

PART AND WHOLE, philosophical categories expressing the relationship of an aggregate of objects (or elements of a single object) to the connection that joins the objects together and endows the aggregate with a new set of integrative properties and regularities not inherent in the objects when separate. As a result of this connection, a whole is formed, with the individual objects representing its parts.

The categories of the part and the whole also characterize the general movement of knowledge, which usually begins with the undifferentiated representation of the whole, then proceeds to the analysis of the whole and its breakdown into parts, and completes the process by reconstructing the object in the mind in the form of a concrete whole. These principles pertaining to the knowledge of whole objects were formulated by K. Marx in his "Economic Manuscripts of 1857–59" (see K. Marx and F. Engels, *Soch.*, 2nd ed., vol. 46, part 1). The overall strategy of scientific knowledge, as it develops in any given period, is determined to a significant extent by the particular treatment of the categories of the part and the whole and the specific interpretation of the related question of wholeness.

The problem of the relationship of parts and wholes, raised in ancient times by Plato and Aristotle, has been examined by all the important schools of philosophy. The scientifically oriented materialist views of F. Bacon, T. Hobbes, J. Locke, and the 18th-century French materialists were usually associated with a me-

chanistic and summary conception of the whole, borrowed from mechanics and later from classical physics. In classical natural science, knowledge of the whole was sought only from the point of view of its composition and structure. In contrast, the idealist philosophers—Plato, the medieval Scholastics, and, to a certain extent, G. von Leibniz—insisted that the whole could not be reduced to the sum of its parts. Only the products of mental activity were seen by them as truly whole, while material entities were regarded as mechanical wholes, or dead aggregates.

The gap between these contrasting concepts—the mechanistic sum of the parts at one extreme and the mystical mental whole at the other—leads to the following important antinomies with respect to parts and wholes:

(1) Thesis: The whole is equal to the sum of its parts. Antithesis: The whole is greater than the sum of its parts.

(2) The parts precede the whole. The whole precedes its parts.

(3) The whole is causally determined by its parts. Wholeness contradicts and excludes causality.

(4) The whole is understood through knowledge of its parts. The parts, as products of the division of the whole, can be understood only through knowledge of the whole.

The classical German philosophy of F. von Schelling and G. Hegel introduced the distinction between the inorganic and the organic (or self-developing) whole; the organic whole, however, was associated with nonmaterial development only, and not with matter. In the 19th and 20th centuries the relationship between parts and wholes was treated in similar terms in the various idealist schools of thought, such as neovitalism, holism, and intuitivism.

K. Marx critically reinterpreted the traditions of classical German philosophy and formulated a set of principles for the study of organic wholes, including the method of ascent from the abstract to the concrete and the dialectical interpretation of analysis and synthesis. He was also the founder of the methodology for the scientific study of society as a whole. Dialectical materialism provides a rational explanation of the dialectics of parts and wholes by combining the data of theoretical conceptions and disciplines based on the integral approach to objects—for example, the concept of integrative levels in theoretical biology and the results of research in genetics, ecology, physiology, psychology, and linguistics.

It has been demonstrated not only theoretically but also on the basis of experimental data that the whole cannot be reduced to the sum of its parts in objects that have a complex structure. The formula "the whole is greater than the sum of its parts" has proved inadequate to resolve the problem, since the formula implicitly presumes additivity (or summariness, which does not constitute wholeness) of the properties of the whole; wholeness here seems to be what remains after the sum of the parts is subtracted from the whole. The answer is that the whole is characterized by new properties and qualities, which are not inherent in the individual parts (or elements) but which appear as a result of the latter's interaction within a particular system of connections.

This property of any form of a whole, which may be called the integrative property, also makes it possible to understand all the other specific properties of the whole. Such properties include the appearance of something new in the process of development, the emergence of new types of wholeness, the appearance of new structural levels and their hierarchical order, and the distinction between organic and inorganic wholes—a distinction based on the fact that in inorganic wholes (such as atoms or molecules) the properties of the parts, even though reflecting the nature of the whole, are determined primarily by the internal nature of the parts, whereas in organic systems (such as biological or social objects) the properties of the parts are wholly determined by the properties of the whole.

Further logical contradictions arise in the general formulation of the question of what comes first—the whole or its parts. In the relationship of parts and wholes, as Hegel showed early on, neither can be considered without the other. The whole is inconceivable without or before the parts; on the other hand, a part outside the whole is no longer a part but a different object, since the parts of the whole express the nature of the whole and acquire its specific properties.

The relationship between the parts of an organic whole, as well as the relationship between the parts and the whole, is not a simple functional dependence but a much more complex system of different types of connections, including structural and genetic connections and the connections of subordination and control. Within this system, causes are simultaneously effects, and what is posited is simultaneously a premise. The interdependence of the parts here is such that it appears not in the form of a linear causal series but rather as a special type of closed circle within which each element of the connection is both a condition of and conditioned by the next element (see K. Marx, *ibid.*, p. 229). This structural approach to the whole is not an alternative to causal explanation; it merely demonstrates the inadequacy of univocal causality in the analysis of a complex system of connections. Moreover, the principle of structural explanation may itself be regarded in a certain sense as an extension of the principle of causality.

Modern knowledge also provides the solution for a well-known cognitive paradox—namely, how can the whole be known before the parts if this presupposes knowledge of the parts before knowledge of the whole? The parts and the whole become known at the same time; the parts are identified and analyzed as elements of the given whole, and as a result of synthesis the whole emerges as dialectically broken up into and consisting of its parts. In the final analysis, study of the parts is the only possible means of studying the whole. At the same time, the results of the study of the parts are incorporated into the system of scientific knowledge only because they represent new information about the whole. The analysis of the dialectical interrelation of parts and wholes is a very important methodological principle of scientific knowledge.

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I. V. BLAUBERG and B. G. IUDIN [29–93–1]

PARTIAL DISCHARGE, an electrical discharge that occurs in gaseous inclusions within electrical insulation or over contaminated or damp sections of the surface of such insulation. Partial discharges cause solid insulation to age or deteriorate. To avoid the occurrence of partial discharges, materials used as insulation are subjected to special treatment, such as vacuum drying or the impregnation of voids with an electrically strong dielectric. In addition, whenever possible, the surface of insulation is kept free of contamination and moisture. [29–80–4]

PARTICLE, a member of a lexical-grammatical class of words that express the attitude of the speaker toward an utterance and that may be used to produce certain grammatical forms. An auxiliary part of speech, the particle is not a sentence part.

Particles exist in many languages, and the Slavic languages have a rather extensive system. In Russian, particles are divided into several semantic-functional types. Syntactic particles are used in the formation of the subjunctive, imperative, and optative moods (*by, pust', da, davai, davaite*). Negative particles include *ne* and *ni*. Subjective modal particles modify the sense of other words or entire sentences; they include intensive particles (*ved', dazhe, -to, zhe*), emphatic particles (*tol'ko, lish'*), interrogative particles (*razve, neuzheli, li*), and exclamatory particles (*kak, chto za*). Particles are also used as affixes in the formation of pronouns and adverbs (*koe-, -libo, -nibud', -to*).

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V. A. VINOGRADOV [29–79–4]

PARTICULAR SOLUTION. A particular solution of a differential equation $F(x, y, y', \ldots, y^{(n)}) = 0$ is a solution $y = \phi(x)$ obtained from the general solution $y = \phi(x, C_1, \ldots, C_n)$ of the equation for some specific choice of the arbitrary constants $C_1, \ldots, C_n$. For example, the general solution of the equation $y'' + y = 0$ is $y = C_1 \cos x + C_2 \sin x$; if we set $C_1 = 2$ and $C_2 = -1$, we obtain the particular solution $y = 2 \cos x - \sin x$. [29–82–2]

PARTS OF SPEECH, the fundamental word classes in a language, distinguished according to the similarity of the words' syntactic, morphological, logical, and semantic properties. Autonomous parts of speech include the noun, verb, adjective, and adverb; functional parts of speech include the conjunction, preposition, particle, and article. Numerals, pronouns, and interjections are also traditionally considered parts of speech.

Words can be classified according to the positions they occupy in a sentence. A part of speech will then include all words that can occupy identical syntactic positions in a sentence or that can perform identical syntactic functions. Of importance here is not only the set of syntactic functions, but also the degree to which each of the functions is characteristic of the particular part of speech. The functions are divided into primary and secondary according to specific morphological or syntactic restrictions. Thus, in Russian both the noun and the verb can function as subject (*chelovek liubit*, "man loves"; *kurit'—zdorov'iu vredit'*, "to smoke is to harm one's health") or as predicate (*Ivanov—uchitel'*, "Ivanov is a teacher"; *derevo gorit*, "the wood burns"). However, for the verb the predicate function is primary and the subject function is secondary, but for the noun the subject function is primary and the predicate function is secondary. For example, a verb can only be the subject with a nominal predicate, but a noun can be the subject with any predicate. A sentence with a verb subject can be transformed into a sentence with a noun subject (*kurenie vredno dlia zdorov'ia*, "smoking is harmful to one's health"), but the reverse is not true. A noun predicate requires a copulative verb in order to express tense and mood (*Ivanov byl/-byl by uchitelem*, "Ivanov was/would have been a teacher"), which is not true of a verb predicate. In Chinese both verb and adjective can function as an attributive, but in doing so the verb, unlike the adjective, requires the special adjectival suffix *-tê*.

Some scholars question the validity of considering pronouns and numerals separate parts of speech in most languages, since words of these classes ordinarily vary in their syntactic functions and from this point of view belong to different word classes. For this reason they are often considered subclasses of other parts of speech. (In Russian, for example, compare the noun numerals *tri*, "three," and *chetyre*, "four," with the adjectival numerals *pervyi*, "first," and *vtoroi*, "second.")

Each part of speech has its own set of characteristic grammatical categories; the set of categories embraces an absolute majority of the words of the particular part of speech. This serves as a morphological criterion for distinguishing parts of speech in inflected languages. In Russian, for example, number, case, and gender (as a word-classifying category) are characteristic of the noun, and degrees of comparison, number, case, and gender (as an inflectional category) are characteristic of the adjective. In Burmese, however, the adjective and verb are not contrasted in this way, since words corresponding to both adjectives and verbs in other languages have degrees of comparison.

The distribution of words by parts of speech is governed in all languages by certain semantic regularities that serve to differentiate the parts of speech semantically. In Russian the class of nouns includes words denoting objects (*stol*, "table"), qualities (*krasnota*, "redness"), and actions (*khozhdenie*, "walking"); however, the majority of nouns not denoting objects are derived, and the majority of nonderived nouns denote objects. This regularity imparts to the class of nouns the general meaning of objectness. In the same way, the general meaning of action or state is established for the verb, of quality for the adjective, and of action or quality attribute for the adverb.

The system of parts of speech taught in modern school grammars stems from the works of the Alexandrian philologists, such as Dionysius Thrax and Apollonius Dyscolus, who distinguished nominals, verbs, participles, adverbs, articles, pronouns, prepositions, and conjunctions according to mixed morphological, semantic, and syntactic criteria. In this system nominals included nouns, adjectives, and numerals. (In contrast, Plato combined the adjective and verb on the basis of logical syntactic relations.) The system of the Alexandrian philologists also influenced the Arab grammatical tradition. The Middle Ages and the Renaissance, during which logical-semantic criteria were stressed as the basis for the existence of parts of speech, introduced no significant changes into the system. The development of comparative-historical linguistics placed morphological characteristics in the forefront and was responsible for a purely morphological approach to the problem of parts of speech (with the additional influence of the Indian grammatical tradition). The new approach, as reflected in the works of F. F. Fortunatov, denied the existence of parts of speech in isolating languages. In the 20th century linguistics refused to recognize that word classes analogous to the parts of speech of inflected languages can be distinguished in isolating languages, a fact previously demonstrated by H. C. von der Gabelentz (the syntactic criterion establishes word classes in inflected languages that essentially coincide with morphological parts of speech). With the syntactic approach all languages have parts of speech, and difficulties arising from the morphological approach are avoided (such as the lack of morphological marking in the classification of indeclinable Russian nouns, such as *pal'to*, "overcoat").

Parts of speech differ from language to language. The differences concern not only which parts of speech a language has, but also what words are subsumed under each part of speech. Thus, Russian, French, and Latin distinguish nouns, adjectives, verbs, and adverbs. Several North American and African languages do not differentiate adverbs from adjectives. Chinese distinguishes nominals, predicatives (verbs and adjectives), and adverbs. In some languages, such as the American Indian language Yuma, only nominals and verbs are distinguished. Differences as to what words are subsumed under particular parts of speech can be observed by comparing Hausa, in which words corresponding to the adjectives of other languages are in the same class as nouns, with Burmese, in which this type of word is in the same class as verbs. The most consistent contrast in different languages is between the nominal and the verb, although such a contrast has not been demonstrated as universal.

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V. M. ZHIVOV [29–77–1]

PASSIVE SONAR, a device that detects the source of acoustic vibrations or noise and determines the direction, or bearing, to the source. It is used primarily as a hydroacoustic direction finder.

Passive sonars operate in the range of sonic, ultrasonic, and infrasonic frequencies. They include fixed devices, installed on the floor of the ocean or a sea on special support structures or anchored buoys, and mobile devices, which are used on submarines, on certain types of surface vessels, in containers lowered into the water from helicopters, and on free-floating buoys.

Passive sonars consist of sonic detector, compensator, filter, amplifier, and display device. The detector is usually an acoustic antenna with the required directivity pattern (*see* DIRECTIVITY OF ACOUSTIC TRANSMITTERS AND RECEIVERS), equipped with up to several hundred hydrophones. The compensator turns the axis of the directivity pattern of the antenna toward the noise-producing object and determines the bearing. When a rotating antenna is used, the passive sonar usually has no compensator. The filter passes a specific band of acoustic frequencies. Filtering out low

frequencies helps increase the operating range of the direction finder, and filtering out high frequencies improves the ratio of signal to background noise and increases direction-finding accuracy. The amplifier increases the amplitude of the signals being received to the level necessary for display. The display may be a telephone, loudspeaker, or cathode-ray tube.

Special devices can be connected to passive sonars to analyze the spectrum of the acoustic signal being received and identify the objects emitting the noise by type (submarine, surface ship, torpedo, and so forth). The accuracy of target direction finding of modern passive sonars may be within fractions of a degree, and the operating range may be in the tens of kilometers.

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S. A. BARCHENKOV [29–1543–3]

PATTERN (Russian, *shablom*), in foundry production, an element of a gated pattern, consisting of a flat device whose working side has a highly accurate profile. A distinction is made between molding and control patterns. The former, in the form of wooden boards, are used in individual and small-series production; they take the place of a solid casting pattern or corebox in the manufacture of casting molds and mold cores for medium-size and large castings having the outline of a body of revolution (such as cups, vats, covers, and pulleys). The cavity of the mold or the working surface of the core is produced by rotating the molding pattern around its central axis (a core spindle is positioned at this place in the mold). Control patterns are made of plywood or sheet steel and are used for checking the accurate placement of cores in the cavity of a casting mold during assembly and preparation for pouring. M. N. SOSNENKO [29–792–1]

PEDIMENT, in geomorphology, a zone of unconsolidated deposits formed at the foot of an elevated region by the merging of alluvial fans. The pediment consists of detrital material carried down by rivers, ephemeral streams, and sheetwash or transported by the force of gravity. Depending on the predominant process of transport, various types of pediments are distinguished: alluvial-proluvial, diluvial-proluvial, and diluvial. Pediments sometimes reach a width of 20–25 km, for example, on the southern slope of the Dzungarian Alatau. [29–1283–1]

PELOBATIDAE, a family of tailless amphibians of the suborder Anomocoela. Outwardly, the Pelobatidae resemble toads or frogs. The body length reaches 10 cm. The family comprises nine genera, encompassing about 50 species. Pelobatids are distributed in Europe, northwestern Africa, and western and southeast Asia, including the Philippines and Indonesia, and on the Seychelle Islands and in North and Central America. The USSR has representatives of two genera: *Pelobates* (European spadefoots) and *Pelodytes* (*see* PELODYTES).

Members of the genus *Pelobates* have a large spade-shaped tubercule on the hind foot; the web on the feet is well developed. The genus includes four species, which are distributed in southern and central Europe, northwestern Africa, and western Asia. The USSR has two species—*Pelobates fuscus* and *Pelobates syriacus*—which are found in Armenia and Azerbaijan. *P. fuscus* measures up to 6.5 cm in length. It is distributed in the USSR from the western borders to the central regions of the Kazakh SSR in the east and Ciscaucasia in the south. It inhabits steppes, meadows, and the margins of pine forests, preferring light soils. A nocturnal animal, it burrows in the earth during the day or hides in the burrows of other animals. It emits a faint garlic odor, mainly in the spring. It feeds on insects, spiders, worms, and mollusks. It enters the water only during the egg-laying season. The eggs are arranged in several rows in a jelly-like string up to 50 cm long. The tadpoles often winter over and attain a length of up to 17.5 cm.

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I. S. DAREVSKII [29–341–4]

PELTA, a cell of the membrane of the antheridium (male sex organ) in charophyte algae. [29–1613–1]

PENALTY FUNCTION METHOD, a method of reducing problems of finding a relative extremum of a function to problems of finding the absolute extremum.

An important application of the penalty function method is to problems of mathematical programming. Suppose we wish to minimize the function $\phi(x)$ on the set $X = \{x: f_i(x) \geq 0, i = 1, 2, \ldots, m\}$ of an n-dimensional Euclidean space. The function $\psi(x, \alpha)$, which depends on x and on the numerical parameter $\alpha > 0$, is called the penalty function (or penalty) for violation of the constraints $f_i(x) \geq 0, i = 1, 2, \ldots, m$. This functipn has the following properties: $\psi(x, \alpha) = 0$ if $x \in X$ and $\psi(x, \alpha) > 0$ if $x \in X$. Let us construct the function $M(x, \alpha) = \phi(x) + \psi(x, \alpha)$ and designate as $x(\alpha)$ any point of its absolute global minimum. Let

$$\phi^* = \inf_{x \in X} \phi(x)$$

The function $\psi(x, \alpha)$ is selected so that $\phi(x(\alpha)) \to \phi^*$ as $\alpha \to +\infty$. The function

$$\alpha \sum_{i=1}^{m} |\min \{f_i(x), 0\}|^q \qquad q \geq 1$$

often is selected as $\psi(x, \alpha)$. The selection of the specific form of the function $\psi(x, \alpha)$ involves both the problem of the convergence of the penalty function method and the problems that arise in solving the problem of absolute minimization of the function $M(x, \alpha)$.

In a somewhat more general formulation, the penalty function method consists in reducing the problem of minimizing the function $\phi(x)$ on a set X to the problem of minimizing some parametric function $M(x, \alpha)$ on a set whose structure is simpler, from the standpoint of effectiveness of the application of numerical methods of minimization, than that of X.

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V. G. KARMANOV [29–1493–1]

PENTATOMOIDEA (shield bugs), a superfamily of the order Hemiptera, including the families Pentatomidae, Scutelleridae, Cydnidae, and Plataspidae. The round or oval body is 1.6 to 41 mm long and is covered with a large shield extending to the front third of the abdomen or covering the abdomen completely. The insects feed on the vegetative and, especially, generative organs of plants. Species of the subfamily Asopinae feed on other insects. Of the approximately 4,000 species, about 350 occur in the USSR. Some species are injurious to agricultural crops. The grain pentatomoidea, especially *Eurygaster integriceps* and *Aelia*, are injurious to cereals. Species of the genus *Eurydema* attack vegetable crops, and *Nezara viridula* damages cotton and other plants. [29–1609–1]

PHOLIURUS, a genus of herbaceous plants of the family Gramineae. There is a single species, *P. pannonicus*, a medium-sized annual with an upward-bending or erect stem. The linear leaves are narrow and flat, and the inflorescence is a narrow cylindrical spike. The two flowered spikelets are flattened at the sides and are arranged in a double row on the spike's axis; they fall off completely during fruit formation. The upper glume is leathery, and the lemma is membranous. The plant is distributed in southeastern Europe, the Caucasus, southwestern Siberia, and Middle Asia. It grows on solonchak and slightly saline meadows and on solonetzes. During the spring and early summer, it is eaten by camels, sheep, and horses. [29–528–6]

PIG, in metallurgy, a small ingot of metal—such as pig iron, a nonferrous metal, or a ferroalloy—in the shape of a bar, usually with a contraction. Pigs are cast horizontally in a mold that is open at the top in, for example, casting machines. [29–777–3]

PILLOW LAVA, basic (andesitic or basaltic) lava extruded into water and consisting of a series of spheres that fit closely upon one another. A glassy hardening zone is observed on the edges of each sphere; in the center of some large spheres, divergent parting is observed. Pillow lava is found in volcanic oceanic beds in association with keratophyres and spilites. It also occurs as part of ophiolitic complexes. [29–865–2]

PILOT BALLOON, a small rubber balloon filled with hydrogen and released in free flight to determine wind velocity and direction at different altitudes or to establish the altitude of the lower boundary of clouds. The pilot balloon ascends at a nearly constant speed, calculated according to the lifting force and the weight of the balloon envelope. The altitude of the balloon is determined as the product of the vertical speed and the time between the moment of release and the moment of recording. The wind velocity and direction at different altitudes are computed according to simultaneous readings of the altitude of the balloon and the angles (elevation angle above the horizon and the azimuth) observed through an aerological theodolite. [29–870–3]

PIN, a cylindrical or tapered rod that is used to join parts together, often in a precisely determined position, or to transfer relatively small loads. Pins are employed in fixed joints. In order to insert a pin, the parts are joined together and secured. A hole is then drilled and reamed at the location in the parts where the pin is to be inserted. In contrast to a cylindrical pin, a taper pin may be used repeatedly without reducing the precision with which the parts are positioned. [29–1481–2]

PINCHING, removal of the tops of shoots or the top shoots from agricultural plants to improve the formation of fruit and to speed up ripening of the harvest. After pinching, the shoots stop growing, and there is an intensified flow of nutrients to the young fruit, which reduces self-thinning and creates the best conditions for development of the fruit. Pinching is used for cotton, grapes, and other crops.

Pinching or chopping cotton speeds up fiber maturation and boll opening and reduces plant lodging. The procedure is done when 14 to 16 productive branches have developed on a bush. The main stem is cut back 4–6 cm, and lateral shoots 2–3 cm. Cotton is chopped by a 4VKh-4 cultivator attachment at the same time that the interrow spaces are loosened or irrigation furrows are cut.

Pinching grape plants accelerates shoot maturation, promotes the accumulation of plastic substances in the shoots to improve winter-hardiness, and increases the sugar content of the fruit. Grapes are pinched when plant growth slows down, usually in the second ten days of August. The top one-fifth of shoots that have overgrown their trellises and the tops of lateral shoots are removed, leaving two or three leaves on each. Young grape plants are not pinched. [29–129–1]

PINE GROSBEAK (*Pinicola enucleator*), also pine bullfinch, a bird of the family Fringillidae of the order Passeriformes. The body length is about 22 cm, and the weight, about 50 g. The head and breast of the males are raspberry pink, and the back is brownish gray; the breast of the females is olive green. The pine grosbeak is distributed in the taiga zone of Europe, Asia, and North America. A sedentary bird, it will migrate long distances when there is no food. It nests in trees. The clutch contains three to five eggs. The diet includes seeds, buds, berries, and, sometimes, insects. The pine grosbeak is often kept in cages. [29–1620–4]

PINTAIL (*Anas acuta*), a bird of the family Anatidae. The body length is about 70 cm. The males weigh about 900 g; the females weigh less. The two middle rectrices are very long (hence the name). The pintail is widely distributed in Europe, Asia, and North America. In the USSR it is not found in the Far North, the southern European part, and Middle Asia; during the molting period in the summer, it is commonly seen in the Volga River delta and on the lakes of southwestern Siberia and Kazakhstan. It is a migratory bird, and in the USSR it winters on the southern Caspian Sea. The pintail prefers shallow lakes. It nests in dry places. The clutch contains nine or ten greenish white eggs, which are incubated for 22 to 23 days. The diet consists of plants and animals. The pintail is a game bird. [29–1195–3]

PISTON ROD, a round rod that connects a piston to a slide block in reciprocating machinery—for example, pumps, compressors, steam engines, and some internal-combustion engines—or in the hydraulic or pneumatic mechanism of a reciprocating drive. A piston rod is used when the compartments formed on both sides of a piston are employed. When only one of the compartments formed in a cylinder of a reciprocating machine is used, a piston rod is usually not provided and a connecting rod is connected directly to the piston.

A unilateral piston rod is located on one side of a piston and passes through one head cover. A bilateral piston rod passes through two head covers; such a piston rod is used to provide better alignment of a heavy piston in steam-driven machinery or to connect a second cylinder in a compressor.

In some reciprocating hydraulic drives, a cylinder is attached to the moving part, or table, of a machine and a piston rod is attached to the bed. Hydraulic fluid is supplied through the piston rod to the compartment formed in the cylinder.

The diameter of a piston rod is usually determined by the rod's strength, stiffness, and stability. However, in reciprocating hydraulic drives, it is sometimes determined by the required velocity ratio of the to-and-fro motion at a constant pump capacity.

N. Ia. Niberg [29–1482–2]

PIT, a shallow (up to 25 m deep) vertical or, less often, inclined mining excavation that is sunk from the surface. Pits are used for various purposes, such as the exploration of mineral deposits, ventilation, the raising of water, the hauling of materials, and the lowering and hoisting of people. [29–1552–1]

PITCH, SCREW-THREAD, the distance between parallel sides of the profiles of two adjacent thread forms measured along the axis. The pitch is usually measured along a line on which the width of the thread forms is equal to the width of the groove. Multiple threads have both a pitch and a lead; the latter is defined as the distance through which the screw is displaced in one full turn in a stationary nut, that is, the pitch of one screw line of the thread. The lead is equal to the product of the screw-thread pitch and the number of starts; for single-start threads the lead is equal to the pitch. [29–799–2]

PLAGUE, an acute infectious disease of man and animals, classified as a quarantine disease. The causative agent is the plague bacillus, *Pasteurella pestis*, discovered in 1894 by the French scientist A. Yersin (1863–1943) and the Japanese scientist Kitasato Shibasaburo (1852–1931). It is a coccoid gram-negative bacillus that grows well on ordinary culture media and is sensitive to physical and chemical factors, as well as to ordinary disinfectants. It dies within one minute of exposure to a temperature of 100°C.

Plague epidemics periodically swept many countries. The first pandemic, known in the literature as Justinian's plague, occurred in the sixth century in the Eastern Roman Empire, affecting many countries and killing about 100 million persons in 50 years. The second pandemic, known as the Black Death, began in the 14th century. The third, which broke out at the end of the 19th century, was spread by ship rats to more than 100 ports in various countries. Occurrences of plague were recorded from the 14th century on in central and northwestern Russia, including numerous occurrences in Moscow. It occurred in Transbaikalia, Transcaucasia, and the Caspian Region in the 19th century and in Odessa and other Black Sea ports at the end of the 19th and early 20th centuries, where it was brought in by plague-infected rats. Major epidemics were recorded in India in the 20th century.

Plague is characterized by natural endemism, associated with desert, steppe, and mountain landscapes, where the epizootic process is maintained by certain rodent species; however, other rodents, as well as hares, camels, and other mammals, are also dangerous to man. The epidemiological danger increases when plague is introduced into populations of commensal ro-

dents, such as rats. The disease is transmitted to humans by animals through fleas; less common is infection as a result of direct contact, usually contracted when dressing the carcasses of infected animals. Humans infect other humans through fleas. When the bubonic form is complicated by pneumonia (secondary pneumonic plague), the disease is spread by airborne droplets, like influenza, and the highly contagious primary pneumonic plague occurs. Depending on the mechanism of infection, the causative agent penetrates the organism through the skin, the mucosa of the upper respiratory tract, and the conjunctiva. Carriers of the plague bacillus (in the nasopharynx) have been discovered.

The incubation period of plague is two to six days. The disease is characterized by sudden onset, chills, severe headache, agitation, and mental confusion. The body temperature rises to 40°C, and hyperemia of the face is observed. Frequently, the meninges become involved. In the bubonic form painful buboes appear on different parts of the body; symptoms of pneumonia appear in the pneumonic form. The course is generally severe. Bacteriological and serological methods are used for laboratory diagnosis.

Treatment includes the administration of streptomycin and other antibiotics. Preventive measures include epidemiological reconnaissance in areas where the disease is endemic (epizootological survey and observation of human and animal populations) and the use of live vaccines. To achieve early and emergency prophylaxis, the extermination of rodents and fleas in the wild and in dwellings is vital. In the event of an epidemic, infected persons are hospitalized, and individuals who have come in contact with them are isolated and given prophylactic treatment. Disinfection and quarantine measures are also instituted.

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G. D. OSTROVSKII [29–761–3]

PLAGUE-LIKE DISEASES OF ANIMALS, a group of infectious diseases characterized by an acute course, a variety of symptoms, and high mortality (70–100 percent). The diseases included in the group (see Table 1) differ from one another in etiology, economic impact, and other aspects.

Viruses are the causative agents of most of the plague-like diseases of animals. However, camel plague and furunculosis are caused by bacteria, and crab plague is caused by a pathogenic fungus. The etiology of pike and whitefish plague has not been

Table 1. Some plague-like diseases of animals

Disease	*Animals affected*	*Principal symptoms*	*Distribution*
Rinderpest (or cattle plague)	Cattle, zebus, buffalo, sheep, goats, camels, antelopes, swine	Fever, erosions and ulcers on the buccal mucosa, conjunctivitis, rhinitis, vaginitis, miscarriages, diarrhea	Africa, Middle East; eradicated in the USSR
Classical swine fever (or hog cholera)	Swine	Fever, prostration, digestive disorders, conjunctivitis, petechial hemorrhages	Asia, America, Africa; isolated cases in the USSR
African swine fever	Swine	Fever, prostration, vomiting, convulsions, paralysis, cyanosis, hemorrhages	Africa, Spain, Portugal
African horse sickness	Horses, mules, asses, zebras; occasionally dogs	Fever, weakness, tremors, conjunctivitis, cough, cyanosis of the mucosa	Africa, Middle East
Fowl cholera	Chickens, guinea fowl, pheasants, peacocks	Fever, conjunctivitis, cyanosis of the comb and wattle, convulsions, paralysis	North Africa; sporadically in Europe, including the USSR
Newcastle disease	Chickens, guinea fowl, turkeys, pheasants, peacocks	Fever, diarrhea, discharges from the nose, and mouth, cough, paresis, paralysis	All countries
Anatipestifer infection	Ducks, less commonly geese and swans	Drowsiness, rhinitis, conjunctivitis, loss of appetite, thirst, diarrhea, inflammation of the cloaca, neurological disorders	Europe, including the USSR
Distemper	Dogs, foxes, arctic foxes, raccoons, mink, polecats, sables, jackals, wolves, cats	Fever, listlessness, loss of appetite, rhinitis, cough, conjunctivitis, vomiting, diarrhea, thirst, skin rash, pneumonia, convulsions, paralysis	Widely distributed in all countries
Camel plague	Camels, rodents, also humans	Fever, prostration, loss of appetite and rumination, miscarriages, cough, enlargement of superficial lymph nodes	Asia, Africa, America, southeastern USSR (natural reservoirs of rodent plague)
Pike plague	Pikes, rarely roach, European pike, burbot, European bream	Hemorrhagic inflammation of the buccal mucosa and gills, skin and scales, necroses, ulcers	Europe; a few cases in the USSR
Furunculosis	Salmon	Ulcerative lesions of the skin and scales, necrosis of fins	Great Britain
Whitefish plague	Whitefish (cisco and others)	Inflammation of muscles, destruction of skin and scales	Europe; a few cases in the USSR
Crab plague	Crabs	Walking on outstretched legs, convulsions	Europe, Baltic region of the USSR (several natural reservoirs)

determined, but the epizootological characteristics of these diseases suggest that they are plague-like diseases.

Plague-like diseases usually occur in epizootics affecting large numbers of animals. They occur throughout the year, strike animals of all ages, and are transmitted by food or through the air (African swine fever and camel plague are also transmissible diseases). The incubation period is brief, averaging three to 12 days; the course is acute, and the animals die soon after onset. Methods of laboratory diagnosis have been developed for almost all of the diseases. Rinderpest (or cattle plague), African swine fever, classical swine fever (or hog cholera), African horse sickness, fowl cholera, and Newcastle disease are highly contagious; control measures include mandatory notification of any outbreak of any one of these diseases, quarantine, and the slaughter of the diseased animals and the burning of the carcasses. If outbreaks of other plague-like diseases occur on a farm, restrictive measures are instituted, the diseased animals are isolated, and disinfection is carried out. Specific preventive agents (vaccines) have been developed for most of the diseases.

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I. A. BAKULOV [29–762–1]

PLAGUE REVOLT, an uprising in Moscow in September 1771 caused by an epidemic of plague. The immediate crisis was aggravated by the discontent of many Muscovites with unemployment, famine brought on by the closing of factories as a quarantine measure, and an absence of medical help. The direct cause of the revolt was the attempt by Ambrosius, the archbishop of Moscow, to prevent crowds from gathering near the miracle-working icon at the Varvarka Gate of Kitai-Gorod; he thereby hoped to prevent the spread of the plague.

On September 15, responding to an alarm, a crowd of thousands that included landless household serfs, peasants on quitrent, tradesmen, and laborers pushed back the troops at the Varvarka Gate and set out for the Kremlin, where the city's rulers were hiding. On the following day the mob stormed the Don Monastery and killed Ambrosius, who had taken refuge there; it then began destroying the quarantine barriers. Troops under G. G. Orlov were sent to crush the revolt, which was disorganized in character.

The Plague Revolt was cruelly suppressed. More than 300 of the participants were put on trial, of whom four were hanged (the merchant I. Dmitriev and the household serfs V. Andreev, F. Deianov, and A. Leont'ev) and 173 flogged and sentenced to hard labor. At the same time, the government was forced to take more effective measures against the plague and to provide assistance to the urban populace in the form of jobs and food. The Plague Revolt provoked disturbances among the peasants in the vicinity of Moscow and in the neighboring districts of Moscow Province.

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Istoriia Moskvy, vol. 2. Moscow, 1953. Pages 368–77. [29–766–1]

PLASTER AND STUCCO (in Russian, *shtukaturka*), hardened finishing layers formed by a mortar applied to the surfaces of structural members and parts of buildings and other structures.

Various types of plaster and stucco are distinguished in modern construction: conventional types designed to smooth the surfaces of walls and partitions, prepare them for final treatment (painting and wallpapering), and protect against atmospheric effects (for example, in finishing the facades of buildings); special types, such as for fire protection, sound absorption, and X-ray protection, which are used as insulating and screening layers; and decorative types, used to enhance the aesthetic expressiveness of buildings and other structures. Different types of plaster and stucco are used depending on the type of building or other structure and the requirements for the quality of finish on surfaces: simple types—for temporary buildings and warehouses and where wooden walls will be subsequently tiled; improved types—in large-scale residential and public buildings; and high-grade types—in buildings constructed to individual designs.

Plaster and stucco finishes may be applied as a wet solution directly on a surface, or the surface may be finished with large, prefabricated sheets and slabs. Plaster and stucco must be strong, with an even, smooth surface and without traces of the applicator or cracks.

G. I. VERSTIN [29–1498–5]

PLASTERING AND STUCCOING, the finishing of surfaces of structural members and other parts of buildings and other structures (exterior and interior walls, ceilings, partitions, and the like) with a plaster or stucco mortar; the mortar is applied wet to the application surfaces. Because the work is very labor-intensive, in modern industrial construction plastering has in large part been replaced by the facing of surfaces with large dry-plaster sheets and other efficient prefabricated finishing materials.

In wet plastering, the composition of the plaster mortar applied depends on the purpose of the plaster, the material of the surfaces being plastered, and the conditions under which the buildings will be used. For example, lime mortars are used to plaster interior stone walls of rooms with normal humidity (up to 60 percent), and lime-gypsum mortars are used for wood partitions. Cement and lime-cement mortars are used in areas with increased humidity, such as bathrooms, laundries, and bathhouses.

Plastering mortars are usually manufactured at centrally located plants, chiefly in the form of dry mixes that are delivered to construction sites. Mortar-mixing units and mobile plastering stations mounted on motor vehicle trailers are used to prepare the mortars to the required composition at the sites.

In most cases the application of wet plaster is mechanized; plastering machines supply and apply the mortar by means of pumps. Hand plastering is reserved for small jobs and areas difficult to reach. The mortar is supplied through rubber hoses or metal pipes. The type and diameter of the feed line and the capacity of the pump depend on the number of stories in the building, the amount of wet plaster, and the distance over which the mortar must be delivered (up to 200 m horizontally and 40 m vertically). Special nozzles are usually used to apply the mortar to the surface being plastered. The mortar is usually applied in three layers. The first two layers are required for all types of plaster and stucco; the third is required for improved and high-grade types. Electric and pneumatic finishers and power tools are used for the final dressing of the top layer.

In areas where humidity under operating conditions will not exceed 60 percent, surfaces are finished with dry-plaster (gypsum, gympsum-fiber, and wood-fiber) sheets. Gypsum facing sheets, manufactured from construction-grade gypsum with mineral or organic additives and covered with cardboard on two sides, are most frequently used. Sheets produced in the USSR (1978) have lengths of 250, 270, 290, and 330 cm; widths of 120 and 130 cm; and thicknesses of 1.0 and 1.2 cm. Facing sheets must be correctly shaped and undamaged at the corners and edges, and the face side must not show seams where the cardboard is glued. The grading, laying out, and cutting of sheets to dimensions is usually done at centralized workshops at the construction site. Sheets are cemented to rock or concrete surfaces with gypsum glue, gypsum foam, and other mastics; they are attached to wood surfaces with galvanized nails or wood screws. Before wallpapering, the seams between dry-plaster sheets are filled with gypsum mastic.

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G. I. VERSTIN [29–1499–1]

PLUG-AND-SOCKET CONNECTION, a detachable device for the quick connection and disconnection of electric circuits. Electric contacts in the form of metal jacks and of metal pins or blades that are inserted into the jacks constitute the basis of a plug-and-socket connection. The number of contacts may range from one to several hundred; in the latter case, the device is often called a plug-and-socket connector. The simplest type of plug-and-socket connection is the plug and socket used to connect portable household or industrial appliances to an outside power supply.

[29–1471–1]

POETIC EDDA (also *Saemund's Edda, Elder Edda*, or simply *Edda*), a collection of ancient Icelandic lays. The *Poetic Edda* survives in a 13th-century manuscript; its compiler is unknown. The lays long existed only in oral form, and the date of their composition remains in dispute. Several have been preserved in other ancient manuscripts.

Some of the lays are cast in the form of prophecies, apothegms, or theatrical presentations based on mythology; others are simple narratives. The mythological lays, of which *Völuspa* (The Seeress' Prophecy) is the most important, are the only source of their kind on pagan mythology. Many of the heroic lays derive from south Germanic folk legends. Although the lays show the influence of different periods, their ideology and style indicate that the *Poetic Edda* antedates the ancient Germanic epics.

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M. I. STEBLIN-KAMENSKII [29–1678–4]

PORTLAND BLAST-FURNACE SLAG CEMENT, a cement produced by grinding portland cement clinker together with pellets of blast-furnace slag (30–60 percent of the total weight) and a small amount of gypsum. It differs from ordinary portland cement by a slower increase in strength in the initial hardening period and an increased water resistance. It is used mainly for manufacturing precast reinforced-concrete structures and items prepared with steam curing as well as for laying concrete in hydraulic engineering installations. [29–1274–1]

POSTAGE METER, a machine designed to imprint a dated postmark on written correspondence, such as letters and postcards, and to cancel the symbols of postage payment or to cancel regular postage stamps. The imprinted postmark contains the name of the communications enterprise and the date and time of cancellation; the stamp cancellation consists of three wavy lines.

A postage meter operates in the following manner. A packet of letters or postcards is sorted so that the addresses appear on the same side and the stamps are located in the same position in the upper right corner; the packet is then transferred from a storage unit to a separator. From the separator each letter is individually guided across conveyor rollers to the device that prints the postmark, whose single-cycle mechanism is set in motion by an arm engaged by the forward edge of the moving letter. The cancelled letters are ejected by a blade wheel into the next storage unit.

The most widely used postage meters in the USSR are the ShM-4A for large postal enterprises (designed for prolonged, continuous operation) and the ShMN-2 for regional postal centers and communications offices. The best-known foreign postage meters are made by the American firm of Pitney-Bowes, Inc., the British company Universal Postal Frankers, and the French company SECAP. Postage meters can process from 12,000 to 45,000 letters per hour. K. V. BOROZDIN [29–1470–2]

PRINT AND LETTERING, the graphic form of the symbols of an alphabetic writing system. Depending on the reproduction technique used, a distinction is made between handwriting, which is produced with a pen or other implement on a soft material, such as papyrus, parchment, or paper; lettering applied by hand with a brush or other implement on signs, vases, fabric samples, original bookbindings, book covers, title pages, and other elements of publications; engraved lettering, which is cut or stamped in wood, metal, stone, or some other hard material and used for inscriptions on monuments, architectural structures, or engravings; and print, which consists of individual letters and other elements and which is designed for the manual or mechanized composition of texts to be reproduced by printing, chiefly on paper. In the narrow sense, a full set of print characters designed for composition is called a typeface.

Depending on the intended use, typefaces are subdivided into text faces—for text composition; display faces—for the composition of covers, title pages, and headings; and decorative faces—for the composition of small printed items, such as diplomas, blank forms, labels, and announcements.

Figure 1. Graphic features of the principal type families: (a) Literary (formerly, Latin), Bannikov, Garamond, (b) Baskerville, (c) New Standard, Elizaveta, Bodoni, (d) Academic, School, Bazhanov, (e) Telingater, (f) Newspaper Square Serif, Memphis, (g) Journal Sans Serif, Univers

Typefaces may be divided into seven groups depending on weight (the ratio of the width of the thick strokes to that of the thin strokes in the letters) and on the presence and shape of serifs (Figure 1). A special group comprises typefaces that, because of their form, cannot be included in the groups in Figure 1, including scripts and faces that imitate the typefaces of typewriters. Depending on the form, which is determined mainly by the letters' inclination, width (the ratio of the thickness of a stroke to the width of the counter), and weight, typefaces may be upright, cursive, or oblique; normal, condensed, or expanded; and light, medium, or bold. Typefaces of a given form are divided into different type sizes; typefaces that are different in size and form but quite similar in overall design are combined into groups, called type families. Every type family has a name, for example, Elizaveta, Bannikov, and School. The variety of type families used in printing houses in the USSR is regulated by state standards.

The design of the first typefaces was based on handwriting; examples are the Russian Manuscript Poluustav (Figure 2,a), based on Russian handwriting, and Gothic (Figure 2,b), based on Latin handwriting. The primary source of modern Russian Cyrillic typefaces is the Russian Civil typeface (Figure 2,c), which was approved by Peter the Great in 1708. The original source of modern Latin alphabet type is the Roman form (Figure 2,d), which appeared in the late 15th century during the Renaissance. Some type families that appeared as early as the beginning of the 20th century are still used in printing houses in the USSR: Literary (formerly, Latin; Figure 2,e), Elizaveta (Figure 2,f), and Academic (Figure 2,g).

The type families that have been developed in the USSR since the late 1940's include New Standard (Figure 2,h), Bannikov (Figure 2,i), and Lazurskii (Figure 2,l), for publications of literature and art books (all based on the Civil typeface of the Petrine period and typefaces of the Renaissance); School (Figure 2,j), for textbooks in primary and secondary schools and children's publications; Modern Newspaper, for newspapers; Journal Sans Serif (Figure 2,k), for periodicals; and Rerberg (Figure 2,m), Telingater Decorative (Figure 2,n), Bazhanov (Figure 2,o), and Kuzanian (Figure 2,p), used as display type (all based on the hand letters of contemporary artists). Editions of political, scholarly, and children's publications, works of fiction, and textbooks are often composed in a single typeface (usually a well-established face of classic design).

Many designs of modern Latin alphabet typefaces that are used extensively in foreign countries were modeled on classical designs, such as Garamond (France, 1530's; Figure 2,s), Caslon

(Great Britain, early 18th century), Baskerville (Great Britain, mid-18th century; Figure 2,q), and Bodoni (Italy, early 19th century; Figure 2,r). Original models of modern Latin alphabet typefaces include Egyptian faces (with very little contrast between

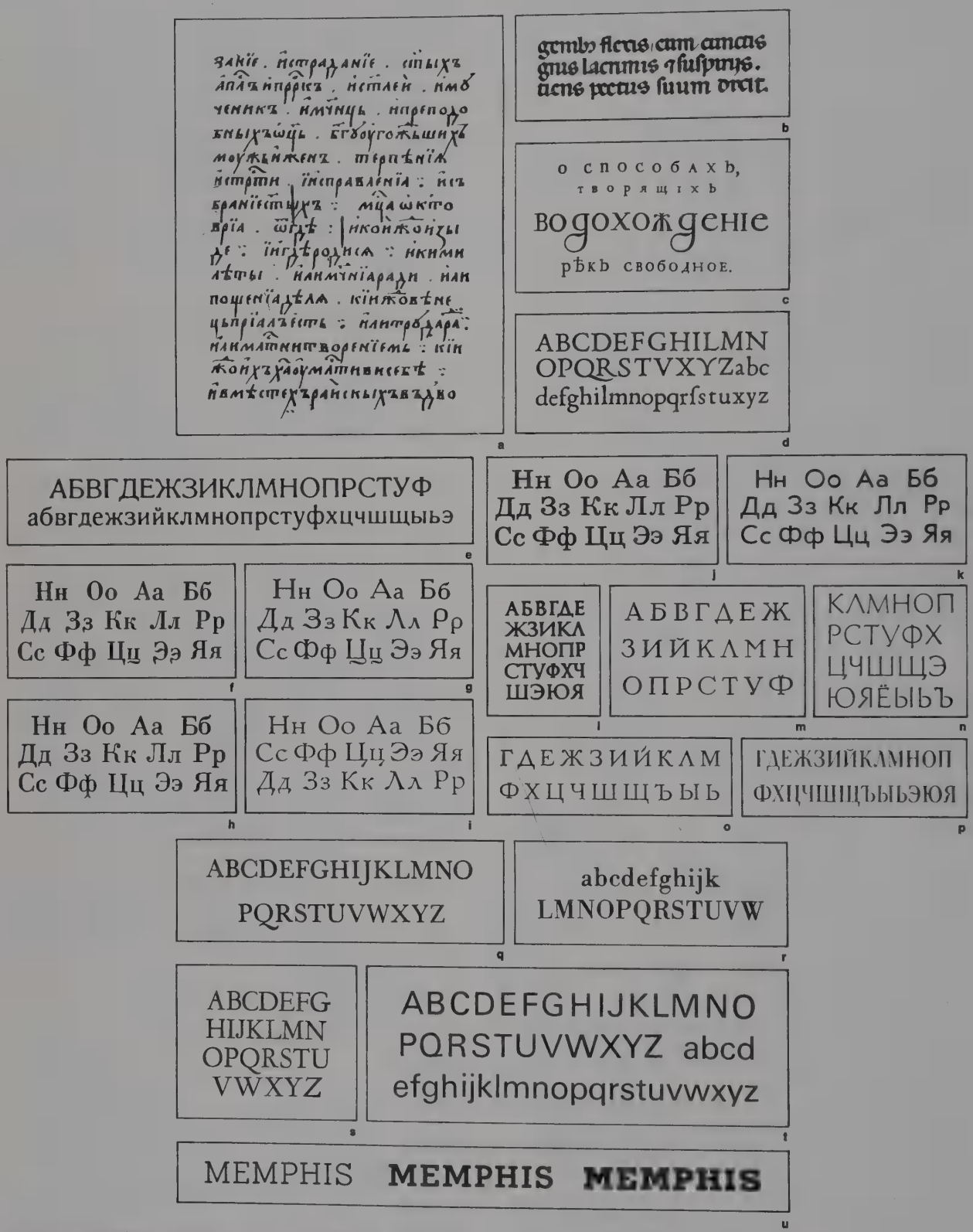

Figure 2. Samples of typefaces and type families: (a–d) historical, (e–p) modern Russian Cyrillic, (q–u) modern Latin alphabet; (a) Manuscript Poluustav, (b) Gothic, (c) Civil, (d) Roman, (e) Literary, (f) Elizaveta, (g) Academic, (h) New Standard, (i) Bannikov, (j) School, (k) Journal Sans Serif, (l) Lazurskii, (m) Rerberg, (n) Telingater Decorative, (o) Bazhanov, (p) Kuzanian, (q) Baskerville, (r) Bodoni, (s) Garamond, (t) Univers, (u) Memphis

thick and thin strokes and rectangular or slab-shaped serifs), (Figure 2,u) and Beton, and sans-serif faces, such as Futura, Gill Sans, and Univers (Figure 2,t).

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Kapr, A. *Schriftkunst*. Dresden, 1971. A. G. SHITSGAL [29–1436–1]

PRIVATE ACCUSATION, a form of criminal prosecution initiated on the complaint of the victim or his representative and subject to termination in the event that the victim is reconciled with the accused (*see* PRIVATE-PUBLIC ACCUSATION). The accusation is supported by the victim himself; in this sense it is considered private.

In Soviet law, cases of crimes involving relatively little social danger are prosecuted by private accusation. Such crimes include defamation, insult, and the infliction of light bodily injury; complete lists of these crimes are provided in the codes of criminal procedure of the Union republics.

Where private accusation is involved, the case is initiated by a judge if the measures he has taken to effect a reconciliation between the victim and the accused have been unsuccessful. Reconciliation is possible until the court leaves for the conference room to decide on a verdict and sentence; under the codes of criminal procedure of the Lithuanian and Estonian soviet socialist republics, reconciliation is possible until the sentence enters into force.

In cases initiated on the complaint of the legal representative of a minor or of a person who is unable to defend his own interests because of physical or mental handicap, the proceedings may be terminated by reconciliation only if the victim's legal representative gives his consent.

In certain instances—if a case has special social significance or if a victim is not in a position to defend his rights and legal interests owing to, for example, his helpless condition or his dependence on the accused—the procurator has the right to initiate proceedings even in the absence of a complaint by the victim. A case initiated by a procurator is not subject to termination in the event that the victim and the accused are reconciled; moreover, the victim is deprived of the right to support the accusation. If a case initiated by a procurator is tried in the absence of the procurator, however, then according to the codes of criminal procedure of some of the Union republics, the victim retains the right to support the accusation.

A procurator may also at any time enter a case initiated by a judge and support the accusation if such action is required for the protection of state or social interests. In such instances, the case may not be terminated in the event that the victim is reconciled with the accused; in accordance with the codes of criminal procedure of most of the Union republics, however, the victim retains the right to support the accusation.

Under the legislation of the RSFSR and of the Moldavian, Tadzhik, Armenian, Turkmen, Latvian, and Lithuanian soviet socialist republics, a case initiated by a judge is not subject to termination in the event of the reconciliation of the parties if a preliminary investigation or inquiry has been conducted. [29–80–10]

PRIVATE LABOR. (1) Labor on discrete small units, where production is closed: that is, directed toward the satisfaction of the producer's own needs, as in a natural economy (*see* SMALL HOLDING). Private labor of this type is possible only if the division of labor does not go beyond the bounds of family cooperation, if the land is parceled out, and if the other means of production are scattered. As Marx noted, "This method of production is compatible only with the narrow original boundaries of production and society" (K. Marx and F. Engels, *Soch.*, 2nd ed., vol. 23, p. 771). Independent private labor on separate small units eventually leads to the development of private ownership. In examining the disintegration of communal property, Marx wrote that "the most essential point is the parceling of labor, the source of private appropriation" (*ibid.*, vol. 19, p. 419).

As productive forces developed, small holdings were increasingly drawn into the social division of labor and cooperation of labor, and the private labor characteristic of the small holding assumed a form typical of commodity production. Even under these conditions, however, private labor of the kind associated with the small holding is anomalous and is found only on patriarchal, single-family farms.

(2) A particular historical form of labor inherent in spontaneous commodity production, a form assumed by the production units making up a system of the social division of labor when private ownership is dominant. The social division of labor is a necessary but insufficient condition for the emergence and existence of this form of private labor, which is found only where the social cooperation of labor is spontaneous and relations between the various primary elements in the division of labor assume the character of value relations. "Only such products can become commodities with regard to each other as result from different kinds of labor, each kind being carried on independently and for the account of private individuals" (K. Marx, *ibid.*, vol. 23, p. 51).

In the spontaneous cooperation of labor, under which labor inevitably becomes private, the social contact between private producers comes about only through, and within the framework of, the exchange of the products of labor, thereby generating a system of indirect relations, involving the reduction of labor through value. Money is the most highly developed form of value; in it the essential lack of independence of private labor is manifested. In any equivalent form of exchange, consequently, "the labor of private individuals takes the form of its opposite, labor directly social in its form" (*ibid.*, p. 68).

The spontaneous cooperation of labor also gives rise to commodity fetishism, in which the relations between commodities (the results of private labor) disguise the social relations between people.

As the planned cooperation of labor progresses, the economic isolation of private acts of labor decreases. Even under capitalism there may be social contacts between the producing elements not only in the marketplace but also in economic programming and in interrelationships with the bourgeois state in the area of taxes, prices, and other forms of economic regulation. As long as capitalist ownership is dominant, the contradiction between the social and private nature of labor remains the chief cause of all antagonisms in capitalism, including its basic contradiction—that between the social character of production and the private, capitalist form of appropriation.

In a planned socialist economy, labor loses the characteristics of private labor: the production units no longer labor independently of one another, nor do they make contact with one another only in the exchange of commodities. Labor ceases to be the private affair of independent producers and increasingly becomes direct social labor; under communism all labor will be direct social labor in the fullest sense of the term. Socialism still retains some features of private labor: workers and the production units are still relatively isolated, and the indirect reduction of labor through the operation of the law of value remains. These features will disappear as socialism is transformed into communism.

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Programma KPSS. Moscow, 1976. Pages 85–90.
S. M. KOVALEV and B. V. RAKITSKII [29–83–3]

PRIVATE LAW, in the bourgeois theory of law, the norms regulating certain relations, including property relations, between private individuals and also governing relations in which the state

and its agencies act not as bearers of public authority but as parties to contractual relations. Private law includes the norms of civil, commercial, and family law.

Whereas public law governs relationships of authority and subordination, private law deals with the relations of formally equal persons. Its subjects enjoy considerable economic and legal autonomy, and the protection of private interests is exercised only on the initiative of the interested persons themselves.

Bourgeois jurists treat private law as "a manifestation of the freedom of the individual" and of purportedly equal possibilities for all. The division of law into private and public, however, reflects the conflict between private and public interests in societies that are marked by antagonism among classes. As K. Marx and F. Engels noted, "Private law develops simultaneously with private property out of the disintegration of the natural community" (*Soch.*, 2nd ed., vol. 3, p. 63). Private law is based on the law of private property, which evolved under Roman law and is fully developed and protected by capitalism; under capitalism the law of private property is declared to be "holy and inviolable."

In the modern era, the development of state monopoly capitalism and the increasing interference of the bourgeois state in the capitalist economy have led to a blurring of the sharp distinction between public and private law as private law is "made public."

The socialist legal system does not distinguish between public and private law. [29–82–1]

PRIVATE-PUBLIC ACCUSATION, a form of criminal prosecution initiated on the complaint of the victim or his representative. In contrast to cases prosecuted by private accusation, such a case is not subject to termination in the event that the victim is reconciled with the accused or renounces the complaint (*see* PRIVATE ACCUSATION).

In Soviet law, cases of rape without aggravating circumstances and of the violation of authors' or inventors' rights are prosecuted only by private-public accusation. Such cases are investigated and tried under the general procedure for criminal trials, as established in the codes of criminal procedure. The victim himself does not support the accusation since a procurator takes part in the court hearing; thus, it is a private accusation that is publicly supported.

In exceptional instances—if a case involving the violation of authors' or inventors' rights has special social significance or if a victim is not in a position to defend his rights and legal interests owing to, for example, his helpless condition or his dependence on the accused—the procurator has the right to initiate proceedings even in the absence of a complaint by the victim. [29–82–3]

PROSE EDDA (also *Snorri's Edda, Younger Edda*), a work written by the Icelandic prose writer and poet Snorri Sturluson between 1222 and 1225. The *Prose Edda* is divided into a prologue and three parts. Many of the pagan myths recounted in the work appear in no other source. In one section Snorri explains the significance of the kennings (metaphorical expressions) and *heiti* (poetic synonyms) used in skaldic poetry and illustrates his explanations with examples from the works of the skalds. The *Prose Edda* also contains an original narrative poem with a prose commentary in a style reminiscent of a scholastic treatise.

PUBLICATION

In Russian translation:

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PRUNE, a dried plum of the varieties Vengerka Ital'ianskaia, Vengerka Domashniaia, and others. The variety Vengerka Ital'ianskaia yields the best prunes.

Only fleshy ripe plums are suitable for drying. The stone must separate readily from the flesh, and the pulp must contain no less than 10 percent sugar and no more than 1.2 percent acid. The plums are blanched to accelerate drying, remove the waxy coating, and obtain cracks in the skin. Vengerka Ital'ianskaia plums are blanched for 20 to 30 seconds; plums of other varieties are blanched for one to 1½ minutes. The plums are then cooled under running water and placed in steam dryers for eight to ten hours at a temperature of 80°C. Toward the end of drying the temperature is lowered to 60°C. After cooling and sorting, the prunes are immersed in boiling water for 1½ to two minutes to obtain a shine. They are then treated with glycerin (5 kg per ton of prunes).

There are three grades of commercial prune varieties. Prunes must be black, soft, and tart. The yield of prunes from fresh plums is 20 to 22 percent. [29–301–2]

PRUNELLA, a genus of perennial herbs of the family Labiatae. The opposite leaves range from entire to pinnatipartite. The flowers are in false whorls that form a dense spicate inflorescence; the corolla has an arched upper lip. The fruit consists of four nutlike lobes. There are five to seven species, distributed in temperate and subtropical zones of the northern hemisphere. The USSR has four species. Self-heal (*P. vulgaris*), with tiny violet flowers, is common along roads and in glades, forest margins, sparse forests, meadows, fields, and wastelands. *P. grandiflora*, with large violet or reddish flowers, occurs in the European USSR, mainly in the south, and in the Caucasus; it is cultivated as an ornamental. [29–262–5]

PSITHYRUS, a genus of bees that are closely related to bumblebees (family Bombidae) and that parasitize their nests. Psithyri females deposit their eggs in the nests of the bumblebee hosts, which rear the young of the parasitic bees as their own. Adult psithyri are also accepted by the bumblebees as their own and are not driven from the nests. Psithyri greatly resemble their hosts in appearance; the female psithyri can only be distinguished from female bumblebees by the absence of pollen combs and pollen baskets on their legs. [29–1313–2]

PUCK, in ice hockey, a black, hard-rubber disk with flat top and bottom surfaces. It is 76.2 mm in diameter, 25.4 mm thick, and weighs 140–170 g. The sides are lightly scored. [29–808–3]

PULLEY, a rotating part of a belt drive or a cable transmission, made in the form of a wheel around which a flexible link passes. Drive pulleys and driven pulleys, which transmit torque, are fastened to shafts by means of, for example, key or spline joints. Pulleys that do not transmit torque, such as idler and tension pulleys, turn freely on shafts or axles. Pulleys with grooved surfaces are sometimes called sheaves.

Pulleys are available in a wide variety of designs. Pulleys of small diameter are manufactured in one solid piece (Figure 1,a). Pulleys of medium or large diameter (Figure 1,b) have a hub (1) and a rim (2) connected by a web (3) or by arms. Large pulleys are sometimes produced in two halves, which are bolted together. Pulleys may be made of cast iron, steel (Figure 1,c), a light alloy, plastic, or—in some cases—wood.

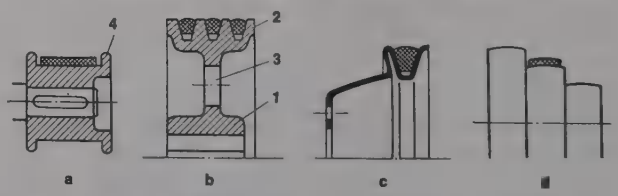

Figure 1. Pulleys: (a) a one-piece pulley, (b) a pulley with a hub and rim, (c) a pressed-steel pulley, (d) a step pulley

Flat-belt pulleys (Figure 1,a) have a cylindrical or crowned peripheral surface to prevent the belt from being thrown off; flanges (4) are sometimes used for the same purpose. V-belt pulleys for single-belt or multiple-belt drives have grooves with a trapezoidal cross section (Figure 1,b). Round-belt pulleys have a groove with a rounded bottom. Timing-belt pulleys have flanges and axial grooves for the teeth of the timing belt. Step pulleys (Figure 1,d) are used in drives in which the transmission ratio is adjusted by shifting the belt from one step to another. Double-cone pulleys in continuously variable transmissions with a wide V belt are produced with one or two spring-loaded movable cones; the displacement of one or both cones is forced.

N. IA. NIBERG [29–1254–3]

PUREBREEDING (also pedigree breeding), one of the main methods of breeding agricultural animals, in which the progeny are produced by mating animals of the same breed. The concept of purebreeding emerged in the 16th and 17th centuries, when people consciously isolated valuable strains for breeding without mixing with less valuable strains.

The goals of purebreeding are to limit variability within a breed; to impart to a particular breed uniformity in conformation, productivity, and hereditary factors; to create and maintain a particular breed, ensuring not only the retention in the animals of economically valuable qualities inherent to the breed but also the breed's further improvement in a given direction; and, finally, to impart hereditary stability to the breed.

Purebreeding is used to produce breeding lines with more flexible heritability and greater variability than the native stock; it is also used in breeding some primitive strains, which are less productive but distinguished by high adaptability to local climatic and economic conditions or by high resistance to local diseases. Purebreeding is usually erroneously identified with inbreeding or breeding hybrids (based on the same principles as purebreeding), produced by crossing different breeds and meeting the requirements of the given breed.

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[29–644–3]

PURE CULTURE, a culture containing cells of a single species of microorganism.

The most reliable way of isolating a pure culture is from a single cell of a population. For yeast and microscopic fungi, this is accomplished by Lindner's drop technique. Drops from a cellular suspension of yeast or fungi spores (conidia) are transferred to a cover glass, or cover slip. The cover glass is then placed over a cavity slide. Microscopic techniques are used to find a drop containing a single cell, and the drop is then transferred, using sterile procedures, to a culture medium. Pure, single-cell bacterial cultures are isolated with the aid of a micromanipulator or thin capillaries (B. V. Perfil'ev's microselector).

The isolation of pure cultures is necessary in the classification and study of the variability of microorganisms and in the production of vaccines. It is also used in the microbiological industry for the preparation of enzymes, antibiotics, vitamins, steroid hormones, and other preparations. [29–645–3]

PURE LINE, the homogenous generations of repeatedly self-pollinating plants or self-fertilizing animals, in which most genes are homozygous. The term was introduced in 1903 by the Danish geneticist W. Johannsen, who proved by experimentation on legumes that pure lines exhibit analogous phenotypes under identical conditions.

Pure lines are obtained from a single ancestor and are maintained by self-pollinization and selection. Individuals in pure lines repeat over several generations the same genetically fixed traits. Pure lines are important in agriculture inasmuch as they are the main structural elements of plant varieties. Hybridization of two pure lines often results in heterosis in the first hybrid generation; certain hybrid varieties of corn are obtained in this way.

The term "pure line" is sometimes incorrectly applied to inbred lines, which are the progeny of animals or cross-pollinated plants obtained from a single pair of ancestors and maintained over a number of generations by constant crossing of related individuals and by selection. Such lines are almost always used in genetic research on higher organisms. For example, "pure line" laboratory mice are used to study carcinogenesis and cancer treatment. I. I. TOLSTORUKOV [29–637–5]

PURE METAL, a metal with a low admixture content. Depending on the degree of purity, the following types of pure metals are distinguished: high-purity metals (99.90–99.99 percent pure); superpurity, or chemically pure, metals (99.99–99.999 percent pure); and ultrapure metals (more than 99.999 percent pure). [29–645–4]

PURE STATE. A pure state of a quantum-mechanical system is a state that is characterized by specifying the complete set of possible values of the dynamic variables that define the state of the system. A pure state is described by the wave function of the dynamic variables and is a basic concept of quantum mechanics. A superposition of wave functions—that is, the sum of such functions with arbitrary complex coefficients—also describes a pure state of a system. A pure state is often simply called a quantum state, although there is a more general case, namely the mixed state, in quantum mechanics. (*See* MIXED STATE.) [29–642–3]

PURGATORY, according to Catholic dogma, a place where the souls of dead sinners can be cleansed of sins committed in life. The cleansing is supposedly accomplished through the sinner's enduring various trials; it is also accomplished through the prayers and good works of the relatives of the deceased, primarily through their monetary contributions to the church. The doctrine of purgatory was adopted by the Council of Florence (1438–45) and was confirmed in 1562 by the Council of Trent. [29–641–1]

PURGE OF THE PARTY (Russian, *chistka partii*), verification of the observance of the Rules of the Communist Party and the norms of communist morality by members of the party in order to increase members' political activity and eliminate socially alien elements and persons who violate party and state discipline from the party ranks. V. I. Lenin pointed out that "careerists and charlatans . . . inevitably do all they can to insinuate themselves into the ranks of the ruling party" (*Poln. sobr. soch.*, 5th ed., vol. 41, p. 30). In the period of the dictatorship of the proletariat, therefore, the party resorted several times to systematic purges and examinations of the party ranks.

The first party purge was a general purge; that is, it affected all party organizations. It was conducted in accordance with a resolution adopted by the Tenth Congress of the RCP(B), which was held in 1921, in response to the revival of capitalist elements in the country and the appearance of capitalist agents in the party during the transition to the New Economic Policy. To carry out the purge, the Politburo of the Central Committee formed a central commission, and local party bodies formed city and raion commissions, to check on the work of all party organizations and members. The purge was conducted at open party meetings with the participation of broad masses of nonparty workers, whose involvement Lenin especially valued. As a result of the purge, 24.1 percent of the party's members were expelled.

A purge of nonindustrial party organizations, which made up 25 percent of the party membership, was carried out in 1925 in accordance with a resolution adopted by the Thirteenth Congress of the RCP(B), which was held in 1924. Six percent of the party's members were expelled. A partial examination of rural party organizations was carried out in 1926 with a view to cleansing the party of kulak elements.

The second general purge was called for by the Sixteenth Party Conference, which was held in 1929. It took place in 1929 and 1930, during a period of a full-scale offensive against urban and rural capitalist elements and of an intensification of the class struggle; 7.8 percent of the party's members were expelled.

The third general purge was carried out in implementation of a resolution of the United Plenum of the Central Committee and the Central Control Commission of the ACP(B) of January 1933. The purge affected 25 territorial party organizations; 18.3 percent of the members were expelled. The remaining 17 territorial party organizations were purged during the verification and exchange of party documents carried out in 1935 and 1936.

The purges produced beneficial results and increased the prestige of Communists among the masses, although some mistakes were committed, such as expulsion for "passivity." These mistakes were subsequently corrected by the Central Control Commission and the Central Committee of the ACP(B). In view of the victory of socialism and the liquidation of capitalist elements,

the Eighteenth Congress of the ACP(B) abolished the party purge in the belief that the party can cleanse its ranks in a routine manner of persons who violate the party program and the Rules and who are unworthy of the lofty name of Communist.

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[29–641–2]

PYGOPODIDAE, a family of reptiles of the order Sauria. The snakelike body reaches 80 cm in length. The front extremities are not developed, and the back extremities resemble small fins covered with scales; they are practically unnoticeable in some species. The tail is very long. The eyes are small, with vertical pupils. The eyelids have fused into a transparent membrane.

The Pygopodidae embrace eight genera, with approximately 30 species. The lizards are distributed mainly in Australia, as well as in New Guinea and neighboring islands. They are primarily nocturnal and usually live in tall grasses. They feed on insects and other invertebrates. [29–528–5]

QUADRIPARTITE AGREEMENT ON WEST BERLIN, an agreement signed on Sept. 3, 1971, in West Berlin in the former seat of the Control Council by the Soviet ambassador to the German Democratic Republic (GDR) and the American, French, and British ambassadors to the Federal Republic of Germany (FRG). It went into effect after the Final Quadripartite Protocol was signed on June 3, 1972, by the secretary of state of the USA and the foreign ministers of Great Britain, France, and the USSR. The agreement was a result of talks held in 1970 and 1971 between the ambassadors of the four powers at the initiative of the USSR.

The agreement is based on a recognition of the existing political realities and territorial boundaries in Europe. A key clause affirms that the western sectors of Berlin "continue not to be a constituent part of the FRG and not to be governed by it." The agreement regulates the flow of civilian persons and goods between West Berlin and the FRG by way of the GDR in a manner that recognizes the GDR's prerogatives as a sovereign state; traffic identified as through, or transit, traffic is to be treated according to international practice. The agreement states that residents of West Berlin may visit East Berlin and other parts of the GDR under conditions comparable to those applying to other foreign visitors.

In the agreement the Western powers maintain their rights and responsibilities relating to the representation abroad of the interests of West Berlin and its residents. However, provided that matters of security and status are not affected, the FRG may perform consular services for the residents of West Berlin and may act for them in the international arena in other strictly limited spheres. The agreement authorizes the establishment of a Soviet consulate general in West Berlin and the opening of an office for Soviet foreign trade associations. Other Soviet institutions are also permitted to establish facilities.

The Quadripartite Agreement on West Berlin constitutes a major step toward normalizing the position of West Berlin, which has for many years been a source of international tension. The agreement promotes détente in Europe and facilitates an overall improvement in the international situation.

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QUARTER-TONE SYSTEM, a tonal system based on the division of the octave into 24 equal intervals of ■ quarter tone instead of the usual 12 halftones. Theoretical work on the quarter-tone system began in 1910, and several composers have used the system in their works. The most prominent exponent of the quarter-tone system was the Czech composer A. Hába. In the USSR, A. M. Avraamov and G. M. Rimskii-Korsakov experimented with the quarter-tone system.

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QUARTER-WAVE STUB (also quarter-wave line), a section of a microwave transmission line that is a quarter-wavelength long at the fundamental frequency being transmitted. The input impedance of a quarter-wave stub is inversely proportional to its load impedance. This property of quarter-wave stubs makes it possible to use such stubs in many microwave devices, such as quarter-wave transformers and antenna switches. [29–355–3]

QUATERNARY GEOLOGY, the branch of geology that studies the Quaternary, or Anthropogenic, system and the corresponding period of earth history [*see* ANTHROPOGENIC SYSTEM (PERIOD)]. The Quaternary period covers the period directly preceding the modern age, and therefore Quaternary geology is closely linked with the scientific disciplines that study the present-day face of the earth and the existing organic world: geomorphology, climatology, soil science, zoology, botany, archaeology, engineering geology, and other disciplines.

Quaternary geology has become an independent scientific discipline owing to a number of special characteristics of its object and methods of investigation and the problems it resolves. In terms of length (600,000 to 3.5 million years according to different estimates), the Quaternary period is not commensurate with other periods of earth history. However, it has been characterized by profound changes in the entire physicogeographic appearance of the earth's surface as a result of global climatic changes, expressed in the development of several periods of continental glaciation on one-fourth of the land area. The Anthropogenic (or Quaternary) period is the period during which the human race and human society have formed and developed. Information about the early stages of society has been obtained primarily from the remains of material culture.

Quaternary deposits are characterized by certain specific features: universal distribution both on land and in the seas; the predominance of continental deposits on the continents; relatively thin, gently bedded accumulations; loose deposits; and good preservation. Evolutionary changes in the organic world during this short segment of geological history have been minor, which has limited the possibility of using the stratigraphic method to delineate Quaternary beds. Consequently, detailed stratigraphic subdivisions of the Quaternary system are based on climatic data. In addition to the methods of investigation used in geology as a whole, Quaternary geology uses a number of special methods and techniques, including radiocarbon dating, thermoluminescent dating, cryolithological dating, paleomagnetic dating, the geochronological method of studying banded clays, diatom analysis, and paleoanthropological and archaeological methods. Geomorphological methods and palynological methods (pollen analysis) are especially important.

The foundations of Quaternary geology were laid in the second half of the 19th century and the early 20th century by Russian and Soviet researchers, including P. A Kropotkin, A. P. Pavlov, V. A. Obruchev. G. F. Mirchink, and S. A. Iakovlev, and by a number of foreign scientists, including A. Penck, E. Brückner, P. Woldstedt, R. Flint, and F. Zeuner.

Quaternary geology became an independent scientific discipline in the 1920's and 1930's, when groups of specialists working on certain problems of Quaternary geology emerged in the USSR and in such foreign countries as Germany, Sweden, Finland, and

the United States. In the USSR, various higher educational institutions began offering courses in Quaternary geology, the Commission for the Study of the Quaternary Period of the Academy of Sciences of the USSR was established (1927), and a methodology for the geological mapping of Quaternary beds was developed.

The International Union for Quaternary Research (INQUA) was founded in 1932.

The principal areas of study in Quaternary geology include biostratigraphy (V. I. Gromov, G. I. Goretskii, K. V. Nikiforova), climatic stratigraphy (S. A. Iakovlev, A. I. Moskvitin, I. I. Krasnov), lithogenesis (E. V. Shantser), geomorphology (A. A. Aseev), and paleogeography (I. P. Gerasimov, K. K. Markov). In addition, problems of neotectonics (N. I. Nikolaev) and "young" volcanism (E. E. Milanovskii) are under study, and methods of mapping Quaternary beds are being developed (G. S. Ganeshin).

The most important research in Quaternary geology is being conducted at the Geological Institute and the Institute of Geography of the Academy of Sciences of the USSR in Moscow, the Institute of Geology and Geophysics of the Siberian Division of the Academy of Sciences of the USSR in Novosibirsk, the All-Union Geological Research Institute in Leningrad, and various research institutes in the Baltic republics, Byelorussia, and the Ukraine. Various problems of Quaternary geology are discussed at INQUA congresses and commissions and at international geological and geographic congresses. All-Union and regional meetings are held regularly in the USSR. The Interdepartmental Stratigraphic Committee established a permanent commission on the Quaternary system in 1956 to deal with stratigraphic problems.

Problems of Quaternary geology are discussed in numerous periodical publications, including *Biulleten' kommissii po izucheniiu chetvertichnogo perioda* (Bulletin of the Commission for the Study of the Quaternary Period), *Doklady AN SSSR* (Reports of the Academy of Sciences of the USSR), *Izvestiia AN SSSR: Seriia geologicheskaia* (Proceedings of the Academy of Sciences of the USSR: Geology Series), *Izvestiia AN SSSR: Seriia geograficheskaia* (Proceedings of the Academy of Science of the USSR: Geography Series), *Sovetskaia geologiia* (Soviet Geology), *Geomorfologiia* (Geomorphology), *Sovetskaia arkheologiia* (Soviet Archaeology), *Izvestiia Vsesoiuznogo geograficheskogo obshchestva* (Proceedings of the All-Union Geographical Society), *Anthropozoikum* (Czechoslovakia), *Biuletyn Peryglacjalny* (Poland), and *Eiszeitalter und Gegenwart* (Federal Republic of Germany).

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G. S. GANESHIN [29–349–3]

RANK (Russian, *chin*), the service position held by military personnel and civil servants, to which apply specified official rights and obligations. In prerevolutionary Russia, ranks were conferred according to the Table of Ranks, established by Peter I the Great. The concession of estate rights and privileges was connected with the attainment of a specific rank.

All civil and military ranks were abolished by the decrees of Soviet power of Nov. 10 (23) and Dec. 16 (29), 1917. Class ranks (*chiny klassnye*) have been established in the USSR for workers in the Procurator's Office. [29–602–1]

RANK, a military formation in which servicemen are ranged side by side in a line. In a two-rank formation, the servicemen of one rank take a position one step behind the men of another rank; the front rank is called the first rank and the rear rank, the second. Both formations may be either close or open. In close formation the intervals between the men within a rank are equal to the width of a hand; in open formation the interval is one step or a distance ordered by the commander. [29–1138–2]

RAW SILK, an industrial thread of natural silk, obtained in cocoon reeling by combining lengthwise several, usually five to ten, cocoon filaments; the filaments are firmly cemented together with sericin. Raw silk must be uniform with respect to thickness, smoothness (the absence of thickenings or breaks on short segments of the fiber), and cohesion of the filaments. Its mechanical properties are higher than the properties of the cocoon filaments: the breaking strength is 15 percent higher and the extensibility is 10–15 percent higher. More than one-half of all the raw silk produced is processed into thrown silk. Raw silk, which is usually produced in crosswound skeins, is used to manufacture dress fabrics, sewing threads, and other articles. [29–1110–2]

READER, a device for the viewing and reading of enlarged optical images of microfilms or microphotocopies. A reader is a projector in which the image of a microfilm frame is projected, by means of an objective and a system of mirrors, on a screen that is built into the device or on an external screen. Depending on the principle of their operation, readers are divided into devices for viewing microfilms and microphotocopies in transmitted light or in reflected light. The most widely used readers are table models, which make it possible to view both microfilms and microphotocopies—for example, microcards or microfiches—on either a transparent or an opaque substrate.

According to their design, readers are divided into devices with a diffusely reflecting screen and devices with a translucent screen. The components of a reader with a diffusely reflecting screen may include a mirror attachment for projecting images on an external screen.

In a reader with a diffusely reflecting screen, light from an electric lamp passes through a heat filter and a system of lenses and falls on a microfilm frame. The optical image of the microfilm frame is projected, by means of an objective and a mirror, on a screen located within a housing that shields the screen from light. Such a housing makes it possible to use the reader in undarkened rooms.

In a reader with a translucent screen, rays of light pass through a heat filter and fall on a microfilm frame. The image of the microfilm frame is projected on the translucent screen by means of an objective and a system of mirrors.

In working with microphotocopies, it often becomes necessary to obtain an enlarged duplicate of a document. For this purpose, a reader copier is used. In such a device, a reader and a reprographic system are integrated. The first reader-copiers, which were manufactured by Kodak (USA) in the 1930's, made copies on photographic paper. In present-day reader-copiers, enlarged copies are produced on dielectric paper or on ordinary paper by means of electrography. Work with reader-copiers is carried out in two stages. First, the required microfilm frame is retrieved on the screen; then, an enlarged copy is produced.

Readers and reader-copiers are office equipment. They are used in libraries, in the scientific and technical information departments of scientific research institutes, in design organizations, and in other organizations where the type of activity requires microfilming.

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See references under MICROFILMING.

A. IA. MANTSEN [29–650–1]

RECOVERY OF SOLD PROPERTY, in Roman law and later in civil law, the retaking of property from a buyer on grounds that arose before the sale.

Under Soviet law, recovery of sold property is regulated by the civil codes of the Union republics—for instance, Articles 250 and 251 of the Civil Code of the RSFSR. The codes specify that the seller is obliged to reimburse the buyer for the loss suffered if the buyer is deprived of the goods by the judgment of the court. Both the buyer and seller must be party to the proceedings and must take part in them on the side of the buyer. Failure of the buyer to

involve the seller in the case frees the seller from responsibility, provided he shows that he could have prevented the buyer's being deprived of the goods if he had taken part in the proceedings. [29–1650–1]

RECURVIROSTRA, a genus of birds of the family Charadriidae of the suborder Limicolae. The bill is long and recurved and has a flattened tip. The plumage is white with black or red. The genus comprises four species, which are distributed in Europe, Asia, Africa, America, and Australia. In the USSR there is one species, the Eurasian, or European, avocet (*R. avosetta*). The European avocet measures 45 cm in length. Its plumage is black and white, and its bill is black. The bird is found in the south, from the Danube to Transbaikalia. It lives in colonies along the flat, swampy shores of seas and salt lakes. The clutch contains four eggs, which are incubated 22 to 24 days. The diet consists of crayfish, mollusks, and aquatic insects. [29–1195–2]

RED GOLD (in Russian, *chervonnoe zoloto*), a high-purity alloy of gold and copper that was used to make chervontsi and other coins. The fineness of red gold ranged from 916 to 986, or from 88 to 94 ⅔ in the *zolotnik* system. In Russian, the term *chervonnoe zoloto* has lost its technical meaning and has been retained only in everyday language as an equivalent of "pure gold." [29–181–4]

REGIONS OF THE WORLD, the division of the land masses of the Earth into areas consisting of one or more continents or parts of continents, together with adjacent islands. The world is generally divided into the following regions: Europe, Asia, Africa, Australia, North and South America, and Antarctica. Oceania, which is sometimes included as a special island region of the world, is on occasion joined with Australia to form a dual region. The division of the world's land masses into regions should not be confused with the division into continents or into the Old World, which comprises Eurasia and Africa and was known before the discovery of America, and the New World, which comprises North and South America. Australia, Oceania, and Antarctica are disregarded in this division. [29–79–1]

REPOUSSAGE, the production of raised images on sheet metal. The reverse side of the metal sheet is laid against a block of special resin, and a special hammer is used to strike a raising tool applied most frequently to the face side. Repoussage is one of the oldest techniques used in decorative metalworking.

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RESOLUTION SENSITIVITY (Russian, *informatsionnaia chuvstvitel'nost'*), a characteristic of photosensitive emulsion layers that describes their capacity to record an individual optical signal or unit of optical information and to make it discernible from adjacent recorded signals.

In ordinary silver halide photographic materials, high photographic contrast and photographic sensitivity are factors that contribute to a high resolution sensitivity; graininess and light scattering by the emulsion are factors that reduce resolution sensitivity. Thus, the index of resolution sensitivity for such films is taken as the ratio $GS/\sigma_D\omega$, where G is the increase along the ordinate of the characteristic curve per unit of length along the abscissa in the linear segment of the characteristic curve, S is the photographic sensitivity value, σ_D is the mean square granularity (the mean square value of the variations in optical density D of a macroscopically uniform section of photographic blackening; the variations are caused by the grain structure in the section), and ω is the area of the scattering section in the image of a luminous point on the photosensitive layer. (*See* SENSITOMETRY for a discussion of the quantities G and S.)

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A. L. KARTUZHANSKII [29–726–3]

RETE MIRABILE, a vascular network formed as a result of the one-time division of the original blood vessel into capillary-like branches that subsequently reunite into a single vessel.

One of the many anachronisms in terminology, the term was coined by Galen, who discovered the division of the internal right and left carotid arteries in animals into numerous small arterial branches, which then rejoined between the internal base of the skull (in the body of the sphenoid bone and the upper part of the clivus) and the dura mater of the brain. The unusual feature of this vascular network of vessels is that all the smaller vessels eventually unite into a single vessel that continues further under the same name—the internal carotid artery—and that acts as the source for the capillary network of the corresponding hemispheres of the brain. Commentators on Galen's works believed that the life spirit (*spiritus vitalis*) was transformed into the animal spirit (*spiritus animalis*) in the rete mirabile and was then distributed throughout the entire body from the brain along the nerves, as if through pipes.

In the modern literature, the term "rete mirabile" sometimes refers to the glomerular capillaries of the kidneys that join blood vessels bringing blood into the glomeruli and then taking it out (rete mirabilis artereosum) and to the sinusoids in the liver, which connect the branches of the portal vein with the roots of the hepatic veins (rete mirabilis venosum).

The rete mirabile in the wall of the swim bladder of fishes is composed of the finest precapillary arterioles, through which gas passes into the swim bladder from the blood cells. The function of the rete mirabilis is to retard the flow of blood in certain parts of the circulatory system. V. V. KUPRIIANOV [29–735–4]

RHIZOCTONIA ROT OF CITRUS, a disease of the root system of citrus crops caused by the fungus *Rhizoctonia violacea*. A reddish-violet mycelial tomentum forms on the roots and penetrates the tissue. Affected roots wither, and the cortex separates and is converted into a semifluid, blackish, foul-smelling mass. The plants usually die. The disease occurs in citrus-growing regions. Control measures include digging up and burning diseased plants and disinfecting the soil after removal of the plants. [29–250–2]

ROLLER-BIT DRILLING, a drilling method that uses a roller bit (*see* DRILL BIT). The method was first used in the USA in the 1920's and in the USSR in the 1930's to drill oil and gas wells.

In roller-bit drilling, rock is cut by steel or hard-alloy teeth projecting from rolling cutters, which rotate on the drill-bit bearings. In turn, the drill bit rotates at a rate of 60–600 rpm and presses against the bottom hole with a high axial force of 500–2,000 kg per cm of the bit diameter. The teeth of the rolling cutters roll over the bottom hole and, owing to the large stresses that develop in the area of contact between the teeth and the rock, cut the rock by crushing and chipping. As the hardness of the rock increases, the rotation rate decreases and the axial force increases. The rock that is cut at the bottom of a well is removed to the surface by washing, blowing, or a combination of washing and blowing.

Roller-bit drilling is carried out by stationary, self-propelled, or mobile drilling rigs using the rotary method (*see* ROTARY DRILLING) or the turbine method (*see* TURBODRILLING) of transmitting torque to the roller bit. Less often, electrodrills are used.

Roller-bit drilling is used to drill deep (up to several kilometers in depth) exploratory, oil, and gas wells. It is also used to drill blastholes in underground and open-pit mining, to bore raises in underground mines, and to sink mine shafts.

The efficiency of roller-bit drilling is evaluated on the basis of the shift or monthly drilling rate per rig and the volume of drilling with a roller bit before the bit is replaced. Depending on the hardness of the rock and on the field of application, the cited indicators vary over a wide range. As of 1978, roller-bit drilling was superior to other drilling methods in performance.

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B. N. KUTUZOV [29–869–1]

ROOFING TILE, pieces of ceramic roofing material made of fired clay, a cement-sand mortar, or a lime-sand mortar processed in an autoclave (silicate tile). The most common clay tile is made from plastic clays having a low fusion point (sometimes with the addition of a fireclay).

Depending on the shape and the molding method, roofing tile may be classified as grooved (both pressed and strip types) and flat (strip type); a ridge tile is also produced to cover the ridge of a roof. Depending on the composition of the clay and the firing method, tile may have a natural color ranging from brick red to a yellow-gray. For decorative purposes tile is sometimes coated with a colored glaze. Cement tile can be colored with a weatherproof pigment through its cross section or on its surface. The advantages of roofing tile are its durability, fire resistance, impermeability to water, frost resistance, and low maintenance costs (periodic painting is not required); the disadvantages include brittleness and relatively high weight. Tile roofs should have a steep slope (more than 30°) in order to drain off water.

[29–214–2]

RUMEX, a genus of perennial or annual herbs or subshrubs of the family Polygonaceae. The erect branching stem is for the most part rough. The leaves are large and petioled. The bisexual or, less commonly, unisexual flowers are in panicled inflorescences. The fruit is a three-angled achene.

There are about 150 species of *Rumex*, distributed mainly in temperate regions of the northern hemisphere. The USSR has more than 50 species. The plants grow along roads and rivers, near fences, on floodplain meadows, and in wastelands, orchards, gardens, and fields. They are only sometimes eaten by livestock. The plants severely suppress the growth of cultivated plants, including valuable cereal grasses.

The garden sorrel (*R. acetosa*) is cultivated as a vegetable. It is sown several times throughout the summer. The leaves are gathered 18 to 25 days after sowing; if the seeds are not needed, the flower stalks are cut. Varieties of garden sorrel include Belleville, Odesskii 17, and Broad-leaved. The fresh leaves are used to prepare various foods, including canned goods (puree). The leaves contain oxalic acid, iron, and tannins. Another cultivated species is the spinach-dock, or herb patience (*R. patientia*). The species *R. confertus* is cut before seed maturation for silage.

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SA (Sturmabteilung; known in English as Storm Troopers), a paramilitary unit of the National Socialist Party in Germany from 1921 to 1945. The SA was an instrument of terror used against opponents of fascism.

After the fascists seized power in Germany in 1933, the SA was turned into an auxiliary police force; members of the organization were used as guards in the Nazi concentration camps and were responsible for some types of military and paramilitary training. In early 1934 there were more than 3 million members of the SA, mostly from petit bourgeois strata. On June 30, 1934, the fascist leadership, taking advantage of unrest within the SA caused by the failure to fulfill the promises made by the Nazi leaders to the petite bourgeoisie, liquidated the discontented members; those killed included E. Röhm and other leaders of the SA who tried to use the discontent of the rank and file to strengthen their own position. After the events of June 30, the SS (Schutzstaffel), which until then had been subordinate to the command of the SA, became a separate organization. The SA was outlawed after the defeat of German fascism in 1945.

[29–1505–1]

ŠABAC, a city in Yugoslavia, in Serbia. Port on the Sava River. Population, 45,000 (1976). Šabac has zinc-smelting, chemical, wood-products, and leather industries. Flour, alcohol, vodka, meat, canned fruit and vegetables, and other food products are also manufactured. [29–790–2]

SABER CARP (*Pelecus cultratus*), also chekhon, a semianadromous or freshwater fish and frequently a school fish of the family Cyprinidae. The body is elongated and flattened. Its lateral line is irregular, with a considerable bend at the pectoral fin. The mouth is apical. The saber carp is generally 30–40 cm long, sometimes reaching 60 cm. It weighs between 300–400 g and 2 kg. It inhabits freshwaters and brackish waters, and it is distributed in the basins of the Baltic, Black, Caspian, and Aral Seas, in lakes, and in reservoirs. A pelagic fish, it lives in the depths of the water. It attains sexual maturity in the third to fifth year of life. Spawning occurs in May or June. Fecundity is about 30,000 eggs. The semianadromous forms winter in rivers. The diet consists of invertebrates and small fish. The saber carp is of commercial importance.

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[29–411–1]

ŠAFAŘÍK, PAVEL JOSEF. Born May 13, 1795, in Kobeliarovo Slovakia; died June 26, 1861, in Prague. Slovak and Czech Slavicist. Figure in the Czech and Slovak national liberation movements.

Šafařík graduated from the University of Jena in 1817 and taught in a Serbian *Gymnasium* from 1819 to 1833. In 1841 he became curator of the library of Charles University, and in 1848 he became the library's director. During the Revolution of 1848, Šafařík adopted a liberal bourgeois stance. He became chairman of the society Lípa Slovanská in April 1848 and headed the Czech and Slovak delegation to the Slavic Congress, held in Prague that June.

Šafařík was the first Slavicist to apply the comparative historical method to the study of the Slavic peoples. His principal works *Slavic Antiquities* (Russian translation, vols. 1–2, 1837–48) and *Slavic Ethnography* (Russian translation, 1843) provided historical substantiation for the concept of Slavic unity and demonstrated the role played by the Slavs in world history. Šafařík also wrote on mythology, paleography, Slavic languages, and Czech and Slovak literature and folklore. He and F. Palacký published the treatise *Principles of Czech Poetry* in 1818. Šafařík's *History of Slavic Language and Literature in All Its Dialects* appeared in 1826. His activity as a poet is represented by the collection of verse *A Tatra Muse With a Slavic Lyre* (1814). Šafařík's work influenced the development of Slavic studies in Russia and in other countries.

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R. A. AGEEVA [29–887–1]

SÁGVÁRI, ENDRE. Born Nov. 4, 1913, in Budapest; died there July 27, 1944. Figure in the Hungarian youth movement. A lawyer by education and profession.

In 1936, Ságvári joined the Social Democratic Party of Hungary and became a leader of the All-Hungarian Youth Committee (AYC). In the following year he was sentenced to eight months in prison for his revolutionary activities. In 1940 he joined the Communist Party of Hungary and became secretary of the AYC.

Ságvári helped organize antiwar demonstrations in Budapest in 1941 and 1942, and in March 1942 he was forced to go underground. In 1944 he edited *Béke és szabadság*, the illegal newspaper of the Peace Party. Ságvári was killed during an exchange of gunfire with the police.

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SAISUNAGA, a dynasty that ruled the ancient Indian kingdom of Magadha from approximately 430 B.C. to 364 B.C., or according to some sources, during the seventh and sixth centuries B.C. The dynasty consisted of two rulers: Saisunaga, who seized power through a coup, and his son Kalasoka, whose murder was arranged by Mahapadma Nanda.

Under the Saisunaga dynasty, the Magadhan state grew by subjugating other states, such as the kingdoms of Avanti and Kasi. The Saisunaga rulers supported Buddhism, and, according to tradition, the Buddhist Second Council met at Vesali during Kalasoka's reign. [29–811–6]

SAJÓ (also Slaná), a river in Czechoslovakia and Hungary, a right tributary of the Tisza River of the Danube basin. The Sajó is 229 km long and drains an area of 12,700 sq km. The river rises in the Slovak Ore Mountains and flows, for the most part, in a broad valley; in its lower course it flows along the Middle Danube Plain. The Sajó is fed primarily by rain, and freshets occur in the summer and fall. The mean flow rate is approximately 70 cu m per sec. In some years, the river freezes over for one or two months. It is used for timber flotation. The Hungarian city of Miskolc is located on the Sajó. [29–811–2]

ŠAKIAI, a city and the administrative center of Šakiai Raion, Lithuanian SSR. Šakiai is situated on the Siesartis River of the Neman River basin. The city is 61 km northwest of Kaunas and 33 km north of the Pilviškiai railroad station on the Kaunas-Kaliningrad line. Industry is represented by a metalworking shop of the Vilkaviškis Metalworks. [29–813–3]

SAKYA (also Shakya), an ancient Ksatriyan oligarchic republic and tribe in the Nepalese Terai. The city of Kapilavastu was the capital of the republic.

According to tradition, Siddhartha Gautama, the founder of Buddhism, belonged to the Sakya tribe; he is sometimes called Sakyamuni, or sage of the Sakya. Since his first followers were also Sakya and constituted the nucleus of the first Buddhist monastic community, the tribe's name is sometimes used to refer to Buddhist monks in general. [29–813–1]

ŠALČININKAI, a city and the administrative center of Šalčininkai Raion, Lithuanian SSR. Šalčininkai is located 45 km southeast of Vilnius on the Vilnius-Lida highway and has a railroad station on the Vilnius-Lida line. The city has an alcohol plant and a production combine whose products, made of fiber glass reinforced plastics, include boats and launches. [29–817–2]

SALGÓTARJÁN, a city in northern Hungary, on the Zagyva River. Capital of the *megye* (county) of Nógrád. Population, 44,000 (1976). Salgótarján is the center of the Nógrád Coalfield, from which brown coal is extracted. Industries include metallurgy, the production of mining equipment, agricultural machine building, and the manufacture of metal goods, glass, and bricks. [29–816–3]

SALLAI, IMRE. Born Dec. 17, 1897, in Erdőfülle, in the *megye* (county) of Baranya; died July 29, 1932, in Budapest. Figure in the Hungarian working-class movement.

Sallai helped found the Communist Party of Hungary (CPH) in 1918 and became a member of its Central Committee. Under the Hungarian Soviet Republic of 1919 he was deputy director of the political department of the People's Commissariat for Internal Affairs.

From 1921 to 1923 Sallai engaged in party work in Vienna. He was on the staff of the Marx-Engels Institute in Moscow from 1924 until 1928, when, at the behest of the Central Committee of the CPH, he organized an underground press in Hungary. Sallai returned to the USSR in 1929 and stayed there until 1931. In the spring of that year he became the head of the secretariat of the Central Committee of the CPH. Captured by the police in Budapest in July 1932, Sallai was executed together with S. Fürst. [29–814–3]

SALVIA (sage), a genus of perennial herbs or subshrubs of the family Labiatae. The flowers are in false whorls, which form a spicate or panicled inflorescence. The upper lip of the corolla is helmet-shaped, straight, or crescent-shaped. There are two stamens. The flowers have a unique adaptation for cross-pollination. The fruit consists of four nutlets.

The approximately 700 species occur throughout the world, primarily in the subtropics and tropics. The USSR has about 80 species, growing mainly on dry mountain slopes. The most common species is garden sage (*S. officinalis*), a usually violet-flowered subshrub that grows in the Mediterranean region. In the USSR it is cultivated for medicinal and culinary purposes in Moldavia, the southern Ukraine, and Krasnodar Krai. The leaves contain essential oil, alkaloids, and tanning substances; they are used as a flavoring in the production of liqueurs and spirits and in the fish canning industry. A tincture of leaves is used medicinally as an astringent or anti-inflammatory rinse to treat inflammations of the mouth, pharynx, and larynx. Clary (*S. sclarea*), a perennial with pinkish lilac flowers, grows in the southern Ukraine, the Crimea, the Caucasus, and Middle Asia. It is cultivated for the essential oil contained in the inflorescences; the oil is used by the pharmaceutical, distilling, confectionery, and tobacco industries. Many species, including scarlet sage (*S. splendens*), *S. coccinea*, and garden sage, are cultivated as ornamentals.

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T. V. EGOROVA [29–815–3]

SANDING, in woodworking, the processing of workpieces with abrasive materials, such as sandpaper, and with special tools, such as brushes and wire disks, immediately after planing, shaping operations, routing, puttying, or priming. In sanding unvarnished surfaces, the abrasive materials are moved in the direction of the wood grain; otherwise, the wood fibers are cut, and subsequent application of varnish or paint causes the fibers to rise, resulting in a rough surface.

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A. A. SHISHKIN [29–1298–1]

SANDING MACHINE, a woodworking machine for sanding parts and articles made of wood and wood materials. Sanding machines are divided into disk, belt, drum, bobbin, vibratory, and polishing types depending on the type of abrasive tool, the shape of the backing to which the abrasive paper is applied, and the purpose.

Depending on the workpiece feed motion, sanders may be fixed or traverse types. In the former, either the abrasive paper or the workpiece executes a reciprocating motion; in the latter, the workpiece passes through the working zone of the abrasive paper. Machines used for polishing varnished items are of the fixed type. Varnished surfaces are usually sanded on vibratory sanders, in which the abrasive paper executes an oscillating motion together with its clamping device at a rate of approximately 1,400 vibrations per min. The most productive types of sanders are wide-belt traverse types and drum sanders.

A. A. SHISHKIN and N. K. IAKUNIN [29–1296–2]

SANKARA (also Shankara). Probably born in A.D. 788; died circa 820. Indian religious philosopher and poet; reformer of Hinduism and creator of the consistently monistic system of Advaita Vedanta (nondualistic Vedanta).

Sankara was born into a Brahman family in Malabar (now state of Kerala). He became an ascetic in early childhood and studied with Govinda, a pupil of Gaudapada's. Sankara founded several religious communities. His chief works are the commentaries to Badarayana's *Brahma Sutra*, or *Vedanta Sutra*, to the Upanishads, and to the *Bhagavad-Gita*.

According to Sankara, the only and all-pervasive reality is *brahman*, the supreme objective principle that is identical to the self (*atman*, or the soul), which is the subjective principle. The

apparent plurality of the world is explained by *maya*, the special power of divinity; *maya* is the illusion that at times conceals and at other times distorts the truth. Our ignorance (*avidya*) prevents us from apprehending the unity of *brahman*, creating the world of plurality and the movement and change associated therewith.

Sankara does not acknowledge the reality of changes, which he explains as mere appearance. He refuses to grant the status of reality to the empirical world, even though he regards the latter as objective inasmuch as behind every appearance lies its hidden substratum, or pure being (*brahman*). Sankara is consistent in distinguishing between the empirical and the transcendental point of view—from which two different pictures are obtained—and he sets forth the rules governing the transition from one to the other; these rules lead to the elimination of all attributes, such as creation, movement, change, and quality, that are functions of our ignorance.

Sankara's system is crowned by his doctrine of immanent and transcendental divinity, which possesses no qualities, and of salvation (*moksha*), which is achieved by the free realization of the infinite and absolute self, acknowledgment of the self's extraempirical nature, and recognition of the essential identity of the self and *brahman*.

Sankara's works laid the foundation for the many commentaries within Vedanta, of which the best known is the *Panchapadika* by Padmapada, one of Sankara's pupils. Sankara's doctrine was exceptionally influential in the development of the traditional world view of Hinduism, its influence being felt even today; his work is deemed to have contributed to the victory of Vedic beliefs over Buddhism, which was forced out of India shortly after Sankara's time.

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V. N. TOPOROV [29–833–1]

ŠANTIĆ, ALEKSA. Born May 27, 1868, in Mostar, Hercegovina; died there Feb. 2, 1924. Serbian poet associated with the liberation movement in Hercegovina.

Šantić studied at business schools in Ljubljana and Trieste. His first collection, *Poems*, appeared in 1891. He later published six more books under that title, as well as a collection entitled *On the Old Hearths* (1913). In Šantić's poetry lofty civic sentiments, intense lyricism, and a tendency toward generalized images are combined with profound social content in depictions of the hard lot of the peasants and vivid portraits of working people. His poems above love and nature display a heartfelt lyricism. The poet's faith in the victory of the working class is expressed in "Underground Song" (1920). Šantić also wrote two dramas in verse, *In the Fog* (1911) and *Hasan-Aganica* (1911).

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[29–837–1]

SARCOPTIDAE (itch mites), a family of minute parasitic mites of the order Sarcoptiformes. The insects parasitize the skin of mammals, including humans, causing a burning itch (acariasis or sarcoptiasis). The light yellow body measures 0.2–0.5 mm in length. There are no eyes or tracheae. The eight pairs of short legs end in suckers or bristles. The family embraces approximately 20 species. The females burrow long, twisting passages in the skin and fill them with ova and feces. In four to seven days the larvae hatch. In another 14 days the mites attain sexual maturity and begin to burrow, forming new channels. They mate on the skin surface, after which the males die. [29–343–1]

ŠAR PLANINA, a mountain range in southern Yugoslavia, near the Albanian border. The Šar Planina is more than 60 km long and reaches an elevation of 2,760 m at Titov-Vrh. The range is composed of schists, limestones, and dolomites and exhibits karst phenomena. Mixed forests are found on the slopes, and mountain meadows are encountered at elevations above 2,000 m. [29–870–4]

SASTRI, K. A. NILAKANTA. Born Aug. 12, 1892. Indian historian. A Tamil by nationality.

Sastri is a moderately nationalistic member of the objectivist school. Most of his more than 15 books on Indian history deal with the southern part of the subcontinent. Sastri's works are rich in factual material.

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[29–875–2]

SAXICOLA, a genus of birds of the family Turdidae of the order Passeriformes. The body length ranges from 12.5 to 20 cm. The genus comprises about ten species, which are distributed in Europe, Africa, and Asia.

There are four species in the USSR: the stonechat (*S. torquata*), the whinchat (*S. rubetra*), the pied stonechat (*S. caprata*), and Hodgson's stonechat (*S. insignis*). The stonechat is widely distributed throughout the USSR, inhabiting shrub-filled meadows and forest marshes. The whinchat occurs as far east as Krasnoiarsk and is commonly found in cleared forests and along forest margins. The pied stonechat inhabits the river valleys of southern Middle Asia, while Hodgson's stonechat lives on mountain meadows of the Sailiugem Range in the Altai Mountains.

Members of the genus *Saxicola* are migratory. They nest on the ground, beneath shrubs; they sometimes nest in building cracks. The clutch contains four to seven eggs, which are incubated by either the female alone or by both the female and the male. The diet consists of insects. [29–131–4]

SCABIES, a contagious skin disease of humans caused by the itch mite. Scabies occurs after direct contact with various objects and clothing of a person suffering from scabies.

Seven to ten days after infection, a rash appears in the form of tiny nodules, blisters, and slightly raised straight or curved lines about 1 cm in length (mite burrows). The rash occurs in the folds between the fingers, on the sides of the fingers, at the bends of the upper limbs, and on the front and sides of the trunk; in children, it occurs all over the body. The rash is produced by fertilized female mites, which bore into the epidermis, where they deposit their eggs. Mite reproduction is very rapid: about 150 million individuals appear within three months. Persons afflicted with scabies are disturbed by severe itching, especially at night, and in warm conditions. Ulcerations often form on the skin as a result of infections brought on by excessive scratching.

Treatment involves the application to the affected areas of Wilkinson ointment, a 33 percent sulfur ointment, a 20–25 percent soap and water emulsion of benzyl benzoate, a 60 percent sodium thiosulfate solution, or a 6 percent solution of hydrochloric acid. Scabies can be prevented by the observance of the rules of personal hygiene, periodic examination of children's groups, and the isolation and treatment of individuals afflicted with scabies and the disinfection of their belongings.

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I. Ia. SHAKHTMEISTER [29–342–3]

SCALE. (1) A microscopic chitinous plate on the bodies of some arthropods, mainly insects, which sometimes completely covers the body. As a result of their optical properties, the scales as a rule determine the coloration of the animal. Butterflies have scales which are particularly developed. Bristletails, springtails, weevils, mosquitoes, and some Hymenoptera have scales, as well as some mites.

(2) Various growths on plants, usually flat and having a protective function. Frequently "scale" refers to the base of a leaf that remains on the stalk after the leaf has fallen off and that forms a peculiar shell on the stem. [29–529–1]

SCALE (also plate), a hard metameric protective plate of the epidermis in vertebrates, including fish, reptiles, birds, and some mammals.

The scales of fossil Agnatha and fossil fishes were mesodermal in origin and were formed by bony tissue (dentin, bone). Scales are distributed on the body in regular diagonal rows in the direction of the collagen fibers of the skin. In addition to their protective function, they fulfill musculoskeletal functions. In the phylogenesis of the lowest, originally aquatic, vertebrates, such as cyclostomes, fishes, and amphibians, the origin of the scales is the placoid scales of fossil Thelodontidae and cartilaginous fishes, as represented by dentin spines and teeth that were periodically replaced as the animal grew (*see* PLACOID SCALE). The cosmoid scales, ganoid scales, cycloid scales, and ctenoid scales of the bony fishes are complex phylogenetic derivatives of the original type of scale (*see* COSMOID SCALE; GANOID SCALE; CYCLOID SCALE; and CTENOID SCALE). These scales are characterized by cyclical growth and the formation of annual rings, which make it possible to determine the age of the fish.

Among amphibians, bony plates similar to fish scales are found in some stegocephalians and modern Apoda, such as the Caeciliidae, including water snakes. The horny plates of reptiles, birds, and some mammals are formed by the keratinization of the outermost epidermal layer. They prevent the skin from drying out and protect it from physical damage. The horny plates are usually replaced through periodic molting or desquamation. In certain reptiles, such as crocodiles and tortoises, the horny plates sometimes fuse with the secondary dermal ossifications and cover the entire body. In birds they cover only the legs, and in mammals, for example, marsupials, rodents, insectivores, and some others, they are usually found on the tail. The secondary development of large plates on the body is observed in armadillos, in which they overlie bony plates, and in pangolins.

V. N. IAKOVLEV [29–531–3]

SCALE, part of the reading device of a measuring instrument, consisting of a system of markings (dots or lines arranged in some definite sequence) with numbers or other symbols at some of the markings representing a series of consecutive values of the measured quantity.

Scale parameters, such as scale limits and the value of a division of the scale (that is, the difference between scale values corresponding to two adjacent markings), depend on the inherent measurement limits of the measuring mechanism, on the sensitivity of the instrument, and on the required reading precision. The arrangement of the divisions, which can be in a circle, an arc, or a straight line, depends on the design of the reading device, while the scale itself may be uniform, quadratic, logarithmic, and so on. The main divisions of the scale, corresponding to the numerical values, are marked off by longer or thicker lines. Readings are made by the naked eye on scales the distance between whose divisions is 0.7 mm or higher; smaller intervals require the use of a magnifying glass or microscope. Fractional estimates of scale divisions are made with the aid of verniers. [29–1252–5]

SCALE INSECT, the common name for any one of numerous homopterous insects of the suborder Coccoidea, which unites representatives of the families Ortheziidae, Margarodidae, Asterolecaniidae, Pseudococcidae, and Eriococcidae.

Scale insects are tiny sucking insects with marked sexual dimorphism. The males have wings, usually the first pair; the extremities are normally developed, and there are two setae or a tuft of setae at the caudal end of the abdomen. There is no mouth apparatus (the males do not feed in the adult stage). The females are wingless and larva-like and are covered with a waxy coating secreted by numerous glands. The head is fused with the prothorax. The mouth apparatus is a sucking one. In a number of species the legs are reduced or absent. Segmentation of the abdomen is not always marked. Most species lay eggs; some species are viviparous. Fertility is very high; many forms produce two, sometimes as many as four, generations in a year. First-stage larvae (wanderers) actively move over the host plant and may be carried by wind. Upon attaching themselves to a plant, the larvae lose their mobility; after molting, the next-stage larvae again seek a feeding ground. Females have three stages (instars) of larval growth. Males have two additional nonmotile, nonfeeding, nymphal stages. Adult females of some species can actively crawl over the host plant. Prior to egg laying, many forms abandon their feeding ground and disappear from view.

There are more than 1,600 species of scale insects distributed throughout the world; there are about 250 species in the USSR. Scale insects are most numerous in warm climates. Many are pests of fruit, industrial and ornamental crops, and greenhouse plants. Best known are the greenhouse scale (*Orthezia insignis*), the cottony-cushion scale (*Icerya purchasi*; a pest of citrus plants, infestation with which necessitates quarantine), the bamboo scale (*Antonina crawi*), the citrus mealybug (*Planoccocus citri*), the grape mealybug (*Pseudococcus maritimus*), the grape scale (*Aspidiotus uvae* or *Eulecanium persicae*), the Comstock mealybug (a pest of mulberry), and the olive scale (*Parlatoria oleae*). Some species secrete beneficial substances that are used in the paint and varnish industry; they include the lac insect and the cochineal insect, which yields the red dye carmine.

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Zhizn' zhivotnykh, vol. 3. Moscow, 1969.
B. R. STRIGANOVA [29–179–5]

SCHACHT, JOSEPH. Born Mar. 15, 1902, in Ratibor (Racibórz); died Aug. 1, 1969, in New Jersey. Islamic scholar; specialist in Islamic law. Editor and one of the founders of the journal *Studia Islamica*; editor of the second edition of the *Encyclopedia of Islam*. Of German extraction.

Schacht left fascist Germany in 1934 and moved to Egypt, where he taught at the University of Cairo until 1939. From 1946 to 1953 he was a professor of Islamic studies at Oxford, and from 1953 to 1959 he headed the Arabic studies department at the State University of Leiden. In 1959 he became a professor of Arabic and Islamic studies at Columbia University in New York City.

Schacht believed that the formation of the basic system of Islamic law had been completed by the eighth century. Although he dealt with Islamic law chiefly in a historical and sociological context, Schacht saw the law as self-contained.

WORKS
The Origins of Muhammadan Jurisprudence. Oxford, 1967.
[29–906–4]

SCHÄDEL, GOTTFRIED JOHANN. Born 1680's in Wandsbek, near Hamburg; died Feb. 10 (21), 1752, in Kiev. German architect active in Russia from 1713; representative of the baroque style.

From 1716 to 1726, Schädel directed the construction of A. D. Menshikov's palaces in St. Petersburg and Oranienbaum (present-day Lomonosov). In 1730 he worked on the designs for the bell tower of the Don Monastery in Moscow. He worked in Kiev from 1730, where he built the bell tower in the Kiev-Pecherskaia Laura and a number of other buildings. [29–1078–4]

SCHADOW, a family of German artists of the late 18th and 19th centuries.

Johann Gottfried Schadow. Born May 20, 1764, in Berlin; died there Jan. 27, 1850. Sculptor in the classical style.

J. Schadow studied in Berlin and, from 1785 to 1787, in Rome. In 1788 he became the director of the royal school of sculpture in Berlin. In 1805 he became the vice-director, and in 1815 the director, of the Berlin Academy of Arts. Schadow often used classical motifs. He created imposing official monuments, such as the quadriga with the figure of Victory on the Brandenburg Gate in Berlin (copper, 1788–94); he also produced works noted for their sculptural and emotional freedom and, in some cases, for their sensitive portrayal of their subjects, such as the sculpture *The Princesses Luise and Frederike*. Schadow was also a graphic artist and art theorist.

Friedrich Wilhelm von Schadow. Born Sept. 6, 1788, in Berlin; died Mar. 19, 1862, in Düsseldorf. Romantic painter; one of the founders of the Düsseldorf school. Son of J. Schadow.

F. von Schadow visited Rome several times. In 1816 and 1817 he painted frescoes in the Casa Bartholdi that dealt with the legend of Joseph; since 1877 they have been in the National Gallery in Berlin. In 1819, Schadow became a professor at the Berlin Academy of Arts; from 1826 to 1859 he was director of the Düsseldorf Academy. Schadow was an outstanding teacher; his students included K. F. Lessing, A. Rethel, A. Feuerbach, and K. W. Hübner.

REFERENCES

Mackowsky, H. *Johann Gottfried Schadow: Jugend und Aufstieg, 1764–1797*. Berlin, 1927.
Hübner, J. *Schadow und seine Schule*. Bonn, 1869. [29–805–5]

SCHAFFHAUSEN, a city in Switzerland, on the right bank of the Rhine. Capital of Schaffhausen Canton. Population, 35,000 (1975). The city manufactures watches, machine tools, instruments, textiles, and chemical products. [29–890–2]

SCHÄFFLE, ALBERT EBERHARD FRIEDRICH. Born Feb. 24, 1831, in Nürtingen; died Dec. 25, 1903, in Stuttgart. German and Austrian economist, sociologist, and state figure.

Schäffle was a professor of political economy at the University of Tübingen from 1860 to 1868 and the University of Vienna from 1868 to 1871. He served as the Austrian minister of commerce and agriculture in 1871 and edited the journal *Zeitschrift für die gesamte Staatswissenschaft*.

Schäffle belonged to the organismic school of sociology and shared the views not only of A. Comte and H. Spencer but of such German classical idealists as G. Hegel. He believed that the organic unity of society resulted from the transformation of interacting subjective wills and judgments into a "collective consciousness," or "spirit of the people." According to Schäffle, a feature of the "social body" is the ideal, spiritual-psychological relation between individuals that is embodied in their symbolic and direct actions. This relation differs fundamentally from that between cells in an organism.

In the later editions of his principal work, *The Construction and Life of Social Bodies* (vols. 1–4, 1875–78), Schäffle grew increasingly cautious in his use of bioorganismic analogies and treated them as a methodological tool. At the same time, the idealist tendencies in his works became more prominent.

In economic theory, Schäffle stressed the ethical and volitional nature of economic life and sought to furnish a rational ethical and anthropological foundation for it. A prominent representative of Katheder-socialism, he described as socialist any state intervention in the economy and urged cooperation between the proletariat and the bourgeoisie. In the words of F. Engels, Schäffle's socialism was "merely a feudal reaction" to the development of capitalism (K. Marx and F. Engels, *Soch.*, 2nd ed., vol. 35, p. 140).

WORKS

Über die etische Seite der nationalökonomischen Lehre vom Werte. Tübingen, 1862.
Das gesellschaftliche System der menschlichen Wirtschaft, 3rd ed., vols. 1–2. Tübingen, 1873.
Die Aussichtslosigkeit der Sozialdemokratie, 4th ed. Tübingen, 1891.
Die Steuern, vols. 1–2. Leipzig, 1895–97.
Aus meinem Leben, vols. 1–2. Berlin, 1905.
In Russian translation:
Kapitalizm i sotsializm, part 1. St. Petersburg, 1871.
Kvintessentsiia sotsializma. St. Petersburg, 1906.
Sushchnost' sotsializma. Petrograd, 1917.
"Osnovnye sviazi umstvennoi organizatsii." In V. Zombart, *Sotsiologiia*. Leningrad, 1926.

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L. D. S. "Vzgliady Sheffle na obshchestvo." *Russkaia mysl'*, 1892, book 12.
Mann, F. K. "Albert Schäffle als Wirtschafts- und Finanzsoziologe." In *Gründer der Soziologie*. Jena, 1932.
Wiese, L. von. "Albert Schäffle als Soziologe." *Ibid.*

A. D. KOVALEV [29–1168–2]

SCHAIRER, JOHN FRANK. Born Apr. 4, 1904, in Rochester, N.Y.; died Sept. 26, 1970, Chesapeake Bay. American geologist.

Schairer graduated from Yale University in 1925 and received a Ph.D. degree there in 1928. Beginning in 1927, he was a physical chemist in the geophysical laboratory of the Carnegie Institution of Washington. His main works were devoted to mineralogy, geochemistry, and physical chemistry.

Schairer was vice president of the International Association of Volcanology and Chemistry of the Earth's Interior (1957–60), president of the Mineralogical Society of America (1943), vice-president of the Geological Society of America (1944), and president of the American Geochemical Society (1960).

REFERENCE

Yoder, H. S. "Presentation of the Roebling Medal to J. Frank Schairer." *American Mineralogist*, 1964, vol. 49, no. 3–4.

[29–1139–1]

SCHALLÜCK, PAUL. Born June 17, 1922, in Warendorf, Westphalia. German writer (Federal Republic of Germany [FRG]).

Schallück was raised in a Catholic family. After World War II he studied philosophy, history, and art at the universities of Münster and Cologne. His novels *If It Were Possible to Stop Lying* (1951), *Arrival at Zero Hours Twelve Minutes* (1953), and *The Invisible Gate* (1957) and the short-story collection *White Flags in April* (1955) are devoted to young people and portray the negative effects of fascism on the social atmosphere of the FRG. Schallück's other literary works include the tragicomic novel *Don Quixote in Cologne* (1967) and critical essays. A member of Group 47, Schallück has won several West German literary prizes.

WORKS

In Russian translation:
Engel'bert Reineke. Moscow, 1964.

REFERENCE

Simonian, L. "Glavnym obrazom o chudakakh, nemnogo o kheppeningakh." *Inostrannaia literatura*, 1968, no. 12. [29–814–5]

SCHALLY, ANDREW VICTOR. Born Nov. 30, 1926 in Vilno, Poland. American physician.

Schally graduated from McGill University in Canada in 1955. He served as an assistant in biochemistry at the National Institute of Medical Research in London from 1949 to 1952 and worked in the psychiatry department of McGill University in Montreal from 1952 to 1957. He has lived in the United States since 1957. Schally was an assistant professor of physiology and biochemistry at the college of medicine at Baylor University in Houston from 1957 to 1962. In 1962 he became chief of the polypeptide and endocrinology laboratory of a hospital in New Orleans. He was an adjunct professor of medicine at a university in New Orleans from 1962 to 1967, becoming a professor in 1967.

Schally's work has been devoted mainly to the isolation from the hypothalamus of releasing hormones, in particular, the luteinizing hormone-releasing factor and the thyrotropin-releasing factor. He studies the substances' structure, synthesis, and clinical use.

Schally won a Nobel Prize in 1977 jointly with R. Guillemin and R. S. Yalow. IU. A. PANKOV [29–814–4]

SCHAPPER, KARL. Born Dec. 30, 1812, in Weinbach; died Apr. 29, 1870, in London. Figure in the German and international working-class movement.

From his early youth Schapper led the life of a professional revolutionary. He helped found the League of the Just in 1836, the German Workers' Educational Society in 1840, and the Fraternal Democrats in 1845, and he took part in the activities of all three organizations. He was among those who invited K. Marx and F. Engels to reorganize the League of the Just.

In 1847, Schapper became a member of the Communist League. He was chairman of the league's First and Second Congresses and a member of the league's Central Committee. During the Revolution of 1848–49, he became a leader of the Cologne Workers' Union.

After the defeat of the revolution, Schapper fell under the influence of voluntaristic and conspiratorial ideas; together with A. Willich, he led an adventuristic sectarian faction within the Communist League. In 1856, however, he realized that he had been in error and resumed friendly relations with Marx and Engels. In 1865, Schapper became a member of the General Council of the First International.

REFERENCE

Leviova, S. "Karl Shapper." In the collection *Marks i Engel's i pervye proletarskie revoliutsionery*. Moscow, 1961. [29–852–2]

SCHÄRF, ADOLF. Born Apr. 20, 1890, in Nikolsburg, now Mikulov, Czechoslovakia; died Feb. 28, 1965, in Vienna. Austrian state figure; a jurist by education.

Schärf joined the Social Democratic Party of Austria in 1912. He served in the army during World War I, and when the war ended, he entered government service. His participation in the social democratic movement resulted in his arrest in 1934, 1938, and 1944. After the liberation of Austria in April 1945, Schärf served as secretary of state in the Provisional Government of Austria from April to December 1945. In the same year he helped organize the Socialist Party of Austria (SPA). From December 1945 to May 1957 he was both vice-chancellor of Austria and chairman of the SPA. Schärf became president of the Austrian republic in 1957. [29–1152–1]

SCHARF, ERWIN. Born Aug. 29, 1914. Figure in the Austrian working-class movement.

Scharf joined the Social Democratic Party of Austria in 1934. He lived abroad during the period from 1938 to 1945, when Austria was part of fascist Germany, and took part in the antifascist struggle as a member of the Austrian freedom battalion of the Yugoslav National Liberation Army.

Scharf became a member of the Socialist Party of Austria in 1945 but was expelled for criticizing the opportunism of the party's leaders. He subsequently organized the League of Progressive Socialists, which was later renamed the Socialist Workers' Party of Austria. Scharf was elected chairman of the party. After the party merged with the Communist Party of Austria in July 1956, he was named a member of the Politburo of the Central Committee of the CPA.

Between 1957 and 1965, Scharf was editor in chief of the newspaper *Volkstimme*, the main press organ of the CPA. He was named secretary of the Central Committee of the CPA in 1965 and editor in chief of the journal *Weg und Ziel*, the party's theoretical organ, in 1974.

Scharf was awarded the Order of Friendship of Peoples in 1974. [29–872–5]

SCHARNHORST, GERHARD JOHANN DAVID VON. Born Nov. 12, 1755, in Bordenau, Hanover; died June 28, 1813, in Prague. Prussian military figure. General (1807).

The son of a sergeant major, Scharnhorst entered the Hanoverian Army in 1777 and served in the artillery. After joining the Prussian Army in 1801, he became head of the German War College in Berlin in 1802 and was knighted in 1804. In 1806, during the war with France, Scharnhorst served as chief of staff to the commander in chief, the duke of Braunschweig, and fought in battles at Auerstedt and Preussisch Eylau. In July 1807 he was appointed director of the war department, head of the general staff, and chairman of the commission for the reorganization of the army. In 1808, Scharnhorst headed the newly re-created war ministry, although he did not hold the rank of minister.

Scharnhorst and A. Gneisenau significantly improved the army's organization and its officer training. They made progressive changes in tactics, shortened the length of mandatory service (as a result of which a trained reserve was created), and prepared the way for military conscription, which was introduced in 1813. Because Scharnhorst supported war against France, he was forced to retire in 1811 at the insistence of the French government.

Serving in the war of liberation of 1813 as chief of staff to General G. Blücher in the Silesian Army, Scharnhorst was critically wounded in fighting near Lützen in May 1813.

REFERENCE

Usczeck, H. J. *Scharnhorst: Theoretiker, Reformer, Patriot: Sein Werk und seine Wirkung in seiner und für unsere Zeit* [2nd ed. Berlin, 1974]. [29–865–1]

SCHAROUN, HANS BERNHARD. Born Sept. 20, 1893, in Bremen; died Nov. 25, 1972, in West Berlin. German architect (West Berlin).

From 1926 to 1932, Scharoun studied in the Academy of Arts in Breslau (present-day Wrocław, Poland). He developed the traditions of expressionism, creating asymmetrical, often curvilinear, compositions and juxtaposing elements of geometrical rationalism with organic form. His works include the philharmonic hall in West Berlin (1956–63) and the "Romeo and Juliet" apartments in Stuttgart (1955–59).

REFERENCE

Strigalev, A. A. "Vozvrashchenie k ekspressionizmu (G. Sharun)." In *Arkhitektura Zapada*, [book] 1. [Moscow] 1972. Pages 166–86. [29–872–4]

SCHAUDINN, FRITZ RICHARD. Born Sept. 19, 1871, in Röseningken; died June 22, 1906, in Hamburg. German protistologist.

In 1894, Schaudinn began working at the Zoological Institute of the University of Berlin, first as an assistant and then as a docent. In 1904 he became head of the protistology department created by him at the Imperial Ministry of Health in Berlin. In 1906 he moved to Hamburg, where he organized a department of protozoology at the Institute of Marine and Tropical Diseases.

Schaudinn's main works dealt with the study of free-living protozoans that are mainly parasitic to animals and man. He described the life cycle of coccidians, the stages of development of trypanosomes and spirochetes, and the cycle of the malaria plasmodium. In 1905, together with E. Hoffmann, he discovered the syphilis pathogen—*Spirochaeta pallida* (or *Treponema pallidum*).

Schaudinn founded (1902) the journal *Archiv für Protistenkunde*. He was a foreign corresponding member of the St. Petersburg Academy of Sciences (1905).

WORKS

Fauna arctica, vols. 1–6. Jena, 1900–33.
Arbeiten. Hamburg-Leipzig, 1911. [29–883–4]

SCHAUM, MATTHÄUS. Dates of birth and death unknown. A German who took part in the Swedish intervention in Russia in the early 17th century.

Schaum was the author of a work on Russian political history, in which he described battles at Ladoga and Korela (Priozersk), the Swedes' capture of Novgorod, and their negotiations with Russian officials.

WORKS

"Tragoedia Demetrio—Moscovitica: Istoriia dostopamiatnykh proisshestvii, sluchivshikhsia s Lzhe-Dimitriem, i o vziatii shvedami Velikogo Novgoroda." *Chteniia v Obshchestve istorii i drevnostei rossiiskikh*, 1847, no. 2, [sec.] 3. [29–884–1]

SCHEEL, HEINRICH. Born Dec. 11, 1915, in Berlin. German historian and social figure (German Democratic Republic). Academician of the German Academy of Sciences (1969).

During the fascist dictatorship in Germany, Scheel took part in the German resistance movement. He joined the antifascist organization led by H. Schulze-Boysen and A. Harnack and in 1943 was sentenced to a long prison term. After being freed in 1945, Scheel taught at the Humboldt University of Berlin; he became a professor at the university in 1960. A staff member of the Institute of History of the German Academy of Sciences, he was named the academy's vice-president in 1972.

Scheel's principal works deal with the history of Germany in the late 18th and early 19th centuries, particularly the history of revolutionary-democratic movements in the period. Scheel has also written on the German antifascist movement and its historiography.

WORKS

Süddeutsche Jakobiner: Klassenkämpfe und republikanische Bestrebungen im deutschen Süden Ende des 18. Jahrhunderts, 2nd ed. Berlin, 1971. [29–1080–2]

SCHEEL, WALTER. Born July 8, 1919, in Solingen. State figure of the Federal Republic of Germany (FRG).

Scheel studied economics and became a businessman. He joined the Free Democratic Party (FDP) in 1948 and was elected a member of the Bundestag in 1953. He served as vice-president of the Bundestag from 1967 to 1969.

From 1961 to 1966, Scheel was minister for economic cooperation in the coalition government formed by the Christian Democratic Union, the Christian Social Union, and the FDP. He was chairman of his party from 1968 to 1974 and subsequently honorary chairman. From 1969 to 1974, Scheel served as both vice-chancellor and minister of foreign affairs in the coalition government formed by the FDP and the Social Democratic Party of Germany. He was directly involved in negotiating treaties between his country and the USSR (signed 1970), the Polish People's Republic (1970), the German Democratic Republic (1972), and the Czechoslovak Socialist Republic (1973). Scheel was president of the FRG from 1974 to 1979. [29–1080–1]

SCHEELE, KARL WILHELM. Born Dec. 9, 1742, in Stralsund; died May 21, 1786, in Köping. Swedish chemist. Member of the Royal Swedish Academy of Sciences (1775).

Trained as a pharmacist, Scheele worked in apothecary shops in various Swedish cities, where he also carried out chemical research beginning in 1757. He discovered many inorganic and organic substances. He showed (1774) that pyrolusite, a naturally occurring manganese dioxide considered to be a variety of magnetic iron ore, is a compound of an unknown metal. He obtained chlorine by the action of hydrochloric acid on pyrolusite during heating (1774) and glycerin by the action of lead oxide on plant oils and animal fats. From natural molybdenite and tungsten minerals (scheelite) he obtained the corresponding molybdic (1778) and tungstic (1781) anhydrides. He discovered silicon tetrafluoride (1771), barium oxide (1774), hydrogen arsenide (1775), and a number of acids, including tartaric acid (1769), fluosilicic and hydrofluoric acids (1771), arsenic acid (1775), and oxalic (1776), lactic (1780), and prussic (1782) acids. He discovered (1777; at the same time as F. Fontana) the ability of freshly roasted charcoal to absorb gases.

In the work *Chemical Treatise on Air and Fire*, Scheele described the preparation and properties of "fire air" and showed that atmospheric air is composed of two "types of air": "fire air" (oxygen) and "phlogisticated air" (nitrogen). However, J. Priestley is credited with the discovery of oxygen (1774), since Scheele's work was not published until 1777.

WORKS

Manuskript 1756–1777. Edited by C. W. Ossen. [Uppsala, 1942.]
Chemische Abhandlung von der Luft und der Feuer. Leipzig, 1894.
Nachgelassene Briefe und Aufzeichnungen. Edited by A. E. Nordenskiöld. Stockholm, 1892. (Contains a biographical sketch and bibliography of Scheele's works.)

REFERENCE

Figurovskii, N. A. *Ocherk obshchei istorii khimii: Ot drevneishikh vremen do nachala XIX v.* Moscow, 1969. [29–1079–1]

SCHEELITE (named after K. W. Scheele), a mineral of the tungstate class, with a chemical composition $CaWO_4$. Admixtures include Mo (up to 25 atomic percent in molybdoscheelite and more than 25 atomic percent in seyrigite), Cu (up to 25 atomic percent in cuproscheelite), Sr, Mn, Nb, Ta, and F.

Scheelite crystallizes in the tetragonal system, forming dipyramidal crystals; penetration twins are known to exist. Grains and granular masses are common, and pseudomorphs of scheelite after wolframite often occur. Scheelite may be colorless, white, gray, yellowish, or, more rarely, brown, green, or black in color, with a greasy to adamantine luster. It is brittle and has perfect cleavage. The hardness varies from 3 to 5 on Mohs' scale, and the density is 5,500–6,170 kg/m^3. The mineral's luminescence in ultraviolet light (ranging from bright blue to yellow) is related to the Mo content.

The largest agglomerations of scheelite are confined to skarns, where the mineral occurs in association with garnet, pyroxene, plagioclase, amphibole, quartz, molybdenite, and other minerals. It is commonly found in high-temperature greisens, quartz-ore veins, and stockworks together with wolframite, cassiterite, fluorite, gold, and other minerals. In low-temperature hydrothermal deposits, it is associated with ferberite, antimonite, or cinnabar. Accessory scheelite has been found in granites and metamorphic rocks. Scheelite also sometimes occurs in pegmatites and alpine veins, as well as in the oxidation zone; it is converted to alluvial deposits upon weathering. Scheelite is the most important ore of tungsten; it also serves as an ore of molybdenum. The largest deposits are located in the USSR, the United States, and Korea.

REFERENCE

Bybochkin, A. M. *Mestorozhdeniia vol'frama i zakonomernosti ikh razmeshcheniia.* Moscow, 1965. O. V. KONONOV [29–1079–2]

SCHEER, REINHARD KARL FRIEDRICH VON. Born Sept. 30, 1863, in Obernkirchen; died Nov. 26, 1928, in Marktredwitz. German admiral.

Scheer joined the navy in 1879. From 1909 to 1911 he was chief of staff of the High Sea Fleet, from 1911 to 1913 head of the public affairs section of the Navy Department and an associate of A. von Tirpitz, and from 1913 to 1915 commander of a squadron of battleships. In January 1916, Scheer was made commander of the High Sea Fleet, which he led in the battle of Jutland of 1916. Scheer waged unlimited submarine warfare, but was unable to bring about a complete blockade of Great Britain or to weaken the blockade of Germany. From August to November 1918, Scheer was chief of the German Admiralty Staff. Scheer was the author of the memoir *Germany's High Sea Fleet in the World War* (Russian translation, 1940). [29–1080–3]

SCHEFFERVILLE, a city in Canada, on the Labrador Peninsula, in the province of Quebec. Population, 3,300 (1971). Schefferville was founded in 1954 in connection with the development of the Knob Lake iron ore deposit. The ore is shipped out by the railroad that connects Schefferville with the port of Sept-Îles. [29–1167–4]

SCHEIDEMANN, PHILIPP. Born July 26, 1865, in Kassel; died Nov. 29, 1939, in Copenhagen. Figure in the right wing of the German social democratic movement.

Scheidemann, a typographer by trade, joined the Social Democratic Party of Germany in 1883 and became a member of its administrative board in 1911. He was a member of the Reichstag from 1903 to 1918 and again from 1920 to 1933. During World War I he was a social chauvinist.

Seeking to avert a revolution, Scheidemann joined the monarchist government of Max of Baden in October 1918. The November Revolution of 1918 brought about the collapse of the monarchy, and on November 9 Scheidemann proclaimed the establishment of a republic. He became a member of the new government, the Council of People's Commissars, which sought to prevent the further development of the revolution. Between February and June 1919, he headed the first government of the Weimar Republic. He served as mayor of Kassel from 1920 to 1925. Scheidemann emigrated after the fascist dictatorship was established in Germany. [29–1083–1]

SCHEINER, CHRISTOPH. Born July 25, 1575, in Wald, near the city of Mindelheim; died July 18, 1650, in Neisse. German astronomer, physicist, and mathematician.

Scheiner's principal works were in the field of observational astronomy. In 1611, independently of Galileo and I. Fabricius, he discovered spots and faculae on the sun and determined the period of the sun's rotation and the tilt of its axis relative to the plane of the ecliptic. In 1613, Scheiner constructed a telescope that is considered the world's first refractor. [29–1084–1]

SCHEINER, JULIUS. Born Nov. 25, 1858, in Cologne; died Dec. 20, 1913, in Potsdam. German astronomer.

In 1888, Scheiner and H. Vogel determined the radial velocities of stars by photographing stellar spectra. This enabled them to determine the orbit of the eclipsing variable star Algol and to explain the cause of the variations in its brightness.

WORKS

Die Spektralanalyse der Gestirne. Leipzig, 1890.
Die Photographie der Gestirne. Leipzig, 1897.
Populäre Astrophysik, 2nd ed. Leipzig-Berlin, 1912. [29–1084–2]

SCHELDT (Dutch and Flemish, Schelde; French, Escaut), a river in France and Belgium and in the Netherlands, where it forms an estuary. The Scheldt is 430 km long and drains an area of 35,500 sq km. It flows across the plains of Flanders and empties into the North Sea through the estuary known as the West Scheldt. Until 1867 it also formed an estuary called the East Scheldt. The river's principal tributaries are the Lys and the Rupel.

In its lower course, the Scheldt is subject to tides as far as the city of Ghent; the tides reach an amplitude of 3.8 m at the river's mouth. In the Scheldt's delta, the river and its branches have been diked to protect the adjoining land from floods. High water occurs during the cold months. The mean flow rate is approximately 100 cu m per sec.

The Scheldt is navigable as far as the city of Cambrai in France. Oceangoing vessels can sail as far as Antwerp. A system of canals connects the river to the Senne, Somme, and Meuse (Maas). The Belgian cities of Ghent and Antwerp are situated on the Scheldt. [29–1118–4]

SCHELER, MAX. Born Aug. 22, 1874, in Munich; died May 19, 1928, in Frankfurt am Main. German idealist philosopher; one of the founders of axiology, the sociology of knowledge, and philosophical anthropology.

Scheler was a professor in Cologne from 1919 to 1928. He was influenced significantly by the philosophy of life and E. Husserl's phenomenology; in the mid-1910's he turned to Catholic religious philosophy (*On the Eternal in Man*, 1921), but later he evolved a pantheistic and personalist metaphysics.

Scheler's philosophy was influenced by a keen sense of the crisis in European culture, the source of which he saw in the triumph of the bourgeois spirit with its cult of profit and gain. Rejecting socialism, which he regarded as a "condensed form" of the same utilitarianism of the bourgeois spirit, he set his hopes in his system of ethics on a "third path"—the awakening of a feeling of value in the individual consciousness. Seeking to overcome the abstractness and formalism of Kantian ethics through the use of the phenomenological method, Scheler attempted to construct a hierarchy of objective values (*Formalism in Ethics and Material Value Ethics*, vols. 1–2, 1913–16) and introduced a distinction between abstract values and empirical variables: according to Scheler, it is not values as such but the historical forms of their existence that are relative. Influenced by St. Augustine and Pascal, Scheler contrasted the logic of intellect with the logic of feeling, which he interpreted as an intentional act whereby the knowledge of value is realized. Love, according to Scheler, is an act of ascent, accompanied by instantaneous insight into the highest value of an object; the specific character of love is that it can be directed only toward an individual as the bearer of value, but not toward value as such (*The Nature of Sympathy*, 1923). In his works on the sociology of knowledge, which include *Forms of Knowledge and Society* (1926), he viewed the diversity of social norms and values as a consequence of the diversity of historical conditions that hinder or help the realization of various "life," "spiritual," and religious values.

Scheler's characteristic dualism—the world of values as ideal tasks and the real existence of the present—achieved particular acuity in his unfinished work on philosophical anthropology, *The Place of Man in the Universe* (1928). In this work the powerful but blind "gust" of life and the all-comprehending but powerless spirit are put forth as the fundamental principles of human existence. Scheler greatly influenced the subsequent development of idealist philosophy, becoming a link between the philosophy of life and existentialism.

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D. N. LIALIKOV [29–1101–1]

SCHELLING, FRIEDRICH WILHELM JOSEPH VON. Born Jan. 27, 1775, in Leonberg; died Aug. 20, 1854, in Bad Ragaz, Switzerland. German philosopher, representative of German classical idealism.

Schelling studied at the theological seminary at Tübingen from 1790 to 1792; two of his fellow students were Hölderlin and Hegel. He was a professor in Jena from 1798 to 1803, where he became friendly with a romantic circle that included August von Schlegel and Friedrich von Schlegel. He moved to Munich in 1806; he was a professor at the universities of Erlangen from 1820 to 1826, Munich from 1827, and Berlin from 1841.

Several distinct periods may be distinguished in Schelling's philosophy: the philosophy of nature (from the mid-1790's), transcendental or aesthetic idealism (1800–01), the philosophy of identity (to 1804), the philosophy of freedom (to 1813), and positive philosophy, or the philosophy of revelation (until the end of his life).

Schelling was strongly influenced by J. H. Fichte, to the interpretation of whose ideas he devoted his first philosophical works. Proceeding from Fichte's teaching about nature, which was regarded as a means to the realization of a moral end, Schelling set himself the task of revealing consecutively all the stages of development of nature on the way to this lofty goal, that is, examining nature as an expedient whole, as a form of the unconscious life of reason, the purpose of which is to engender consciousness. The problem of correlating consciousness and the unconscious is predominant at all the stages of Schelling's development. Unlike Fichte, nature for Schelling ceases to be merely a pure means, a material on which practical reason tests its forces, and becomes instead an independent reality—intelligence in the making. The dialectic method used by Fichte in analyzing the activity of the self is expanded by Schelling to include an analysis of natural processes; every natural body is interpreted as a product of the work of a dynamic principle, the interaction of opposing forces, including positive and negative electrical charges and positive and negative magnetic poles. In this regard, Schelling was influenced by the discoveries of Galvani, Volta, and Lavoisier in physics and chemistry and the work of Haller and Brown in biology. Schelling's philosophy of nature was antimechanistic. The principle of expediency, the basis of the living organism, became for him a general principle for explaining nature as a whole; inorganic nature appeared to him as an underdeveloped organism. His philosophy of nature had an important influence on many naturalists, including H. Steffens, C. G. Carus, and L. Oken, and on such romantic poets as L. Tieck and Novalis. Even in this period Schelling was closer to the traditions of Neoplatonism (*On the World Soul*, 1798) than to the ethical idealism of Fichte.

Schelling regarded the philosophy of nature as an organic part of transcendental idealism, which showed how the development of nature was complete with the appearance of the conscious ego.

This organic part has to be supplemented with another part that explores the development of the ego itself. Schelling's *System of Transcendental Idealism* (1800; Russian translation, 1936) was devoted to this theme. The activities of the ego can be broken down, according to Schelling, into theoretical and practical spheres. The former begins with sensation, proceeds to reflection, conception, and judgment, and finally reaches the highest level—reason—the point at which the theoretical ego recognizes itself as independent and enterprising, that is, it becomes the practical ego, or will. Will, in turn, passes through a series of developmental stages, the highest of which is moral activity, which has itself as its goal. If in the theoretical sphere consciousness is determined by the unconscious activity of the ego, then in the practical sphere, on the contrary, the unconscious depends on consciousness and is determined by it. For Fichte, these two diverse processes coincide only at infinity, to which the realization of the cognitive and the moral ideal is also ascribed. Relying on Kant's *Critique of Judgment* and the aesthetic teaching of F. Schiller, Schelling regarded art as that sphere wherein the opposition of the theoretical and the moral-practical is overcome; the aesthetic principle appears as a balance: the total harmony of conscious and unconscious activity, the coincidence of nature and freedom, the identity of sensible and moral principles. In artistic activity and in works of art, infinity is reached—an ideal unattainable in either theoretical cognition or moral activity. The artist, in Schelling's opinion, is a genius, that is, an intelligence that functions like nature; a contradiction insurmountable by any other means is resolved in the artist. Accordingly, philosophy of art for Schelling is an "organon" (implement) of philosophy and its conclusion. Schelling developed these ideas further in *Philosophy of Art* (published 1907; Russian translation, 1966), a work that expressed the outlook of the Jena romantics.

The concept of intellectual intuition, allied with aesthetic intuition, became one of Schelling's central concepts. In the philosophy of identity he viewed intellectual intuition as no longer the self-contemplation of the ego, as he had done earlier following Fichte's example, but as a form of self-contemplation of the Absolute, which was presented now as the identity of subject and object. This idealist teaching was developed most clearly in his dialogue *Bruno, or the Divine and Natural Principle of Things* (1802). Since the Absolute is the identity of the subjective and the objective, it is neither spirit nor nature, according to Schelling, but an indifference of both (like the point of indifference of the poles in the center of a magnet)—a nothing that contains the possibility of all determinations. The complete development or realization of these potencies, according to Schelling, is the universe; it is the identity of the absolute organism and the absolute work of art. The Absolute engenders the universe to the same extent that it creates the universe as an artist would: emanation and creation merge here in the indifference of oppositions. In this system of aesthetic pantheism, which goes back to Neoplatonism, Schelling was close to the pantheism of German mysticism (Eckhart).

In his *Philosophy and Religion* (1804), Schelling raised questions that led him beyond the philosophy of identity: How and by virtue of what was the world born out of the Absolute? Why was that balance of the ideal and the real that exists at the point of indifference disturbed, with the result that the world emerged? In *Of Human Freedom* (1809; Russian translation, 1908), Schelling stated that the genesis of the world from the Absolute cannot be explained rationally; it is an irrational primary fact rooted not in reason but in will and its accompanying freedom. Following J. Boehme and F. X. von Baader, Schelling distinguishes in god both god himself and his indefinable ground, which he calls the abyss, or the ungrounded, and which is something unreasonable and dark—unconscious will. It is because of the presence of this dark ground that the division of the Absolute occurs, an act of assertion of free will, a separation from the universal divine principle—an irrational fall that is impossible to understand using the laws of reason and nature. The act of the fall is a supratemporal act; unconscious will operates before any consciousness, and on a metaphysical level man is guilty even at the moment of his birth. The expiation of this original guilt and reunion with the Absolute, and thereby the reunion of the Absolute itself, is, according to Schelling, the goal of history.

Insofar as will as a primordial irrational desire is an inscrutable primary fact, it cannot be an object of philosophy comprehended as a rational deduction of everything real from an initial principle. Calling this rationalistic philosophy (including his philosophy of identity and the philosophy of Hegel) negative, Schelling considered it necessary to supplement it with a positive philosophy that examines the primary fact—irrational will. The latter is comprehended empirically, in an experience identified by Schelling with mythology and religion, in which the revelation of god was given to consciousness in history. In this philosophy of revelation, Schelling essentially left philosophy proper and approached theosophy and mysticism. The lectures on positive philosophy, or the philosophy of revelation, that he began in 1841 in Berlin were not a success with audiences; the young F. Engels, for example, wrote a series of pamphlets against Schelling.

Schelling's philosophy greatly influenced European thought of the 19th and 20th centuries; as European thought passed through its stages of development, different aspects of Schelling's teaching were accepted. His effect on Russian philosophy was significant—through the natural philosophers D. M. Vellanskii, M. G. Pavlov, and M. A. Maksimovich, the Moscow Liubomudry circle (V. F. Odoevskii, D. V. Venevitinov, and A. I. Galich), the Slavophiles, and P. Ia. Chaadaev, who was personally acquainted with and corresponded with Schelling. In the 20th century Schelling's irrationalistic ideas were developed in the philosophy of existentialism. The founders of Marxism valued Schelling first and foremost for the dialectics of his philosophy of nature and for his teaching about development, that is, those elements that exerted the greatest influence on the formation of Hegel's philosophy.

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P. P. GAIDENKO [29–1113–1]

SCHERER, WILHELM. Born Apr. 26, 1841, in Schönborn, Austria; died Aug. 6, 1886, in Berlin. German philologist.

Scherer graduated from the University of Vienna in 1864. He became a professor at Vienna in 1868, at the Kaiser Wilhelm University (University of Strasbourg) in 1872, and at the University of Berlin in 1877. The leader of a school of positivist literary scholars, he advocated renunciation of the traditions of idealist metaphysics. Scherer sought to apply the rigorous methods of science to the humanities and to introduce the historical descriptive method into comparative and genetic philology. His theory governed the development of Germanic philology in Germany for many years. Scherer also studied the history of the German language.

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SCHERFIG, HANS. Born Apr. 8, 1905, in Copenhagen. Danish satirical writer and artist. Member of the Communist Party of Denmark.

In the novel *The Dead Man* (1937; Russian translation, 1972), Scherfig examines the problems of art in a capitalist society. The satiric novels *The Missing Official* (1938; Russian translation, 1956) and *A Wasted Spring* (1940; Russian translation, 1960) and the antifascist novel *The Idealists* (1945) deal with the fate of the bourgeois intelligentsia. Disguising his works as detective novels, Scherfig denounces social injustice, bourgeois hypocrisy, and unfairness in the education system and the state bureaucracy.

On June 22, 1941, Scherfig was arrested by the Hitlerite occupiers; he escaped in 1943 and went underground until the end of the war. His novel *The Scorpion* (1953; Russian translation, 1956) is directed against the corruption of the upper circles in postwar Denmark. He depicted World War II in the novel *Frydenholm* (1962; Russian translation, 1965). In the novella *The Missing Monkey* (1964; Russian translation, 1965), Scherfig sharply criticized contemporary modernistic art. Scherfig is the author of many works on literature and art, including *On the Way to the Constellation Aquarius* (1951) and *Three Poets* (1963), which deals with N. Grieg, B. Brecht, and H. R. Kirk. He has contributed to the Communist press. He is the author of *A Journey Through the Soviet Union* (1951) and travel essays on the socialist countries.

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I. P. KUPRIIANOVA [29–1152–2]

SCHEUCHZER, JOHANN JAKOB. Born Aug. 2, 1672, in Zürich; died there June 23, 1733. Swiss naturalist.

Scheuchzer studied in Altdorf and Utrecht. In 1696 he became assistant municipal physician in Zürich, later assuming the head position. In 1710 he became a professor of mathematics at the *Gymnasium* in Zürich, and in 1733, a professor of physics.

Scheuchzer studied the glaciers and geological structure of the Alps. He published a number of works on paleontology and geology. In his theoretical ideas he was an adherent of diluvianism: he believed organisms that were extinct had perished during "the flood." He described many different species of fossil plants and animals and was one of the first to note the plant origin of coal. In 1700 he found the skeleton of a large fossil salamander (*Andrias Scheuchzeri* Cuvier) and mistook it for a human skeleton.

Scheuchzer was a member of the Leopoldina German Academy of Naturalists (1697).

WORKS
Physica sacra . . . , iconibus aeneis illustrata procurante . . ., vols. 1–4. Augsburg, 1731–35.
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[29–1088–3]

SCHEUCHZERIA, a genus of perennial herbs of the family Scheuchzeriaceae. The plants have a climbing rhizome. The leaves, which are situated high on the stem, are two-rowed and linear. The leaf sheaths are enlarged. The small greenish bisexual flowers are in a loose racemose inflorescence. The perianth consists of six leaflets arranged in two circles. The fruit is usually trifoliate, with three bulging fruitlets widely spaced apart.

There are one or two species, distributed in cold and temperate belts of the northern hemisphere. The USSR has one species, *S. palustris*, which grows everywhere but in the southern European portion, in Siberia, and in the Far East. The plant occurs in very damp sphagnum swamps, on swampy peat shores of reservoirs, and in floating masses of vegetation. The *Scheuchzeria* aid in the formation of peat.

REFERENCE
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SCHICK TEST, a skin test used to determine human susceptibility to diphtheria; one of the allergy-based diagnostic tests, proposed in 1913 by the Austrian pediatrician B. Schick. Dilute active diphtheria toxin is injected into the skin. Local inflammation (reddening, edema) develops three to four days later, and an individual's reaction is evaluated from the severity of the inflammation. The Schick test is used to determine which individuals, primarily children, should be vaccinated against diphtheria.
[29–1183–1]

SCHIFF, HUGO. Born Apr. 26, 1834, in Frankfurt am Main; died Sept. 8, 1915, in Florence. Italian chemist. German by nationality.

A student of F. Wöhler, Schiff was a privatdocent at the University of Bern (1857). He later emigrated to Italy, where he worked in Florence from 1863 to 1876 and from 1879 to 1915. From 1876 to 1879 he was a professor at the University of Turin.

Schiff's main works were devoted to organic chemistry. Schiff discovered the condensation reaction of aromatic amines with aldehydes (1864) and investigated the products of the reaction, which have come to be called Schiff bases. He synthesized populin (1868) and digallic, or tannic, acid (1873). He proposed qualitative reactions for aldehydes (with fuchsin sulfurous acid; called the Schiff reaction), urea, and pentosanes. Schiff invented the azotometer (or nitrometer), a device for determining nitrogen according to the method proposed by J. B. Dumas.

REFERENCE
"Hugo Schiff." In the collection *Berichte der Deutschen chemischen Gesellschaft*, fasc. 48, vol. 2. Berlin, 1916. Pages 1566–67.
[29–1242–2]

SCHIFF BASE, any one of a class of organic compounds with the general formula $RR'C{=}NR''$, where R and R′ represent hydrogen, an alkyl, or an aryl and R″ is an alkyl or aryl; in the latter case, Schiff bases are also called anils.

Schiff bases are crystalline or oily substances that are insoluble in water and soluble in organic solvents. They are weak bases, forming salts with acids in an anhydrous medium; in aqueous acid solutions they undergo hydrolysis to yield an amine and aldehyde. The majority of Schiff bases are stable in alkaline solutions. Schiff bases undergo hydrogenation to give secondary amines ($RR'CH{-}NHR''$) and add on many compounds containing mobile hydrogen, such as β-dicarbonyl compounds, ketones, and imines. They are produced mainly by the condensation of aldehydes or ketones with primary amines.

The reaction was first completed by H. Schiff in 1864 (hence the name of the compounds). Schiff bases are valuable intermediate products of organic synthesis, for example, in the preparation of secondary amines and various heterocyclic compounds. The Schiff bases known as azomethine dyes are used for dyeing acetate and synthetic fibers; they are also used in color photography to reduce the photosensitivity of photographic emulsions.
[29–1242–3]

SCHILLER, FERDINAND CANNING SCOTT. Born Aug. 16, 1864, near Altona; died Aug. 6, 1937, in Los Angeles. British idealist philosopher, representative of pragmatism.

Schiller taught at Oxford University from 1903 to 1926. He became a professor at the University of Southern California in the USA in 1929. Schiller's version of pragmatism, called humanism, is based on the premise that knowledge as a product of human activity reproduces only the human element of a reality dependent on human activity. Unlike W. James, Schiller saw the criterion of

truth not in the sensible, but only in the good (useful) consequences of an action. Schiller's metaphysics was a combination of pragmatic subjective idealism and voluntarism, personalism, and teleology (god, according to Schiller, is the driving force of development, a reasonable and personal spirit). In the sociopolitical sphere, Schiller took an anticommunist stand and sympathized with fascism.

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A. S. BOGOMOLOV [29–1191–1]

SCHILLER, JOHANN CHRISTIAN FRIEDRICH VON. Born Nov. 10, 1759, in Marbach am Neckar; died May 9, 1805, in Weimar. German poet, dramatist, aesthetician, and historian. An outstanding representative of the Enlightenment in Germany and one of the founders of modern German literature.

Schiller's father was initially an assistant army surgeon and later an officer in the service of Duke Karl Eugen of Württemberg. The writer was brought up in a pious atmosphere that was reflected in his early poetry. After graduating from a Latin school in Ludwigsburg in 1772, he was enrolled at the order of the duke of Württemberg in a military school (Karlsschule), later renamed an academy. He studied first in the law division and then in the medical division. At the academy Schiller became acquainted with the moralistic philosophy of A. Ferguson and Shaftesbury, with the ideas of the English and French Enlightenment philosophers Locke, Montesquieu, Voltaire, and Rousseau, and with the works of Shakespeare, Lessing, and the *Sturm und Drang* poets. Schiller's social and political views were also influenced by German antifeudal journalism and by the liberation movement in America. After graduating from the academy in 1780, he was appointed a regimental surgeon in Stuttgart.

By the time of his graduation, Schiller had completed his first tragedy, *The Robbers* (published 1781, staged 1782), in which he protested against the feudal system in Germany. The main hero tends to make pronouncements for effect, and the ending compromises the ideals voiced in the play. Nevertheless, the tragedy was subsequently viewed as a militant revolutionary play. While in Stuttgart, Schiller published the *Anthology for the Year 1782*, a collection of poems most of which were written by himself. He also wrote *Fiesco, or the Genoese Conspiracy* (1783), a tragedy based on Italian Renaissance history.

For absenting himself from his regiment without leave in order to attend a performance of *The Robbers* in Mannheim, Schiller was arrested and forbidden to write on any subject but medicine. This restriction forced him to flee from the duke's domain. He settled first in the hamlet of Bauerbach, where he completed the drama *Luise Millerin* (subsequently called *Love and Intrigue*), and then in Mannheim. He moved to Leipzig in 1785 and then to Dresden.

Schiller's early dramas and lyric works raised the *Sturm und Drang* movement to a new level by making it more purposeful and socially effective. *Love and Intrigue* (1784), which F. Engels called the first politically tendentious German drama, is of especially great importance. The play expresses the main social contradiction of Schiller's time, that between the disfranchised people and the ruling aristocracy. This bourgeois tragedy (as Schiller, in keeping with the spirit of Enlightenment literature, defined the play's genre) contained the outlines of a great social and philosophical tragedy that Schiller soon developed on a historical theme. From 1783 to 1787 he worked on *Don Carlos*, a drama based on 16th-century Spanish history. Originally conceived as a domestic drama about the Spanish infante, the play was changed into a tragedy dealing with the Marquis of Posa, a social reformer and citizen of the universe. In the final version Schiller used iambic pentameter rather than prose; he defined the genre as a dramatic poem. The tragedy shows the irreconcilable conflict between the ruling absolutism and the ideal of reason and freedom. Posa's fate anticipates the tragedy of the noble idealist and enthusiast that Schiller later formulated theoretically and gave literary embodiment to in his poetry.

Schiller's move to Weimar in 1787 opened the new phase in his work that had been promised by *Don Carlos*. While reviewing the works and the artistic principles of the *Sturm und Drang* movement, he began studying history, philosophy, and aesthetics. In 1788 he became the editor of a series of books under the title *The History of Remarkable Uprisings and Conspiracies*. That same year he wrote *The History of the Defection of the United Netherlands From the Spanish Empire*, in which he interpreted the liberation movement of the Dutch people as a harbinger of the struggle between the old world and the ideals of the Enlightenment. Only the first volume of the work was published.

In 1789, with the assistance of Goethe, with whom he had become acquainted in 1788, Schiller was appointed extraordinary professor of history at the University of Jena. At Jena he delivered an introductory lecture entitled *What Is Universal History and Why Do We Study It?* In 1793 he published *The History of the Thirty Years' War* and several articles on universal history. By this time he had become an adherent of the philosophy of I. Kant, whose influence can be seen in Schiller's works on aesthetics, such as *On Tragic Art* (1792), *On Grace and Dignity* (1793), *Letters on the Aesthetic Education of Man* (1795), and *On Naïve and Sentimental Poetry* (1795–96).

In his study of universal history, Schiller noted progress in the development of society, although society had not rid itself of barbarism and slavery. His reflections on the historical fate of mankind intensified his tragic perception of the world. Schiller welcomed the French Revolution, and in 1792 the Convention named him an honorary citizen of the French Republic. He was alarmed, however, by the Jacobin dictatorship. While approving the overthrow of the feudal system, he condemned the execution of Louis XVI and viewed it as an act of violence, which he now rejected in any form.

Having repudiated revolutionary methods of social change, Schiller formulated an extensive program of aesthetic education, believing that "the way to freedom is only through beauty" and that the mission of art is gradually to prepare corrupted and enslaved contemporary man for the rational social relations of the future. In accordance with this aesthetic-political program, Schiller advocated the principles of idealization that had enabled artists in the classical era to attain unsurpassed heights. He was a founder of Weimar classicism, and its tenets were reflected in his lyric poems of the late 1780's and the 1790's, such as "Ode to Joy," "The Gods of Greece" and "The Artists."

According to Schiller, his friendship with Goethe was the equivalent of a whole epoch in his development. In their correspondence Schiller and Goethe posed the cardinal aesthetic problems of their time and extensively discussed their works in progress. They jointly wrote the *Xenien* (literally, "gifts for guests"), a cycle of epigrams that was directed against shallow rationalism and philistinism in literature and the theater and against the early German romantics. The friendship with Goethe contributed to a new upsurge in Schiller's art. From 1795 to 1798 he edited the journal *Die Horen* and, in competition with Goethe, wrote the ballads "The Diver" ("The Goblet" in V. A. Zhukovskii's translation), "The Glove," "The Ring of Polycrates," and "The Cranes of Ibycus." In "The Song of the Bell" (1799) he again condemned violence, which leads to anarchy, and at the same time glorified the joy of creative work and concord among men. Schiller's views on aesthetics also changed; he concluded that there was a radical difference between ancient poetry, which was "naïve" and objective, and modern poetry, which is "sentimental" and subjective. He believed that contemporary literature should combine the ideal and the real.

In Schiller's mature work the main conflict depicted is that be-

tween harsh reality and the Enlightenment ideal of the free organization of society. This theme is developed in his poem "Ideal and Life" (1795). Schiller's later tragedies deal with turning points in history, which are rendered in a stylized and at times conventional manner. These works reveal the tragic state of man in his conflict with objective historical necessity. This basic tragic conflict is complicated in Schiller's plays by other social, political, ethical, and psychological clashes and problems, but as a philosophical conflict it determines the structure of the tragedies.

In 1791, Schiller conceived the idea of the tragedy *Wallenstein* (published 1800), which in the process of writing became a trilogy consisting of *Wallenstein's Camp* (staged 1798), *The Piccolomini* (staged 1799), and *The Death of Wallenstein* (staged 1799). The trilogy was based on the Thirty Years' War of 1618–48. Wallenstein's contradictory personality is revealed through a complex chain of political and psychological conflicts. Schiller's *Maria Stuart* (1801) was based on 16th-century English history. In this play the most important political problem of the Europe of his time—the relationship between the individual and the new, bourgeois state—acquired an enormous tragic resonance owing to his masterly portrayal of the heroine's character. In the "romantic tragedy" *The Maid of Orleans* (1801), Schiller glorified the French national heroine Joan of Arc and combined a patriotic theme with the heroine's ethical conflict.

The drama *The Bride of Messina* (1803) was an original attempt at reviving classical forms and the concern with fate characteristic of classical tragedy. In *Wilhelm Tell* (1804), a drama about the legendary Swiss national hero, Schiller arrived at a justification of revolutionary action, although this justification was not always consistent. The main themes of the drama are the people's influence on the course of history and the consequent necessity for the hero to be linked to the people. In the last months of his life Schiller worked on the tragedy *Demetrius*, which was based on Russian history; his sudden death left the work unfinished.

One of the greatest tragedians of world literature, Schiller created a special type of drama, one in which ideas were declaimed in poetic forms. The traditions of this type of drama influenced the dramatugy of the Junges Deutschland movement, as seen in the works of K. Gutzkow. Other writers influenced to a greater or lesser degree by these traditions include F. Hebbel, G. Hauptmann, H. Ibsen, and, in the 20th century, B. Shaw and B. Brecht.

Schiller was known in Russia as early as the 1790's; translations from his works were made by such writers as N. I. Gnedich, G. R. Derzhavin, V. A. Zhukovskii (whose translations became classics), A. S. Pushkin, M. Iu. Lermontov, F. I. Tiutchev, and A. A. Fet. One of the most popular foreign writers, he was highly valued by V. G. Belinskii, A. I. Herzen, I. S. Turgenev, and L. N. Tolstoy; there are direct echoes of Schiller's works in F. M. Dostoevsky's novels. Schiller's popularity in Russia increased especially during the Revolution of 1905–07 and after the Great October Revolution of 1917; his plays hold a firm place in the repertoire of Soviet theaters.

The works of this great humanist and herald of the ideals of freedom and universal brotherhood have been studied in depth and popularized in the German Democratic Republic, especially by the National Museum of German Classical Literature in Weimar. Soviet scholars have made a considerable contribution to the study of Schiller's legacy.

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Z. E. LIBINZON [29–1585–7]

SCHILLER, LEON (real surname, de Schildenfeld). Born Mar. 14, 1887, in Kraków; died Mar. 25, 1954, in Warsaw. Polish theatrical figure, director, and pedagogue. Member of the Polish United Workers' Party from 1948.

Schiller worked in a number of theaters in Warsaw: he was a director at the Teatr Polski from 1917 to 1920 and at the Reduta Theater from 1922 to 1924; together with W. Horzyca and A. Zelwerowicz he ran the W. Bogusławski Theater from 1924 to 1926. During the 1930's, Schiller headed theaters in Poznań, Łódź, and Lwów (L'vov). His productions, which included Mickiewicz's *Dziady*, Słowacki's *Kordian*, Krasiński's *The Undivine Comedy*, and Brecht's *Threepenny Opera*, were marked by revolutionary romanticism and conveyed a protest against the social injustice of the bourgeois world.

Schiller was in charge of the Teatr Wojska Polskiego in Łódź from 1946 to 1949 and of the Teatr Polski in 1949 and 1950. He played a decisive role in the development of 20th-century Polish theater and molded the aesthetic principles upon which the Polish monumental style of theater is based. Relying heavily on the traditions of Polish romanticism, he endowed his productions with strong social overtones. Schiller undertook pedagogical work in 1933. He founded the quarterly *Pamiętnik teatralny* in 1952.

Schiller was a deputy to the Sejm from 1947 to 1952. He served as president of the Association of Polish Theater and Film Artists from 1950 to 1954. Schiller was awarded the State Prize of the Polish People's Republic in 1948.

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[29–1190–1]

SCHILLING, the monetary unit of Austria; equal to 100 groschen. Introduced in 1925 to replace the crown, the schilling was replaced by the reichsmark in 1938 but reintroduced in 1945. According to the rate of exchange set by the State Bank of the USSR in January 1978, 100 schillings = 4.55 rubles. [29–1192–1]

SCHILTBERGER, JOHANN (also Hans Schiltberger). Born 1380; died not earlier than 1438. Bavarian soldier.

Schiltberger was captured by the Turks at the battle of Nikopol in Bulgaria. His *Book of Travels* told of his wanderings in Asia Minor, Egypt, Middle Asia, Siberia, and the Caucasus. Schiltberger's work was the earliest European description of Siberia and northern Asia.

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SCHIMMELPENNINCK, RUTGER JAN. Born Oct. 31, 1761, in Deventer; died Mar. 25, 1825, in Amsterdam. Dutch state figure; a lawyer by education and profession.

A moderate republican and a supporter of the French Revolution, Schimmelpenninck helped found the Batavian Republic in 1795. Between 1798 and 1805 he served intermittently as its ambassador in Paris. In November 1805 he was appointed by Napoleon I to the post of grand pensionary, or head of government, of the Batavian Republic. He opposed Napoleon's efforts to turn the republic into a kingdom and was forced to resign in 1806. Schimmelpenninck was a member of the Dutch First Chamber from 1815 to 1821. [29–1202–1]

SCHIMPER, ANDREAS FRANZ WILHELM. Born May 12, 1856, in Strasbourg; died Sept. 9, 1901, in Basel. German botanist.

Schimper, the son of W. P. Schimper, graduated from the University of Strasbourg in 1878. He became a professor at the University of Bonn in 1886 and at the University of Basel in 1898. He traveled frequently to study tropical plants. Schimper substantiated and developed the ecological-physiological school in plant geography and distinguished five types of vegetation based on the interrelation of physiology and geography. He elucidated the genetic links between various types of plastids and studied the formation of starch grains.

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SCHIMPER, WILHELM PHILIPP. Born Jan. 12, 1808, in Dossenheim; died Mar. 20, 1880, in Strasbourg. German botanist.

Schimper graduated from the University of Strasbourg in 1832. He worked at the Strasbourg Museum of Natural History from 1835, becoming its director in 1866. In 1862 he became a professor at the University of Strasbourg. His main works are on the flora of European mosses and on fossil plants. Schimper was one of the founders of paleobotany. In 1854 he became a member of the French Academy of Sciences.

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De Bary, A. "Wilhelm Philipp Schimper." *Botanische Zeitung*, 1880, fasc. 38, no. 26. (Contains bibliography.) [29–1204–2]

SCHINKEL, KARL FRIEDRICH. Born Mar. 13, 1781, in Neuruppin, Brandenburg; died Oct. 9, 1841, in Berlin. German architect, painter, and graphic artist.

Schinkel studied at the Berlin Academy of Architecture under F. Gilly from 1798 to 1800. He worked mainly in Berlin. He initially concentrated on painting and the graphic arts, producing landscapes, panoramas, works of stage design, drawings, and lithographs in the romantic style.

The most outstanding representative of late classicism in 19th-century German architecture, Schinkel strove for laconically monumental composition. His works include the Neue Wache (now a monument to the victims of fascism and militarism), the Drama Theater, and the Altes Museum, all in Berlin. He also revealed romantic tendencies in his pseudo-Gothic buildings, including a chapel in Petergof (1831–33). In the last years of his life, renouncing the forms of classicism and the Gothic, he anticipated the principles of rationalism, for example, in the Academy of Architecture in Berlin (1831–35). He also was an architectural theorist.

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SCHIRMACHER PONDS, an ice-free section of the coastland of Queen Maud Land, in Eastern Antarctica. Separated from the Lazarev Sea by an ice shelf that is approximately 80 km wide, Schirmacher Ponds has an area of approximately 32 sq km and rises to an elevation of 221 m. The rounded hills of the region are separated by elongated hollows, and there are numerous lakes. Along the northern edge of the region there are lagoons that communicate with the sea beneath the ice shelf. The region was discovered in 1939 by a German expedition led by A. Ritscher and was named in honor of a member of the party, the pilot R. Schirmacher. The Soviet antarctic station Novolazarevskaia has been operating in the eastern part of Schirmacher Ponds since 1961. [29–1227–1]

SCHIRRA, WALTER MARTY, JR. Born Mar. 12, 1923, in Hackensack, N.J. US pilot and astronaut. Captain in the navy.

Schirra studied at the Newark College of Engineering in 1940 and 1941. He served in naval air units after graduating in 1945 from the US Naval Academy at Annapolis, Md. Schirra also graduated from the Naval Air Safety Officer School at the University of Southern California and the test pilot training school at the Naval Air Test Center at Patuxent River, Md.

Schirra became a member of the National Aeronautics and Space Administration astronaut corps in 1959. On Oct. 3, 1962, he flew six orbits around the earth in a Mercury capsule. The flight, designated MA-8, lasted 9 hr 13 min. On Dec. 15 and 16, 1965, as command pilot, Schirra flew with T. Stafford aboard the Gemini 6 spacecraft. Gemini 6 achieved rendezvous on December 15 with the Gemini 7 craft, which had been launched into orbit on December 4. During formation flying that lasted 5.5 hr, the ships maneuvered to within 1 m of each other. The total flight time was 25 hr 51 min.

From Oct. 11 to Oct. 22, 1968, with W. Cunningham and D. Eisele aboard, Schirra completed 163 orbits of the earth as commander of the Apollo 7 spacecraft. During the flight, which lasted 10 days 20 hr 9 min, Schirra conducted the first flight test of the Apollo command module. Schirra's three flights gave him a total of 295 hr 13 min of flying time in space. [29–1237–2]

SCHISTOSOMIASIS, any one of several diseases of humans and animals caused by helminths of the family Schistosomatidae of the class Trematoda.

Schistosomiases of humans occur mainly in tropical countries. The causative agents belong to the genus *Schistosoma*, whose females deposit eggs in the small blood vessels of the urinary bladder and intestine. After entering these organs, the eggs are excreted with urine or feces. Larvae (miracidia) emerge from the eggs after they reach water and are ingested by mollusks, in which they reproduce and develop. The cycle is completed with the emergence of larvae with tails (cercariae) in the water. The cercariae penetrate the human body through the skin and mucous membranes. Individuals become infected after working or swimming in bodies of water contaminated by the urine and feces of persons suffering from schistosomiasis or after drinking water from such bodies of water.

Skin rashes, itching, and sometimes fever occur in the early stage of schistosomiasis. If the genitalia and intestine are affected

(bilharziasis), the patient feels a sharp pain upon urination, the urine becomes tinged with blood, and chronic colitis, with mucus and blood appearing in the feces, develops. Schistosomiasis is treated with antimony agents, for example, Anthiomaline (or anthiolimine); it is also treated with Ambilhar (or niridazole). The disease can be prevented by protecting lakes and streams from pollution, by banning swimming in stagnant or slow-flowing water in areas where schistosomiasis is endemic, and by boiling drinking water or filtering it through cloth.

N. N. PLOTNIKOV [29–1239–5]

SCHIZOGNATHISM, a type of structure of the palate in birds, in which the maxillopalatals are not united with one another or with the vomer, the posterior part of which is bifurcated, and the anterior part, pointed. Schizognathism, a form of neognathism, is characteristic of Procellariiformes, Galliformes, Columbiformes, and the majority of Limicolae. [29–1179–2]

SCHIZOGONY, multiple asexual reproduction in protozoans, including foraminiferans, trypanosomes, and sporozoans, as well as in some algae. In schizogony, the nucleus of the maternal individual undergoes a succession of rapid divisions into several nuclei and breaks down into the corresponding number of mononuclear cells (merozoites). The sexual process begins after several asexual generations. Sporozoan merozoites penetrate the host cells and give rise to gametocytes, from which gametes are formed. [29–1179–3]

SCHIZOID, a constitutionally and genetically determined type of personality characterized by autism (that is, preoccupation with the self and alienation from the external world), emotional coldness combined with marked vulnerability, and the predominance of abstract thinking. It is often associated with an asthenic body build. [29–1179–4]

SCHIZOPHRENIA, the commonest mental illness, characterized by the variety of its manifestations and by its tendency to become chronic.

As early as the 17th century, T. Willis observed adolescents who lost their childhood talents and became "grumbling fools" as young adults. In 1857 the French psychiatrist B. A. Morel identified dementia praecox as a form of "hereditary degeneration." In the 1860's and 1870's the German psychiatrists K. L. Kahlbaum and E. Hecker described hebephrenia and catatonia. In 1888 the French psychiatrist V. Magnan identified the chronic hallucinatory-delusional psychoses that end in apathy and feeblemindedness. In 1898, E. Kraepelin classified these forms under the single heading of dementia praecox. E. Bleuler considered the splitting, or breakdown, of the unity of the psyche to be the most important symptom of the disease, and in 1911 he proposed that it be called schizophrenia. Bleuler, however, regarded schizophrenia—as many subsequent researchers did—only as a group of related diseases.

Progress in the study of schizophrenia is associated with the names of such Russian psychiatrists as V. Kh. Kandinskii, S. S. Korsakov, and P. B. Gannushkin. The different manifestations and varying course of schizophrenia were responsible for the lack of uniformity in nosologic definitions of the disease. In France, only the malignant form (that is, process schizophrenia) is regarded as schizophrenia, whereas in Great Britain and in the Scandinavian countries most forms of schizophrenia are treated as constitutionally or psychogenically determined separate psychoses. Some investigators divide this disorder into primary (or genuine) and symptomatic schizophrenia.

The causes of schizophrenia and the mechanisms of its development are still unclear. Most investigators consider it an endogenous disease in which hereditary predisposition is a factor. The importance of heredity in this respect has been confirmed by research studies of twins affected with schizophrenia. The hereditary factor varies in different forms of the disease. When the disease follows a constant course, members of the patient's family often show symptoms of a deep schizoid psychopathy. In cases of intermittent bouts of schizophrenia, this form of the disease often develops in the patient's close relatives as well. However, schizophrenia is not classified as one of the hereditary diseases proper; compared to the latter, it is far more prevalent, affecting approximately 0.8 percent of the population.

Studies of higher nervous activity in schizophrenics show the presence of protective inhibition (in the form of hypnotic phases) and foci of sluggish excitation. Electroencephalography and quantitative analysis are used in order to determine the abnormalities in the brain's electrical activity that are characteristic of schizophrenia. Biological and biochemical studies have shown that immunological and other changes take place and that such changes vary with the form of schizophrenia. Neurochemical data indicate that in schizophrenia the metabolism of biogenic amines and enzymes is impaired. According to some investigators, the histological changes that occur in schizophrenia involve injury to the cerebral cortex; according to others, injury to the subcortical region.

Schizophrenia is usually classified according to the predominant symptoms or the specific course of the disease. To a greater or lesser degree, all forms of schizophrenia are progressive. According to the course of the disease, two basic types are distinguished—unintermittent and intermittent schizophrenia.

Unintermittent schizophrenia. Unintermittent schizophrenia is marked from its very onset by steadily intensifying disturbances (as manifested in reduced mental functioning) combined with monotonous "productive" symptoms, such as hallucinations. This type is subdivided into process, progressive, and nonprogressive schizophrenia.

Process schizophrenia usually develops in teen-agers and young adults and is generally known as hebephrenia. It is characterized by steadily progressive inactivity, emotional hypesthesia, and regressive behavior, accompanied by diverse but rudimentary productive symptoms. When it occurs in childhood, this form of schizophrenia (known as pseudo-oligophrenia) results in mental retardation.

Progressive schizophrenia is manifested in the form of a paranoid syndrome, which includes paranoia and paraphrenia; it usually occurs after the age of 30. It is marked by systematized delusions (for example, hypochondria or delusions of persecution or grandeur), combined with manifestations of psychic automatism—what is known as the Clérambault-Kandinskii syndrome, named after V. Kh. Kandinskii and the French psychiatrist G. de Clérambault (1872–1934); this consists of the feeling of being forcibly controlled by an outside influence and estrangement from one's own mental activity, ending with paraphrenia. In some cases the delusions and hallucinations coexist with proper behavior and the ability to continue working; this is known as monomania or partial insanity, as it was called by 19th-century psychiatrists. Sometimes the disease does not develop beyond the stage of systematized delusions (paranoid schizophrenia).

Nonprogressive schizophrenia (also called latent, mild, pseudoneurotic, or psychopathic-like schizophrenia) is marked by the predominance of obsessions, cenesthesiopathy (vague sensations of bodily distress), manifestations of hypochrondria and hysteria combined with pronounced autism (predominance of self-centeredness and active withdrawal from the outside world), persistent asthenia, and emotional impoverishment.

Intermittent schizophrenia. Intermittent schizophrenia is characterized by the polymorphous development of various productive symptoms, such as affective delusions and dreams; mental disturbances appear only after an attack. Intermittent schizophrenia is subdivided into intermittent-progressive and periodic schizophrenia. The productive symptoms of intermittent schizophrenia, which outnumber the negative symptoms, are keenly perceptible to the senses, affective, and labile, and they are accompanied by feelings of confusion and excitation.

The clinical picture of intermittent-progressive schizophrenia is dominated by acute delusional fantasies, the automatism of the Clérambault-Kandinskii syndrome, and catatonic excitement. The vividness, plasticity, and affectivity of such disorders are less pronounced than in the case of periodic schizophrenia. Negative effects become evident after the first attack is over, sometimes growing more intense after each successive attack. The disease takes an almost unintermittent course and represents an intermediate variety between intermittent and unintermittent schiz-

ophrenia. In other cases, the negative manifestations occurring after the first attack either remain unchanged, in spite of successive similar attacks, or grow more intense after the fourth or fifth attack or even later—that is, irregularly. It is not unusual for a single attack of schizophrenia to occur, followed by a change in personality (for example, in the form of persistent asthenia).

Periodic schizophrenia (also called recurrent or schizo-affective) is marked by excitation, confusion, affective-delusional and oneiric incidents, and minor personality changes.

Unlike progressive and process schizophrenia, the intermittent and nonprogressive forms of the disease may occur at any age. It has been established that specific forms of schizophrenia are sex-related. Process schizophrenia and unintermittently progressive schizophrenia are found more frequently in men than in women (the ratio being 3:1), whereas intermittent schizophrenia is more common in women (the ratio here being reversed). The overall incidence of the disease, however, is approximately the same among men and women.

Treatment. Treatment depends on the form of and the stage reached by the disease; it includes insulin therapy (where hypoglycemia is induced by injecting insulin), electroconvulsive therapy, occupational therapy, and psychotropic agents. Prophylactic measures are primarily directed at preventing acute manifestations of the disease and achieving more extended remission; they consist of preventive treatment—that is, small "maintenance" doses of psychotropic agents and proper working and living habits.

The high level of organization of inpatient and especially outpatient care, treatment by psychotropic agents, and occupational rehabilitation are significantly reducing the rate of permanent disability caused by schizophrenia. As research continues in this area, the opportunities for work rehabilitation are growing steadily. It is only the severe forms of schizophrenia that justify placing patients on disability, exempting them from military service, or limiting their choice of occupation. It is precisely for this reason that schizophrenia requires the kind of diagnosis known as binomial, which identifies not only the disease but also its specific form and course.

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Psychiatrie der Gegenwart, 2nd ed., vol. 2, part 1. Berlin, 1972.
A. V. SNEZHNEVSKII [29–1179–5]

SCHLAF, JOHANNES. Born June 21, 1862, in Querfurt; died there Feb. 2, 1941. German writer.

Schlaf studied at the universities of Halle and Berlin (1884–85). Together with A. Holz he wrote the short-story collection *Papa Hamlet* (1889) and the drama *The Selicke Family* (1890). These, along with Schlaf's drama *Master Oelze* (1892), were fundamental works for the school of logical naturalism, which led to a deterioration of artistic form and an extremely narrow view of life.

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Veigand. St. Petersburg, 1907.
REFERENCE
Jegensdorf, L. *Die spekulative Deutung und poetische Darstellung der Natur im Werk von J. Schlaf*. (Dissertation.) [Bochum, 1969.] (Contains bibliography.) [29–1275–5]

SCHLAGINTWEIT BROTHERS. German geographers and mountaineers.

Adolf Schlagintweit was born on Jan. 9, 1829, in Munich. He was executed on Aug. 26, 1857, in Kashgar, China.

Hermann Schlagintweit was born on May 13, 1826, in Munich and died there on Jan. 19, 1882.

Robert Schlagintweit was born on Oct. 27, 1833, in Munich and died on June 6, 1885, in Giessen.

From 1854 to 1857, on the initiative of A. von Humboldt and with the backing of the Prussian government and the British East India Company, the Schlagintweit brothers traveled about India and Central Asia, exploring the Deccan Plateau, the Himalayas, the Karakoram, the Kunluns, Sinkiang, and the Tibetan Highlands. Before 1853, Adolf and Hermann also explored the Alps. In 1868 and in 1880, Robert climbed mountains in the USA.

WORKS
Reisen in Indien und Hochasien, vols. 1–4. Jena, 1869–80.
[29–1271–5]

SCHLEGEL, AUGUST WILHELM VON. Born Sept. 8, 1767, in Hanover; died May 12, 1845, in Bonn. German literary historian and writer. Brother of F. von Schlegel.

A. von Schlegel studied classical philology at the University of Göttingen from 1787 to 1791. Beginning in 1818, he taught literary history at the University of Bonn and did work in Sanskrit studies. He was one of the founders of comparative linguistics. Schlegel belonged to the Jena school of German romantics. In his works, including the Berlin lectures on literature and aesthetics (1801–04, published 1884) and the Vienna lectures on dramatic art and literature (1808, published 1809–11), he gave the first systematic analysis of romanticism as a historical and aesthetic concept. In this analysis, which became famous throughout Europe, he contrasted ancient, classical aesthetics to modern, romantic aesthetics.

An outstanding theorist of artistic translation, Schlegel translated works by Dante, Calderón, and Petrarch; his translations of the plays of Shakespeare remain unsurpassed. Schlegel's own literary works, including *Poetic Works* (1811) and his dramas, were influenced by classicism.

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Besenbeck, A. *Kunstanschauung und Kunstlehre A. W. Schlegels*. Berlin, 1930.
N. IU. PALIEVSKAIA [29–1276–1]

SCHLEGEL, FRIEDRICH VON. Born Mar. 10, 1772, in Hanover; died Jan. 12, 1829, in Dresden. German critic, philologist, idealist philosopher, writer, and theorist of romanticism. Brother off A. W. von Schlegel.

F. von Schlegel studied classical philology in Leipzig. In articles written in the 1790's under the influence of J. J. Winckelmann, he viewed ancient Greek poetry as the prototype of true art and the embodiment of the objectively beautiful. He sharply criticized modern culture and art for preferring "the mannered, the characteristic, and the individual," for mixing genres, and for tirelessly striving after "the new, the piquant, and the striking" (*On the Study of Greek Poetry*, 1797).

Schlegel lived in Jena from 1796 to 1801. He published the journal *Athenaeum* with A. von Schlegel from 1798 to 1800 and formulated the basic tenets of the Jena school of romantics. In this period he extolled the romantic art of his time. He regarded Dante, Shakespeare, Cervantes, and Goethe as the greatest representatives of romantic art, which he distinguished from the classical art of antiquity. In his numerous "fragments" and aphorisms Schlegel advanced the utopian ideal of a new, universal poetry and culture that would aesthetically transform the world. The new poetry and culture would be oriented toward the "infinite plenitude of the universe" and would undergo a continuous, never-ending process of creative development. The new culture would constantly reflect upon itself and its works; it would fuse art, philosophy, science, and religion. Schlegel regarded ancient mythology as the prototype of such a fusion and dreamed of a new mythology, the beginnings of which he saw in the natural science of his day and in post-Kantian idealist philosophy (*A Conversation About Poetry*, 1800).

Associated with Schlegel's theory of a universal poetry and culture is his treatment of irony, which he viewed as an expression of the dynamism of the world and of cognition. Irony expresses a

feeling of wholeness; it impels the artist to rise above limitations imposed by the individual self, by the material represented, and by the means of representation.

According to Schlegel, the novel is an encyclopedia of the spiritual life of an individual and the highest genre of the new poetry. He regarded Goethe's *Wilhelm Meister* and Cervantes' *Don Quixote* as exemplars of the genre. Schlegel's unfinished and fragmentary novel *Lucinde* (1799), which provoked a charge of immorality, was based on a romantic theory of love and marriage as spiritual and physical union and as the harmonious mutual complementing of man and woman.

From 1802 to 1804, Schlegel lived in Paris. From 1803 to 1805 he published the journal *Europa*, which was devoted to the concept of the spiritual communality of European culture. His *Geschichte der alten und neueren Literatur* (vols. 1–2, 1813–15; English translation under the title *Lectures on the History of Literature*) continued the tradition of J. G. von Herder and played an important role in the development of romantic historicism. National literatures in this work are examined as unique entities. For Schlegel, a national literature expressed the spiritual life of its people and reflected the people's religious, philosophical, and political history.

After his conversion to Catholicism in 1808, Schlegel lived in Vienna. He took up a position in the Austrian government and worked closely with Metternich. Schlegel, who in the 1790's had favored republicanism and supported the ideals of the French Revolution, now espoused the conservative romantic ideal of a "true empire." In the journal *Concordia* (1820–23), he viewed the Austrian estate monarchy as an embodiment of this romantic ideal. In *The Philosophy of Life* (1828), *The Philosophy of History* (vols. 1–2, 1829), and *The Philosophy of Language and Speech* (1830), Schlegel developed the notion of a universal Christian philosophy. Criticizing various philosophical systems, particularly German classical idealism, as forms of divided consciousness, he maintained that the restoration of the inner wholeness of human consciousness was a prerequisite for a true philosophy of life based on the principles of Christian spiritualism. This wholeness involved the unity of all mental faculties, including reason, imagination, and will.

One of the founders of German Sanskrit studies and of comparative linguistics, Schlegel was the author of *On The Language and Wisdom of the Indians* (1808).

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IU. N. POPOV [29–1276–2]

SCHLEICHER, AUGUST. Born Feb. 19, 1821, in Meiningen; died Dec. 6, 1868, in Jena. German linguist.

Schleicher, who became a professor at Charles University in Prague in 1850 and the University of Jena in 1857, subscribed to naturalist views on language. Influenced by C. Darwin, he regarded language as an organism that must be studied by the methods of the natural sciences. He applied Hegelian dialectics to linguistic phenomena and arranged in a triad the principal types of morphological structures in language. He advanced the notion of linguistic degradation, which involves aging, erosion, and destruction.

Schleicher was the first to recognize the need to establish general laws of linguistic development. The comparative method of linguistic study practiced by him paved the way for the neogrammarians' study of phonetic law (*see* NEOGRAMMARIAN). Schleicher's works played an important role in the development of Indo-European linguistics, whose task, in Schleicher's view, was to reconstruct the Proto-Indo-European parent language, in which he composed a fable.

Schleicher was among the first to undertake the study of languages (including Lithuanian) and dialects by consulting native speakers; he also studied the Slavic languages. In *A Compendium of the Comparative Grammars of the Indo-European Languages* (parts 1–2, 1861–62) he offered the most complete account up to that time of the Indo-European language system. Schleicher became a foreign corresponding member of the St. Petersburg Academy of Sciences in 1857.

WORKS

Handbuch der litauischen Sprache, vols. 1–2. Prague, 1856–57.

Compendium der vergleichenden Grammatik der indogermanischen Sprachen, 2nd ed. Weimar, 1866.

Die deutsche Sprache, 4th ed. Stuttgart, 1879.

A. A. KOROLEV [29–1285–1]

SCHLEICHER, KURT VON. Born Apr. 7, 1882, in Brandenburg; died June 30, 1934, in Neubabelsberg. German military and political figure; general.

Schleicher became an officer of the General Staff in 1913. After Germany's defeat in World War I he became a close associate of the commander of the Reichswehr, General H. von Seeckt, and took part in planning the restoration of the country's military potential. Schleicher headed an office in the Reichswehr Ministry in 1929 and served as minister for the Reichswehr in the government of F. von Papen from June to December 1932. He played an important role in relations between the leaders of the Nazi Party, on the one hand, and political authorities, the military, and representatives of monopolies, on the other.

Schleicher assumed the post of chancellor in December 1932. He sought to implement a dictatorial regime that would bring the fascists into the government on terms acceptable to various groups of monopolistic capital. His efforts, however, failed. He was forced to resign on Jan. 28, 1933, and was succeeded by Hitler on Jan. 30, 1933. Schleicher was murdered by the Gestapo during the purge known as the night of the long knives.

[29–1285–2]

SCHLEIDEN, MATTHIAS JAKOB. Born Apr. 5, 1804, in Hamburg; died June 23, 1881, in Frankfurt. German botanist and public figure.

Schleiden graduated from the University of Heidelberg in 1827. He was a professor of botany at the University of Jena between 1839 and 1862, and the director of the botanical gardens there from 1850. In 1863–64 he was a professor of anthropology at the University of Dorpat (present-day Tartu).

Schleiden, a reformer of contemporary botany, used the inductive method to criticize the philosophy of natural science and narrowly systematic methods in *The Fundamentals of Scientific Botany* (1842–43). His main works deal with plant anatomy and embryology. Schleiden substantiated the ontogenetic approach to the study of plant morphology and played an important role in the development of cell theory. He was one of the predecessors and advocates of Darwinism. In individual experiments he made a number of errors, such as his conception of the neogenesis of cells from structureless substances or of the development of the embryo from the pollen tube. Schleiden was the author of popular science books, which have been translated into Russian, and of collections of poetry.

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Grundzüge der wissenschaftlichen Botanik, 4th ed. Leipzig, 1861.

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Ritter, G. "Matthias Jakob Schleiden (1804–1881)." *Estestvoznanie i geografiia*, 1905, no. 2.

D. V. LEBEDEV [29–1280–3]

SCHLEIERMACHER, FRIEDRICH. Born Nov. 21, 1768, in Breslau; died Feb. 12, 1834, in Berlin. German Protestant theologian and philosopher. Member of the Pietistic Herrnhut communal movement.

Schleiermacher studied at the University of Halle. He became a preacher in 1794 and served in Berlin from 1796 to 1802. He

was a professor at the University of Halle from 1804 to 1806. Returning to Berlin in 1807, Schleiermacher became a professor at the University of Berlin in 1810, and he was made secretary of the philosophy section of the Academy of Sciences in 1814. In the early 1800's he was close to the circle of Jena romantics, and in his *Confidential Writings About Schlegel's "Lucinde"* (1800) he defended F. von Schlegel's novel *Lucinde* for its depiction of feeling based on total inner freedom. In the rhapsodically enthusiastic *On Religion: Speeches to Its Cultural Despisers* (1799) and *Soliloquies* (1800), Schleiermacher presented an integrated religious and aesthetic ideology in a spirit of early romanticism; personal inner experience was posited as the basis of religion, which Schleiermacher defined as "contemplation of the universe," later as a feeling of "absolute dependence" on the eternal. He subsequently published a series of systematic works on philosophy (*Dialectics*, 1804), ethics, and Protestant dogmatics. Schleiermacher produced a classic translation of Plato into German.

Schleiermacher's psychologism, his belief in the preeminent role of inner feeling in knowledge and in the inscrutability of the highest source (god) for reason, in which regard he was influenced by Pietism and F. H. Jacobi, were sharply criticized by Hegel. Schleiermacher had a great influence on liberal Protestantism of the 19th century and on the development of philosophical hermeneutics and of the history of philosophy and pedagogy in Germany.

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Haym, R. *Romanticheskaia shkola*. Moscow, 1891. (Translated from German.)
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Kantzenbach, F. W. *F. D. E. Schleiermacher in Sebstzeugnissen und Bilddokumenten*. Reinbek, 1967.
Redeker, M. *Friedrich Schleiermacher: Leben und Werke*. Berlin, 1968.
AL. V. MIKHAILOV [29–1281–1]

SCHLEISSING, GEORG ADAM. Born circa 1660; died no earlier than 1694. German traveler.

Schleissing visited Russia between 1684 and 1686. He published the books *Anatomy of a Deformed Russia* (1688), *Newly Discovered Siberia* (1690), and *The Ruling Council of Two Tsars in Russia* (1694). His works contain a description of the natural conditions in Russia and of Russian cities, a sketch of the political history of the 1680's, and descriptions of life, customs, and beliefs. Schleissing also published a map of Siberia and a reproduction of the first map of Siberia, which was compiled by P. I. Godunov in 1667 but which no longer exists.

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SCHLESINGER, ARTHUR MEIER, JR. Born Oct. 15, 1917, in Columbus, Ohio. American historian.

Schlesinger graduated from Harvard University in 1938. He was a professor of history at Harvard from 1954 to 1961 and later at the City University of New York. From 1961 to 1964 he served as special assistant to Presidents J. Kennedy and L. Johnson.

Schlesinger represents the bourgeois-liberal trend in contemporary American historiography. His early works—for example, *The Age of Jackson* (1945)—hailed bourgeois liberalism as the moving force of social progress. Schlesinger's expression of this viewpoint took on a clearly anticommunist coloration in his works of the late 1940's and 1950's (*Vital Center*, 1949). Since the late 1950's Schlesinger has been developing, in his biographies and other historical works (*The Age of Roosevelt*), the concept of "democratic progress," theorizing that the USA's ability to resolve its differences, characteristic of the country throughout its history, has supposedly made possible the transformation of American society into one of "social justice." During the 1960's Schlesinger criticized the escalation of American aggression in Vietnam.

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The Age of Roosevelt, vols. 1–3. Boston, 1957–60.
A Thousand Days: John F. Kennedy in the White House. Boston, 1965.
The Bitter Heritage. London, 1967.
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Aptheker, H. *History and Reality*. New York, 1955. Chapter 3.
D. G. NADZHAFOV [29–1279–1]

SCHLESINGER, FRANK. Born May 11, 1871, in New York; died July 10, 1943, in Connecticut. American astronomer.

Schlesinger's principal works dealt with photographic astrometry. He developed a technique for determining stellar parallaxes and compiled a number of catalogs of stellar positions that were determined with wide-angle astrographs designed after his idea.

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Jones, H. S. "Frank Schlesinger." *Monthly Notices of the Royal Astronomical Society*, 1944, vol. 104, no. 2. pp. 94–98. [29–1280–2]

SCHLESINGER, MAX. Born 1904; died Feb. 4, 1937, in London. Hungarian biochemist. One of the founders of the molecular biology of viruses.

Schlesinger graduated from the University of Budapest. Beginning in 1931, he was a researcher at the Institute of Colloids in Frankfurt am Main. After the Nazis came to power, Schlesinger emigrated to Great Britain, where he settled in London. His main works dealt with the chemical composition and physicochemical properties of bacterial viruses—bacteriophages. Schlesinger was the first to obtain a pure culture of the bacteriophage WLL of the colon bacillus (1933); he did this by passing a suspension of the bacteriophage through a colloidal filter with a graduated range of pores and then precipitating it in an ultracentrifuge. He was also able to measure the size of the bacteriophage particles. Schlesinger studied the mechanism of adsorption of bacteriophages on the host cell and determined the adsorptive capacity of bacterial cells. He was the first to establish (1934) the nucleoprotein nature of viruses, showing that bacteriophages consist of approximately equal amounts of protein and nucleic acid. In 1936 he found that the latter produces a positive Feulgen reaction to thymonucleic acid (or deoxyribonucleic acid) and that a bacteriophage is a deoxyribonucleoprotein chemically similar to a chromosome.
IA. A. PARNES [29–1280–1]

SCHLESWIG, a historical region on the southern Jutland Peninsula, north of the Eider River. In the Middle Ages, Schleswig became an object of contention between the Frankish (and later German) kings and the rulers of Denmark. Beginning in the early 12th century it was governed by Danish princes holding the title of duke. In 1386, as a Danish *lehn*, Schleswig passed to the German nobility of Holstein County. [29–1278–1]

SCHLESWIG-HOLSTEIN, a *Land* (state) in the northern part of the Federal Republic of Germany. Area, 15,700 sq km. Population, 2,600,000 (1975). The capital is Kiel.

An island chain that includes the North Frisian Islands runs along the North Sea coast of Schleswig-Holstein, whose Baltic

coast is indented by bays, including those of Lübeck and Kiel, and by inlets. Located on the Jutland Peninsula and the North German Lowland, Schleswig-Holstein is hilly in the east and southeast and rises to an elevation of 164 m.

The economy of Schleswig-Holstein is dominated by the industrial and agricultural sectors. The *Land* accounted for 3.4 percent of the gross national output of the Federal Republic of Germany in 1974. Industry produces approximately 33 percent of the gross output of Schleswig-Holstein, and agriculture, 6.6 percent. Shipbuilding in the region accounts for almost one-third of the country's tonnage of oceangoing vessels, and 55,000 tons of fish were caught commercially off the coast in 1975. Schleswig-Holstein has food-processing and textile industries, as well as a match industry that produces 20 percent of the country's matches. Other important industries include copper smelting and machine building. The principal industrial centers are Lübeck, Kiel, Rendsburg, Brunsbüttel, Heide, and Neumünster.

Farmland occupies more than 75 percent of Schleswig-Holstein. Livestock are raised for meat and dairy products. In 1975 the region had 1.5 million head of cattle and 1.6 million swine and produced 2.2 million tons of milk, 64,000 tons of butter, and 338,000 tons of meat. Grains, sugar beets, and potatoes are grown in the southeast, and vegetables are raised in the marshlands and on the island of Fehmarn. The Kiel Canal runs through Schleswig-Holstein, whose seaports include Lübeck, through which 5.6 million tons of freight were moved in 1975, and Kiel, the base for a Baltic fishing fleet. I. A. BASOVA

History. Schleswig-Holstein originally consisted of two independent areas, Schleswig and Holstein, which were united by the Holstein counts in 1386. Although Schleswig-Holstein passed to the rule of the Danish king in 1460 as a result of a personal union, Holstein, which became a duchy in 1474, formally remained a part of the Holy Roman Empire until 1806, when the empire was dissolved. The Reformation spread to Schleswig-Holstein in the mid-16th century, and, owing to the influence of the French Revolution, an extensive antifeudal movement developed in the late 18th century. Serfdom was abolished in Schleswig-Holstein in 1804. In 1806, Denmark declared full possession of Holstein. The Congress of Vienna (1814–15) recognized the right of succession of the Danish king in Schleswig-Holstein, but declared Holstein a member of the German Confederation.

The national liberation movement among the region's predominantly German population intensified in the 1830's. The outbreak of the Revolution of 1848–49 in Germany was followed by revolutionary events in Schleswig-Holstein. A provisional government established in March 1848 proclaimed the independence of Schleswig-Holstein and declared war on Denmark. The provisional government approved a draft for a constitution that F. Engels called "the most democratic [draft] ever drawn up in the German language" (K. Marx and F. Engels, *Soch.*, 2nd ed., vol. 5, pp. 422–23). With an eye to seizing Schleswig-Holstein as well as checking the growth of the revolution in Germany, Prussia entered the war against Denmark in April.

A truce concluded during the Danish-Prussian War of 1848–50 (German-Danish War of 1848–50) called for the return of Schleswig-Holstein to Denmark, the dissolution of the revolutionary provisional government, the repeal of the government's decrees, and the removal of Prussian troops from the region. These stipulations were incorporated in the London Protocol of 1852, which was signed by Great Britain, Russia, and France. Although it recognized the right of succession of the Danish monarchy, the protocol specified that Schleswig-Holstein and Denmark could be linked only through a personal union and that Holstein would remain a member of the German Confederation.

In accordance with the constitution introduced in Denmark in 1863, Schleswig was separated from Holstein and made a Danish province. This precipitated a war between Austria and Prussia, on one side, and Denmark, on the other (*see* GERMAN-DANISH WAR OF 1863–64). The war ended in Denmark's defeat; Holstein fell under Austrian rule, and Schleswig came under Prussian rule. After the Austro-Prussian War of 1866 (Seven Weeks' War), Schleswig and Holstein passed to Prussia as a single province. North Schleswig, most of whose population was Danish, was later incorporated into Denmark as a result of a plebiscite conducted in 1920 on the basis of the Peace Treaty of Versailles (1919). Schleswig-Holstein was organized as a *Land* of the Federal Republic of Germany in 1949.

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Roots, L. *Shlezvig-gol'shtinskii vopros i politika evropeiskikh derzhav v 1863–1864 godakh.* Tallinn, 1957. L. I. GINTSBERG [29–1278–2]

SCHLICH (concentrate), a fraction of heavy minerals obtained by flushing unconsolidated natural deposits and artificially crushed rock or mineral formations. A schlich includes grains of minerals that are resistant to physical and chemical weathering and that have a density of more than 3,000 kg/m^3, for example, gold, platinum, cinnabar, cassiterite, scheelite, magnetite, zircon, and diamond.

Schlich samples are taken systematically from alluvial and diluvial deposits in the course of prospecting for placer and primary deposits of useful minerals. Schlich sampling is also used in the exploration and development of placer deposits. During the process of concentrating sands from placer deposits of gold, platinum, and other metals, what is called gray schlich, containing a significant amount of foreign minerals, is obtained first and then black schlich, which is richer in valuable metals. Schlich concentrating installations or factories, concentrating tables, and separators of various designs are used to extract valuable minerals from schlich on an industrial scale. A. M. BORSUK [29–1299–1]

SCHLICHTING, ALBERT. Dates of birth and death unknown. German nobleman from Pomerania; author of two works on Russia in the mid-16th century.

Taken prisoner by the Russians in 1564, Schlichting served as a translator and servant of the court physician A. Lensey from 1568 to 1570. In the fall of 1570 he escaped to Lithuania, where in 1571 he compiled a short report, *News From Muscovy, as Reported by the Nobleman A. Schlichting on the Life and Tyranny of His Majesty Ivan.* Schlichting later wrote *A Short Tale About the Character and Cruel Government of the Moscow Tyrant Vasil'evich*, in which he described in detail the *oprichnina* and its terror.

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Novoe izvestie o Rossii vremeni Ivana Groznogo, 4th ed. Leningrad, 1935.
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Skrynnikov, R. G. *Nachalo oprichniny.* Leningrad, 1966.
[29–1300–1]

SCHLICK, MORITZ. Born Apr. 14, 1882, in Berlin; died June 22, 1936, in Vienna. Austrian philosopher and physicist; leading representative of the early stage of logical positivism, founder of the Vienna circle.

Schlick was a professor of philosophy and physics at the universities of Rostock from 1917 to 1920, Kiel in 1921 and 1922, and Vienna from 1922 to 1936; he was a visiting professor at Stanford University in California in 1931 and 1932. Schlick's philosophical framework was logical empiricism, at which he arrived after renouncing critical realism under the influence of R. Carnap and L. Wittgenstein. Schlick based himself on the concept of the "sensible present"—the sense experience of a cognizing individual that is incommunicable to other subjects. According to Schlick, only the structural relations of a sense experience can be the object of knowledge—relations that reproduce the order of phenomena. The so-called rational truths, including the statements of logic and mathematics, have a purely analytical character; they are tautologies that do not make it possible to penetrate into unperceived reality. According to Schlick, the problem of the cognition of the essence of existence is meaningless; the laws of nature are for him formal rules determined by the syntax of the language in which a description of nature is given.

Schlick was one of the first to formulate the principle of verification as a criterion of scientific understanding. He occupied him-

self extensively with the application of his philosophical viewpoint to specific problems of the philosophy of science (analysis of space and time, causality, probability) and of ethics.

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I. S. DOBRONRAVOV [29–1288–5]

SCHLIEFFEN, ALFRED VON. Born Feb. 28, 1833, in Berlin; died there Jan. 4, 1913. German military theoretician. General field marshal (1911). Count.

Schlieffen served in the Austro-Prussian War of 1866 and the Franco-Prussian War of 1870–71 as a staff officer. He served as chief of the General Staff from 1891 to 1905, in which post he improved the training of General Staff officers. As a follower of H. Moltke the elder and one of the ideologists of German militarism, Schlieffen developed a theory for surrounding and wiping out an enemy by a decisive strike against one or two flanks. Schlieffen was the author of a plan for warfare on two fronts, against France and Russia.

WORKS
Gesammelte Schriften, vols. 1–2. Berlin, 1913.
In Russian translation:
Kanny, 2nd ed. Moscow, 1938. [29–1295–1]

SCHLIEFFEN PLAN, a draft plan for strategic deployment of the German Army and for conducting combat operations at the beginning of a German war on two fronts, against France and Russia. The plan was formulated in a memorandum compiled in 1905 by the chief of the General Staff, General A. von Schlieffen.

In implementing the plan, the first strike was to be delivered against France by the bulk of the German troops, up to 85 percent of all ground forces. The main forces were to be concentrated on the right flank and moved through neutral Belgium and Luxembourg to outflank the main forces of the French Army from the north, with the objective of seizing Paris and driving French forces back to the east, where they would be surrounded and wiped out. Against Russia, only a weak screening force would be in place, awaiting the victory over France. After France was crushed, the plan envisioned shifting large forces to the war against Russia.

The Schlieffen plan was risky and unprincipled because the German Army in the west did not have superiority in forces and was unable to provide logistic support for a rapid, continuous advance to great depth. The objective of wiping out the French Army of several million in one blow was also unrealistic. When the Schlieffen plan, in somewhat modified form, was put into effect at the beginning of World War I, the German forces were defeated in the battle of the Marne of 1914.

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Groener, W. *Zaveshchanie Shliffena*. Moscow, 1937. (Translated from German.) [29–1295–2]

SCHLIEMANN, HEINRICH. Born Jan. 6, 1822, in Neubukow; died Dec. 26, 1890, in Naples. German archaeologist.

Schliemann, who had amassed a vast fortune through trade, retired from business in 1863 and devoted himself to searching for the sites of places mentioned in the Homeric epics. In 1869 he suggested that the site of Troy was the mound of Hissarlik in Asia Minor. Excavations in 1870–73, 1878–79, 1882–83, and 1889–90 confirmed Schliemann's hypothesis and proved that Homer's epic had a sound, factual basis. Schliemann also carried out excavations in Mycenae (1876), on the island of Ithaca (1878), in Orchomenos (1880–81), and in Tiryns (1884–85). Largely self-taught, Schliemann made use of completely unorthodox methodology in his excavations and, despite the fact that he kept detailed diaries and published the results of his excavations, the scientific value of his works is not very great. Of particular importance, however, was Schliemann's discovery of the "pre-Homeric" Aegean culture, studied scientifically by A. Evans after Schliemann's death.

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Orchomenos. Leipzig, 1881.
Troja. Leipzig, 1884.
Tiryns. Leipzig, 1886.
Heinrich Schleimann: Selbstbiographie, 8th ed. Wiesbaden, 1955.
REFERENCE
Stoll, H. A. *Shliman*. Moscow, 1965. (Translated from German.) [29–1290–1]

SCHLIERE, a segment of irregularly shaped intrusive rock that differs from the rest of the rock mass by the quantitative proportions of its constituent minerals or by structure. Gradual transitions are usually observed between schlieren and the rock within which they are enclosed. Schlieren are usually 2–10 cm in size, sometimes reaching as much as 1 m and more. Some schlieren are formed when fragments of foreign rock (xenoliths) are invaded and reworked by a magmatic melt. In many cases, such schlieren show continuous transitions from xenoliths that differ greatly from the actual magmatic rock. Sometimes schlieren are accumulations of minerals, frequently ore minerals, that have separated out from the magmetic melt in the early stages of crystallization. [29–1290–4]

SCHLIEREN METHOD, a technique that detects optical inhomogeneities in transparent refractive media and defects of reflecting surfaces.

The schlieren method is used to detect striae in optically transparent materials and to determine the quality of mirrors and other optical parts. It is used to study the density gradients of air flows around wind tunnel models and to project images onto screens (the images are obtained in the form of optical inhomogeneities); it is also used in bubble chambers, large-screen television systems, systems used to reproduce images from thermoplastic and vesicular photographic materials, and other devices. The schlieren method was proposed by the German scientist A. Töpler in 1867.

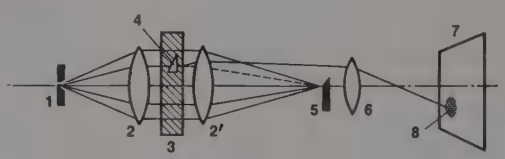

Figure 1

In the schlieren method, a beam of rays from a point or slit source of light (Figure 1) is directed through the object being studied (3) by a lens or a system of lenses and mirrors (2–2′) and is focused on an opaque screen (5) with a sharp edge (a Foucault knife-edge) such that the image of the source is projected on the very edge of the screen. If the object in question has no optical inhomogeneities, all the rays are stopped by the screen. If an optical inhomogeneity (4) is present, the rays will be scattered by the inhomogeneity, and some of them, having been deflected, will pass above the edge of the screen. By placing a projection lens (6) behind the screen, it is possible to project these rays onto the screen (7) and to obtain an image (8) of the inhomogeneities that have scattered the rays. Optical inhomogeneities can be viewed directly by the observer through an eyepiece mounted on the device instead of a projection lens.

Optically conjugate gratings (rasters) that overlap the path of the rays when inhomogeneities are present in their path are sometimes used instead of a point source of light and a Foucault

knife-edge. Gratings with slits in the form of light filters are also used. These make it possible to determine more graphically the character of the optical inhomogeneities. A cruder (shadow) pattern of the zones of abrupt change in the optical density of an object can be obtained if the rays are overlapped by a Foucault knife-edge or gratings. Illumination of the object by two optical systems mounted at an angle to one another makes it possible to obtain a stereoscopic pattern of the distribution of the object's inhomogeneities.

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N. A. VALIUS [29–1291–1]

SCHLIPPENBACH, VOLMAR ANTON VON. Born 1650; died 1739. Swedish general.

The son of a Livonian noble, Schlippenbach commanded the Swedish troops in Livland at the beginning of the Northern War of 1700–21. In 1701 and 1702 he was defeated at Erestfehr and Hummelshof and near Dorpat (Tartu). In 1709, in the battle of Poltava, he served under Field Marshal K. G. Rehnschiöld (Rehnsköld), who sent him to aid the detachment of General Roos, which had been checked by Russian redoubts. After Schlippenbach's arrival, the detachment, with Schlippenbach in command, was surrounded and captured by the cavalry units of A. D. Menshikov.

Schlippenbach entered Russian service in 1715 and was promoted to the rank of lieutenant general. He received an estate in Courland and the title of baron. Schlippenbach served as a member of the Military Collegium and, in 1718, as a member of the Supreme Court. [29–1290–3]

SCHLOSSER, FRIEDRICH CHRISTOPH. Born Nov. 17, 1776, in Jever; died Sept. 23, 1861, in Heidelberg. German historian.

Schlosser became a professor at the University of Heidelberg in 1817. His world view developed under the influence of the Enlightenment and of German classical philosophy. Moralistic Enlightenment attitudes dominate his works *The History of the 18th Century* (vols. 1–2, 1823; 5th ed., vols. 1–8, 1864–66; Russian translation by N. G. Chernyshevskii, vols. 1–8, 1858–60) and *World History* (vols. 1–19, 1844–57; Russian translation edited by N. G. Chernyshevskii and V. A. Zaitsev, vols. 1–18, 1861–69). In these works Schlosser opposed the reactionary romantic apologia for the Middle Ages and feudal despotism and defended the ideals of the Enlightenment and the bourgeois revolutions of the 16th to 18th centuries.

Schlosser attempted to produce a history of mankind as a unified whole, with particular attention being paid to the popular masses. His treatment of the democratic movements of the past, however, was not consistent. Schlosser took a generally negative view of the peasant and plebeian movements of the bourgeois revolution in Germany in the 16th century and in France in the 18th century, but he was sympathetic to the Leveler movement in the English revolution of the 17th century. Although he opposed all manifestations of reaction, he remained a supporter of enlightened absolutism, even after the Revolution of 1848–49 in Germany, whose significance in the history of the German people he did not understand. Karl Marx used Schlosser's *World History* as the basis for his *Chronological Extracts* (see *Arkhiv K. Marksa i F. Engel'sa*, vols. 5–8, Moscow, 1938–46).

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SCHLÖZER, AUGUST LUDWIG. Born July 5, 1735, in Gaggstadt; died Sept. 9, 1809, in Göttingen. German historian, philologist, and statistician. Adjunct of the St. Petersburg Academy of Sciences (1762). Honorary member of the Society of History and Russian Antiquities (1804).

Schlözer studied at the universities of Wittenberg and Göttingen. At the invitation of G. F. Miller, he worked in Russia from 1761 to 1767 and studied the Old Russian chronicles. As a supporter of the Norman theory of the origin of Rus', he was sharply criticized by M. V. Lomonosov. Schlözer contributed to the publication of V. N. Tatishchev's *History of Russia*. In 1763 and 1764 he composed a grammar of the Russian language. After returning to Germany he taught history and statistics at the University of Göttingen and wrote a number of works on Russian history. His principal work, *Nestor*, had a positive influence on the development of the study of sources in Russia.

A rationalist thinker, Schlözer remained a representative of the moderate trend of the Enlightenment and a supporter of enlightened absolutism. He elaborated concepts of universal history and protested against the division of peoples into "historical" and "nonhistorical."

Schlözer became a foreign honorary member of the St. Petersburg Academy of Sciences in 1769.

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Peshtich, S. L. *Russkaia istoriografiia XVIII v.*, Part 2. Leningrad, 1965.
Lomonosov, Schlözer, Pallas. Berlin, 1962. [29–1288–3]

SCHLÜTER, ANDREAS. Born circa 1660 in Gdańsk(?); died before June 23, 1714, in St. Petersburg. German sculptor and architect; outstanding representative of the baroque style in Germany.

Schlüter worked from 1689 to 1693 in Warsaw and from 1694 in Berlin, where he was director of the Academy of Arts from 1702 to 1704. In 1696 he sculpted tragically expressive heads of dying warriors on the keystones in the courtyard of the Berlin Arsenal. Striking characterization and dynamic, monumental composition are typical of the equestrian statue of Frederick William, the great elector, on the Lange Brücke in Berlin (bronze, 1696–1703, completed 1709), which is now in the forecourt of Charlottenburg Palace.

From 1698 to 1706, Schlüter directed the reconstruction of the Royal Palace in Berlin, where he built the inner courtyard in the baroque style and designed magnificent interiors. He also completed a portrait bust of Landgrave Frederick II of Giessen and Homburg (bronze, c. 1704, castle courtyard, Homburg) and a number of decorative works. From 1711 to 1712 he built the Villa Kamecke in Berlin.

In 1713, Peter I invited Schlüter to St. Petersburg, where he completed the Summer Palace (1713–14) and designed the Mon Plaisir Palace and grottoes in Petergof (now Petrodvorets).

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Ladendorf, H. *Andreas Schlüter*. Berlin, 1937. [29–1306–2]

SCHLÜTER, HERMANN. Born Oct. 8, 1851, in what is now Schleswig-Holstein; died Jan. 26, 1919, in New York. Historian; figure in the working-class movement in Germany and the USA.

Schlüter was involved in the socialist movement from his youth, when he became affiliated with the left wing of German Social Democracy. In the 1870's and 1880's he helped publish a number of newspapers and magazines of the Social Democratic Party of Germany. Schlüter emigrated to the USA in 1889. He contributed to the newspaper *New Yorker Volkszeitung*, and in the early 1890's he became a member of the editorial board of the newspaper. In 1904 he represented the Socialist Party of the USA at the congress of the Second International in Amsterdam. He opposed opportunism in the German and international working-class movement.

Schlüter's historical works, which are devoted primarily to var-

ious aspects of the working-class and democratic movement in the USA, criticize the attempts of bourgeois and social-reformist historiography to reduce the history of the working-class movement in the USA to the trade-unionist struggle. Schlüter is also the author of *The Chartist Movement* (1916; Russian translation, 1925), which contains an objective analysis of Chartism.

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SCHMALENBACH, EUGEN. Born Aug. 20, 1873, in Schmalenbach, near Halver, Westphalia; died Feb. 20, 1955, in Cologne. German economist.

In 1906, Schmalenbach became a professor at the University of Cologne. In such works as *Financing* (1915) and *Dynamic Balance* (1919) he examined questions pertaining chiefly to the theory of balanced accounts and the financing of capitalist enterprises. Elevating the capitalists' notions about their day-to-day activities to the status of theoretical concepts, he created a "science of enterprises," which systematized rules for the most profitable management of the economy. Writing as a defender of monopoly capital, he outlined paths for the improvement of accounting, techniques of commerce, commodity circulation, and credit as means of increasing profits and overcoming the contradictions of the capitalist mode of production. An ideologist of "organized" capitalism, Schmalenbach advocated the organization of the economy into trusts with the help of the state. [29–1309–3]

SCHMALKALDEN, a city in the German Democratic Republic, in Suhl District. Population, 15,000 (1975). Schmalkalden has traditionally been a producer of small metal articles; machine tools are also manufactured in the city. [29–1310–2]

SCHMALKALDIC LEAGUE, a political alliance of German Protestants formed in response to Emperor Charles V's refusal to acknowledge the Augsburg Confession. The league was established on Feb. 27, 1531, in the Thuringian city of Schmalkalden. Its members included such Lutheran princes as elector John Frederick of Saxony, Landgrave Philip of Hesse, and, later, Ulrich of Württemberg and Duke Maurice of Saxony, as well as such cities as Magdeburg, Bremen, Strasbourg, and Ulm. In the Schmalkaldic War (1546–48) the league was defeated by Charles V and disbanded. [29–1311–2]

SCHMALKALDIC WAR (1546–48), a war between the emperor of the Holy Roman Empire, Charles V, who was attempting to restore Catholicism in Germany, and the Protestant Schmalkaldic League.

The negotiation of a peace treaty with France in 1544, the conclusion of a truce with the Ottoman Empire in 1545, and the defection of Duke Maurice of Saxony to the side of the emperor enabled Charles V to begin the war in July 1546. Additional troops from the Netherlands and the pope gave the emperor a substantial military advantage. In late 1546, Maurice seized the lands of his relative Elector John Frederick of Saxony. The Protestant troops were routed at Mühlberg, Saxony, on Apr. 24, 1547, and John Frederick, who had been taken prisoner, renounced his electorate in favor of Maurice. On June 19, 1547, another Protestant leader, Philip of Hesse, surrendered.

Fighting resumed in 1552 with a revolt of the Protestant princes. The new war ended in a victory for the princes that was given official recognition by the Treaty of Passau (1552) and the religious Peace of Augsburg (1555). [29–1311–1]

SCHMIDT, ADOLF. Born July 23, 1860, in Breslau (now Wrocław); died Oct. 17, 1944, in Gotha. German geophysicist.

Schmidt graduated from the university in Breslau in 1882. He became director of the magnetic observatory in Potsdam in 1902 and of the magnetic-meteorological observatory in 1909. He was named an honorary professor of the University of Berlin in 1907. Schmidt's principal works dealt with the theory of geomagnetism, magnetic surveys, and the study of geomagnetic variations. In 1915–16, Schmidt constructed vertical and horizontal field magnetic scales.

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SCHMIDT, HELMUT. Born Dec. 23, 1918, in Hamburg. Statesman of the Federal Republic of Germany.

Schmidt graduated with a degree in political economy from the University of Hamburg in 1949. In 1946 he had joined the Social Democratic Party of Germany (SDPG). Schmidt served as a deputy to the Bundestag from 1953 to 1962 and was elected again in 1965. He was chairman of the Social Democratic faction in the Bundestag from 1967 to 1969; he had become vice chairman of the SDPG in 1968. In a coalition government formed by the SDPG and the Free Democratic Party, Schmidt held the posts of minister of defense (1969–72), minister of economics and finance (1972), and minister of finance (1972–74). Schmidt became federal chancellor in May 1974. [29–1317–2]

SCHMIDT, ISAAC JAKOB (also Iakov Ivanovich Shmidt). Born Oct. 14 (25), 1779, in Amsterdam; died Sept. 8 (20), 1847, in St. Petersburg. Russian linguist. Academician of the St. Petersburg Academy of Sciences (1829).

Schmidt's main works dealt with the Mongolian and Tibetan languages. He was the author of the first grammar of the Mongolian language (1831), a grammar of the Tibetan language (1839), and a number of dictionaries. He translated the Mongolian epic *The Exploits of Bogdy Geser Khan* (1836; German translation, 1839) into Russian. Schmidt published, in German translation, the *Mongolian Chronicles of Sagan Setsen, 1662* (1829) and the Tibetan work *Uligerun-Dalai* (1843). The latter was the first Tibetan book translated into a European language.

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SCHMIDT, JOHANNES. Born July 29, 1843, in Prenzlau; died July 4, 1901, in Berlin. German linguist.

Schmidt studied Indo-European languages at the universities of Berlin and Jena. He became a professor at the University of Graz in 1873 and at the University of Berlin in 1876. He was a specialist in comparative Indo-European linguistics. In place of A. Schleicher's family tree model of the development of the Indo-European language family, Schmidt proposed the wave theory to account for the distribution of the Indo-European languages. According to this theory, Proto-Indo-European, while still united as a family of dialects, constituted an aggregate of linguistic innovations, which radiated like waves from the center of the linguistic unity toward its periphery. The Indo-European languages, according to Schmidt, are connected by a number of common features; they lack well-defined boundaries, and there are gradual and imperceptible transitions from one language to another.

Schmidt's works had a considerable influence on the development of Indo-European dialectology. Schmidt became a foreign corresponding member of the St. Petersburg Academy of Sciences in 1892.

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SCHMIDT, WILHELM. Born Feb. 16, 1868, in Hörde; died Feb. 10, 1954, in Fribourg, Switzerland. Austrian ethnologist and linguist; head of the Vienna school of cultural history. Catholic priest.

Schmidt was a professor at the University of Vienna from 1921 to 1938 and became a professor at the University of Fribourg in 1939. He was a specialist in the languages of Southeast Asia, Oceania, and Australia and their comparative study and classification. In his work *The Origin of the Idea of God* (vols. 1–12, 1912–52), he used his vast ethnological erudition to substantiate the theological theory of primitive divine revelation and the consequent theory of primeval monotheism.

Despite the erroneousness of his main views, the extensive material that Schmidt collected on primitive beliefs and especially on languages has considerable scholarly value. In 1906, Schmidt founded the journal *Anthropos*; initially containing ethnological reports by missionaries of his order, it later became an international scholarly organ.

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SCHMIDT, WILHELM MATTHÄUS. Born Jan. 21, 1883, in Vienna; died there Nov. 27, 1936. Austrian geophysicist.

After graduating from the University of Vienna in 1905, Schmidt worked at the Central Institute for Meteorology and Geodynamics in Vienna. In 1912 he became a teacher at the Higher School of Soil Science in Vienna, where he became a professor in 1919. Beginning in 1930, he was a professor and director of the meteorological observatory of the University of Vienna.

Schmidt studied the turbulent mixing of the lower layers of the atmosphere and lake waters and introduced the concept of the coefficient of mixing.

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"Der Massenanstausch in freier Luft und verwandte Erscheinungen." In *Probleme der kosmischen Physik*, vol. 7. Hamburg, 1925. [29–1317–1]

SCHMIDT CORRECTION PLATE, an optical part of the Schmidt telescope designed to compensate for spherical aberration in the telescope's primary mirror, which has a spherical shape. The Schmidt correction plate, which is mounted at the center of curvature of the primary mirror, is a glass plate one surface of which is flat and the other surface of which has a complex form described by the equation

$$x = (y^4 - ay^2)A^3D/512(n - 1)$$

where A is the relative aperture, D is the diameter of the primary mirror, n is the index of refraction of the plate material, and a is a free parameter on the selection of which the chromatism of the plate depends (minimum chromatism is achieved when $a = 1.5$).

The Schmidt correction plate introduces in the optical system a spherical aberration equal in magnitude but opposite in sign to the spherical aberration of the primary mirror, thus making the system stigmatic. N. N. MIKHEL'SON [29–1321–2]

SCHMIDT NUMBER 1, a similarity criterion of the motions of liquids or gases in which processes of internal friction and diffusion are significant.

The Schmidt number 1, the diffusion analog of the Prandtl number, is the ratio of the kinematic viscosity coefficient ν of the liquid or gas to the diffusivity D. The Schmidt number 1 is $N_{Sc} = \nu/D$, where $\nu = \mu/\rho$ (μ is the viscosity coefficient and ρ is the density). The Schmidt number 1 characterizes the relative role of molecular processes of the momentum and mass transfer of an impurity by diffusion. In ideal gases, $N_{Sc} = 1$, since $\upsilon = D$; in real gases it may differ from 1.

The Schmidt number 1 is named in honor of W. M. Schmidt. It is often called the Prandtl diffusion number, which is designated Pr_D. [29–1323–1]

SCHMIDT TELESCOPE, an astronomical mirror-lens telescope designed for photographing large areas of the sky. The Schmidt telescope was invented in 1929 by the German opticist B. Schmidt. Its main components are a spherical mirror and a Schmidt correction plate, which is mounted at the center of curvature of the mirror (see Figure 1). As a result of the placement of the correction plate, all beams of rays passing through it from different parts of the sky prove to be equally corrected with respect to the mirror. Consequently, the Schmidt telescope lacks such aberrations of optical systems as coma, astigmatism, and distortion.

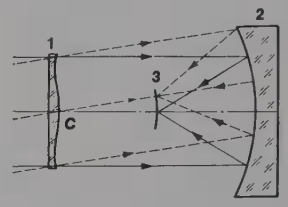

Figure 1. Optical scheme of a Schmidt telescope: (1) correction plate, (2) concave spherical mirror, (3) convex focal surface, (*C*) common center of the mirror and focal plane

The spherical aberration of the mirror is corrected by the correction plate, the central part of which acts as a weak positive lens, and the outer part, as a weak negative lens. The focal surface, on which the image of a segment of the sky is formed, has a spherical shape, whose radius of curvature is equal to the focal distance of the telescope. The focal surface can be converted into a flat surface by means of a Piazzi-Smyth lens. In small Schmidt telescopes, the field of view is limited by a cassette that screens the beam of rays incident on the mirror; in large Schmidt telescopes, it is limited by the aberrations of oblique rays, which are introduced by the correction plate. This plate, in correcting spherical aberrations, gives rise to small residual aberrations (coma and astigmatism), which spoil the image. The chromatism of the correction plate limits the relative aperture of Schmidt telescopes and the operating region of the spectrum. A Schmidt telescope with a primary mirror of a small diameter at a relative aperture $A = 1{:}1$ provides a field of view 20° in diameter; at larger diameters of the primary mirror and at A from 1:2 to 1:3, the diameter of the field of view is about 5°. To eliminate vignetting of the rays at the edge of the field, the diameter of the primary mirror must exceed the diameter of the correction plate by $4l$, where $2l$ is the diameter of the field of view in linear measurement.

A shortcoming of Schmidt telescopes is the considerable length of the tube, which is twice the focal length of the telescope. A number of modifications, including the use of a second (supplementary) convex mirror and the placement of the correction plate closer to the primary mirror, have been proposed to eliminate this shortcoming.

The largest Schmidt telescopes are mounted at the astronomical observatory in Tautenberg in the German Democratic Republic ($D = 1.37$ m, $A = 1{:}3$), the Mount Palomar Observatory in the United States ($D = 1.22$ m, $A = 1{:}2.5$), and the Biurakan Astrophysical Observatory of the Academy of Sciences of the Armenian SSR ($D = 1.00$ m, $A = 1{:}2, 1{:}3$).

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N. N. MIKHEL'SON [29–1322–2]

SCHMITT, HARRISON HAGAN. Born July 3, 1935, in Santa Rita, N.M. US astronaut.

Schmitt graduated from the California Institute of Technology in 1957 with a B.S. in geology. He studied at the University of Oslo in 1957 and 1958 and received a Ph.D. in geology from Harvard University in 1964. Schmitt worked in Oslo for the Norwegian Geological Survey, in New Mexico and Montana for the US Geological Survey, and in Alaska for two summers as a geologist for a private concern.

Schmitt became a member of the National Aeronautics and Space Administration astronaut corps in 1965. Immediately before his association with the Manned Spacecraft Center, he worked at the Astrogeological Center of the US Geological Survey in Arizona, where he helped compile maps of the moon and the planets. From Dec. 7 to Dec. 19, 1972, as pilot of the Apollo 17 lunar landing module, Schmitt made a flight to the moon with E. Cernan and R. Evans. With Schmitt and Cernan aboard, the lunar module touched down in the Taurus-Littrow Valley on December 11. Schmitt's 75 hr on the moon included three excursions onto the surface, for a total of 22 hr 5 min of extravehicular activity. Schmitt and Cernan used what was called a lunar rover to move about on the moon. The entire flight lasted 12 days 9 hr 51 min. [29–1323–3]

SCHMOLLER, GUSTAV VON. Born June 24, 1838, in Heilbronn; died June 27, 1917, in Bad Harzburg. German economist, historian, and state and public figure.

A leading representative of the new (younger) historical school of political economy, Schmoller became a professor at the University of Halle in 1864, the University of Strassburg in 1872, and the University of Berlin in 1882. He became a member of the Prussian Staatsrat (State Council) in 1884 and the Prussian Herrenhaus (Upper House) in 1899. He helped found the Verein für Sozialpolitik (Association for Social Policy) in 1872 and became its chairman in 1890. In 1881 he assumed the editorship of the *Jahrbuch für Gesetzgebung, Verwaltung und Volkswirtschaft im deutschen Reich*.

Schmoller's principal theoretical work was *Foundations for the Comprehensive Study of National Economy* (vols. 1–2, 1900–04). Basing his theories on the ideas of the historical school, he criticized the formal deductive constructs of classical political economy. According to Schmoller, concrete historical research must precede the creation of an economic theory, since only a historical approach makes it possible to determine the causal relations between social phenomena. The behavior of economic entities (individuals and groups) results from the interaction of a variety of factors; therefore, economic science should concern itself with, for example, the intentions of individuals considered as economic units, the level of technological development, the character of existing social institutions, and natural conditions. Schmoller suggested that political economy, as the basic social science, encompasses such disciplines as psychology, sociology, and geography; it is therefore normative and provides a basis upon which to make ethical judgments and practical recommendations.

Criticizing Marxism from the perspective of Katheder-socialism, Schmoller defended active government intervention in the economy in order to stimulate the national economy and mitigate class contradictions. The existence of social classes—whose emergence he linked with racial characteristics, the division of labor, and unequal distribution of income—and the struggle between social classes were considered a necessary condition for social progress. He saw the aim of class struggle, however, not as the revolutionary transformation of society but as a compromise between the opposing parties, who must not violate common ethical standards. Schmoller wrote several works on the socioeconomic and political history of various countries of Western Europe.

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L. D. GUDKOV [29–1324–1]

SCHNEEBERG, a city in the German Democratic Republic, in Karl-Marx-Stadt District. Population, 20,800 (1975). Schneeberg has a textile industry. Other industries include nonferrous metallurgy, engine building, and the manufacture of leather, toys, and lace. The city is known for its wood carving. [29–1326–1]

SCHNEIDER, one of the oldest groups of monopoly capital in France. A major role in the group, which emerged in the first half of the 19th century, is played by the Schneider family.

In 1836, Eugène Schneider and his brother Adolphe acquired metallurgical and metalworking plants in the city of Le Creusot; these developed into the large weapons and metallurgical concern Schneider-Creusot. After World War I the concern controlled enterprises and companies of the machine-building, shipbuilding, automobile, and power-engineering industries, as well as several large French financial institutions.

In 1936, when the nationalization of the French weapons industry went into effect, the plants of Schneider-Creusot devoted solely to arms manufacture were bought by the government. After World War II the government took similar measures with regard to the concern's coal and power-engineering enterprises, insurance business, and several of its banks. In order to build itself up again and modernize production, the concern made extensive use of government aid and accepted approximately $2 million in American credit under the Marshall Plan. In the years after this rebuilding program, the two leading companies in the group were Schneider et Cie and the Union Europeene Industrielle et Financière, which controlled the Schneider industrial and financial empire. The Schneider group is a typical example of a modern trust: a large number of companies, legally independent, are controlled by the holding company Schneider et Cie, which works in concert with the banks and other financial institutions in the group.

In the late 1960's and early 1970's the competitive struggle among the financial groups within the country intensified, and American and Western European corporations increasingly were able to establish themselves in the French economy; during this period Schneider was taken over by the more powerful Empain group, within which it continues to play a major role in the areas of ferrous metallurgy, machine building, and banking. As one of the government's military contractors, the Schneider group manufactures artillery pieces, tanks, and instruments and forms part of the military-industrial complex. The Schneider group has extensive interests in the Federal Republic of Germany, Belgium, and Luxembourg.

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E. F. ZHUKOV [29–1327–1]

SCHNEIDERHÖHN, HANS. Born June 2, 1887, in Mainz; died Aug. 5, 1962, in Sölden, near Freiburg, Federal Republic of Germany. German geologist.

After graduating from the Justus Liebig University in Giessen in 1909, Schneiderhöhn worked as an assistant at the University of Berlin from 1909 to 1914. From 1914 to 1919 he conducted a study of the regional geology and ore deposits of southwestern Africa. Beginning in 1920, he was a professor at the Justus Liebig University. In 1924 he was named director of the Mineralogical Institute of the Technische Hochschule in Aachen. From 1926 to

1955 he was a professor and director of the Geological Institute of the Albert Ludwig University in Freiburg.

Schneiderhöhn's principal works dealt with the development of optical methods of studying ores using a polarizing microscope in beams of reflected light and with the investigation of the origin of ore deposits. Schneiderhöhn substantiated the sedimentary origin of ores in the cuprous sandstones of Africa, the volcanic-sedimentary origin of the copper pyrite deposits of Germany, and the regenerative origin of the ore deposits of the Alpide and Pacific geosynclinal belts. He was the author of well-known textbooks on the geology of ore deposits (1931, 1941).

Schneiderhöhn was a member of scientific societies and academies of sciences of various countries.

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Rudnye mestorozhdeniia. Moscow, 1958.
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V. I. SMIRNOV [29–1326–3]

SCHNITSCHER, JOHANN CHRISTIAN. Dates of birth and death unknown.

Schnitscher, a Swede by nationality, was a captain in the Russian Army. In 1714 he accompanied the Chinese embassy into Kalmykia on its tour through Russia. Schnitscher's records of the mission are a valuable source of information on the life, customs, and beliefs of the Kalmyks, as well as on Russo-Kalmyk and Russo-Chinese relations in the early 18th century.

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Berättelse om Ajuckinska Calmuckiet. . . . Stockholm, 1744.
In Russian translation:
"Zapiska shvedskogo kapitana Ioanna Khristiana Shnichera, kotoryi byl u kitaiskikh poslannikov, byvshikh v 1714 godu u Aiuki khana v provozhatykh." *Ezhemesiachnye sochineniia i izvestiia o uchenykh delakh*, 1764, no. 11.
REFERENCE
Pal'mov, N. N. *Etiudy po istorii privolzhskikh kalmykov*, part 1. Astrakhan, 1926. [29–1328–4]

SCHNITZLER, ARTHUR. Born May 15, 1862, in Vienna; died there Oct. 21, 1931. Austrian writer.

Schnitzler graduated from the medical faculty at the University of Vienna in 1885. His best works written in the late 19th and early 20th centuries continue the traditions of critical realism; they expose the hollowness and cruelty of the worldly life and defend the primacy of true feeling. In the drama *Free Game* (1896; Russian translation under the title *A Slap in the Face*, 1897) and the short story "Lieutenant Gustl" (1901), he portrayed the amorality and the caste-conscious arrogance of officers in the Austrian Army. The effect of Schnitzler's critical statements was weakened, however, by his use of decadent motifs: his play *The Green Cockatoo* (1899) was concerned with the illusoriness of life, and his series of one-act plays *Paracelsus* (1899) dealt with the cult of eternal beauty.

Schnitzler's prose, which includes the novella *Casanova's Homecoming* (1918) and the short-story collections *The Sage's Wife* (1898) and *Masks and Miracles* (1912), is distinguished by psychological insight and an intense concern with sex. Schnitzler was influenced by S. Freud; Freudian tendencies are especially apparent in such late works as the novella *Theresa* (1928).

WORKS
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Poln. sobr. soch., vols. 1–9. Moscow, 1903–11.
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Allen, R. H. *An Annotated A. Schnitzler Bibliography, 1879–1965*. Chapel Hill, 1966. [29–1328–3]

SCHÖFFEN, in medieval Germany, the members of the juridical collegium that determined punishments jointly with the judge presiding over a trial. The institution of the *Schöffen* was based on the Frankish college of *scabini*. The word later came to designate jurors with various powers. [29–1167–3]

SCHOMBURGK, ROBERT HERMANN. Born June 5, 1804, in Freyburg an der Unstrut; died Mar. 11, 1865 in Schöneberg, near Berlin. German explorer in the service of Great Britain.

From 1835 to 1839 and from 1840 to 1844, Schomburgk explored British Guiana (now the Republic of Guyana) and adjacent territories with his brother Richard, a botanist. He mapped the basin of the Essequibo River, discovered the Pakaraima and Roraima mountains, and explored the upper course of the Rio Branco and the upper course and delta of the Orinoco River. In 1860, Schomburgk traveled to Thailand, where he assembled rich zoological and botanical collections.

WORKS
Reisen in Guayana und am Orinoco während der Jahren 1835–1839. Leipzig, 1841.
REFERENCE
Magidovich, I. P. *Istoriia otkrytiia i issledovaniia Tsentral'noi i Iuzhnoi Ameriki*. Moscow, 1965. [29–1344–1]

SCHÖNBEIN, CHRISTIAN FRIEDRICH. Born Oct. 18, 1799, in Metzingen, in what is now the *Land* (state) of Baden-Württemberg in the Federal Republic of Germany; died Aug. 29, 1868, near Baden-Baden. German chemist.

Schönbein studied at the universities of Tübingen and Erlangen. He taught in Switzerland and became a professor at the University of Basel in 1828. He discovered ozone in 1840. Schönbein obtained pyroxylin in 1845, and in 1846 he became the first to prepare collodion from it. [29–1124–2]

SCHÖNBERG, ARNOLD. Born Sept. 13, 1874, in Vienna; died July 13, 1951, in Los Angeles, Calif. Austrian composer.

From 1901 to 1903, Schönberg taught composition at the Stern Conservatory in Berlin. In 1903 he moved to Vienna, where he became known as a composer, conductor, and teacher and as an organizer and director of choral groups. He was a professor at the Prussian Academy of Arts in Berlin from 1925 to 1933. After the fascists came to power, he was forced to emigrate to the USA, where from 1936 to 1944 he taught composition at the University of California at Los Angeles.

In his early works, most notably in the string sextet *Verklärte Nacht* (Transfigured Night; 1899) and the symphonic poem *Pelleas und Melisande* (1903), Schönberg continued the traditions of German and Austrian romanticism and of R. Wagner. Later he developed the dodecaphonic, or twelve-tone, system of composition. Schönberg was the founder of atonal music and the most prominent representative of musical expressionism. His theories greatly influenced several generations of composers, notably—in addition to such students and followers of his as A. Berg and A. von Webern—E. Wellesz, E. Křenek, and R. Leibowitz.

Schönberg most consistently applied the twelve-tone system in such works as the *Fünf Klavierstücke* (1923), the *Serenade for Septet and Baritone* (1923), the concerti for violin (1936) and piano (1942), the monodrama *Erwartung* (1909, staged 1924), and the opera *Moses und Aron* (1932; concert performance, 1954). The music of these works, marked by artificiality and expressionist angst, is devoid of melody.

Shaken by the fascists' destruction of the Warsaw ghetto, Schönberg wrote the story for speaker with orchestra and male chorus *A Survivor From Warsaw* (1947), in which he departed from his characteristic subjectivism. In his works Schönberg protested against the inhuman laws of the bourgeois state, but his overriding theme remained the tragic isolation of the artist in an alien and hostile world.

In addition to *Pierrot Lunaire* (1912), written for voice with chamber accompaniment, Schönberg's other principal works include two chamber symphonies (1906 and 1939), four string quartets, compositions for voice and for piano, and numerous theoretical works.

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M. M. IAKOVLEV [29–1124–3]

SCHÖNBRUNN, TREATY OF (1805), a treaty between France and Prussia. It was signed on Dec. 15, 1805, in the Schönbrunn Palace in Vienna by General M. Duroc for the French side and Minister C. von Haugwitz for the Prussian side.

The signing of the Treaty of Schönbrunn signified Prussia's virtual renunciation of the provisions of the Potsdam Alliance Convention of 1805 between Prussia and Russia. The treaty required Prussia to cede some of its territories to France, including Neuchâtel, Ansbach, and Kleve; in return it received Hanover, which the French had taken from Great Britain in a calculated attempt by Napoleon to drive a wedge between Prussia and Great Britain. The treaty was not ratified by the Prussians, but its principal terms were incorporated into the Treaty of Paris of 1806, which was signed by Prussia and France on February 15.

PUBLICATION
Recueil des traités de la France, vol. 2. Edited by de Clercq. Paris, 1880. Pages 143–44 and 154–56. [29–1125–2]

SCHÖNBRUNN, TREATY OF (1809) (also Schönbrunn Peace), a treaty between France and Austria signed on Oct. 14, 1809, at the Schönbrunn Palace in Vienna, after the conclusion of the Austro-French War (Austrian War of Liberation) of 1809.

Austria was forced to cede Salzburg to Napoleon I for transfer to Bavaria; the county of Görz (Gorizia), Istria, Trieste, Carniola, Fiume (Rijeka), and parts of Carinthia and Croatia passed from Austria directly to France and were included in Napoleon's Illyrian Provinces. Western Galicia was ceded by Austria to the Grand Duchy of Warsaw; the Tarnopol' district of Galicia passed from Austria to Russia as compensation for Russia's participation in the war on the side of the French.

Austria was obligated to join the continental blockade, to break off relations with Great Britain, and to recognize all changes to be carried out by Napoleon in Spain, Portugal, and the Italian states; the treaty specifically stipulated that Austria must renounce intervention in the internal affairs of these states. The strength of the Austrian army was reduced to 150,000 men, and a large indemnity was imposed on Austria. The integrity of the remaining Austrian possessions was guaranteed by Napoleon.

The treaty, which transformed Austria into a virtual dependency of France, was annulled by the Congress of Vienna of 1814–15.

PUBLICATION
Recueil des traités de la France, vol. 2. Edited by de Clercq. Paris, 1880. Pages 293–99. [29–1125–1]

SCHÖNEBECK, a city in the German Democratic Republic, in Magdeburg District, on the Elbe River. Population, 45,000 (1975). Schönebeck is a railroad junction and river port. Industry includes the manufacture of tractors, diesel engines, chemicals, and rubber and concrete products. Bad Salzelmen, a health resort with salt springs, is located near Schönebeck. [29–1128–2]

SCHONGAUER, MARTIN (also Schön Martin). Born between 1435 and 1440 in Colmar, now in France; died Feb. 2, 1491, in Breisach, Baden. German graphic artist and painter.

Schongauer studied in the Netherlands, where he was greatly influenced by Rogier van der Weyden. Schongauer worked in Colmar and Breisach beginning in 1483. He is known for his paintings, including *Madonna in a Rose Garden* (1473), and especially for his copper etchings, such as *The Temptation of Saint Anthony, The Annunciation, Calvary, Madonna in a Courtyard, Peasants Going to Market*, and a series of passion scenes. These works are distinguished by expressiveness of form, and several are examples of harmonious, clear composition. Schongauer's works combine features of the late Gothic and the early Renaissance. They had a significant influence on the masters of the German Renaissance, including A. Dürer.

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[29–1346–2]

SCHÖNGRABERN, BATTLE OF (1805), a battle fought between Russian and French troops on November 4 (16), near the village of Schöngrabern, Austria, near Hollabrunn, during the Russo-Austro-French War of 1805 (War of the Third Coalition).

With Vienna occupied by the French, the Russian Army, commanded by M. I. Kutuzov, found itself in a difficult position as it retreated to Znaim (Znojmo) after crossing the Danube at Krems. Kutuzov sent General P. I. Bagration's detachment of 6,000 men to Schöngrabern to delay the advance of the French marshal J. Murat's vanguard of 30,000 men, which was moving toward Znaim to cut off the Russian Army's line of retreat. Owing to skillful leadership and the tenacity of his troops, Bagration, in stubborn fighting in which the Russians lost more than 2,000 men, succeeded in delaying the enemy and protecting the withdrawal of the main forces. Bagration's detachment then retreated and on November 6 (18) joined the main forces at Pohrlitz (Pohořelice). [29–1127–3]

SCHÖNHERR, KARL. Born Feb. 24, 1867, in Axams, Tirol; died Mar. 15, 1943, in Vienna. Austrian dramatist and prose writer.

Schönherr studied medicine and philosophy at the University of Vienna. At the beginning of the century, influenced by the traditions of the realistic drama of L. Anzengruber, he wrote plays that were critical of village life, including the comedy *Earth* (1907). Schönherr heroized and romanticized rural life to a certain extent and introduced a demonic element in such plays as *A Tirolean Judas* (1927) and *A People in Need* (1916). The consequent attempts of the ideologists of "blood and soil" to use Schönherr's name and works for profascist purposes provoked a strong protest from the writer. He voiced criticism of Hitler after 1933 and vehemently opposed the Austrian *Anschluss*.

Schönherr was also the author of the tragedy *Faith and Fatherland* (1910), of psychological dramas, and of humorous prose written in the Tirolean dialect.

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Vogelsang, H. *Österreichische Dramatik des 20 Jahrhunderts*. Vienna-Stuttgart [1963].
IU. I. ARKHIPOV [29–1130–3]

SCHÖNHERZ, ZOLTÁN. Born July 25, 1905, in Košice, Czechoslovakia; died Oct. 9, 1942, in Budapest. Figure in the Czechoslovak, Hungarian, and international working-class movements; an electrical engineer by education.

After graduating from Charles University in Prague, Schönherz worked for the Communist Party of Czechoslovakia (CPC). In 1934 he served as secretary of the Hungarian group of the Youth League of Slovakia; in 1935 he was a representative of the Czechoslovak Communist Youth in the Communist International of Youth. Schönherz helped organize an antifascist league of Slovak and Hungarian youth organizations between 1936 and 1938, and he was one of the leaders of the Hungarian Youth League, which was established by the CPC. In December 1940 he became a member of the Secretariat of the Communist Party of Hungary (CPH), and in January 1941 he became a member of the Central Committee. As a participant in the resistance movement in Hungary, he headed the Committee for National Independence and contributed to the newspaper *Szabad nép*, an organ of the CPH.

Schönherz was arrested on July 6, 1942, and was executed in accordance with the sentence of a military tribunal.

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Szerémi, B. *Schönherz Zoltán*. Budapest, 1952. [29–1131–1]

SCHOOL, in art, a trend represented by a group of students and followers of some artist, for example, the Venetsianov school, or by a group of artists who share similar creative principles and work in a similar style, such as the Stroganov school of icon painting. The term is also applied to the painting and sculpture of a city or region when the works in question date from a specific period and are stylistically distinguishable as a group, for example, the Bolognese school. The term may be extended to refer to the art of an entire country, for example, the Flemish school.

[29–1262–1]

SCHOOL, an institution for the organized education, instruction, and upbringing of the rising generation, as well as adults and young workers.

Schools may be classified according to who organizes them and where they get their funds as state, municipal (local-government), or private; private schools are supported by social or religious organizations or by private individuals. Depending on their course of instruction, schools may be classified as general or vocational (specialized); the level of education offered may be primary, incomplete secondary, secondary, or higher. With respect to religion, schools may be secular or sectarian. They may be classified according to the students' sex as boys' (men's), girls' (women's), or coeducational. The aims, tasks, and nature of schools depend on the society's level of development and its class structure.

The first schools originated in the countries and states of the ancient East, such as Babylonia, Assyria, Egypt, and India. They included temple schools for priests, palace schools for the education of the aristocracy, and schools for scribes, who were needed in administrative and economic management. In the classical world, the school was a highly important part of the Spartan, Athenian, and Roman systems of upbringing (*see* SPARTAN UPBRINGING; GREECE, ANCIENT: Education; and ROME, ANCIENT: Education).

In the feudal period, schools in the East developed under the influence of the dominant religions—Hinduism, Buddhism, and Islam—and served the interests of the feudal lords. In India, for example, schools were attached to large temples and were intended mainly for the children of Brahmans and Kshatriyas. In addition to reading and writing, instruction was given in the sacred books, epic poems, mythology, grammar, literature, history, philosophy, mathematics, astronomy, and medicine. The children of the lesser landowners were taught reading, writing, and arithmetic in their local language at "communal" Hindu schools attached to rural temples. At Buddhist monasteries in the East there were, in addition to primary and secondary schools, higher theological schools, at which religious subjects and such sciences as mathematics and astronomy were taught. In Muslim regions and countries there were *maktabs* (Muslim primary schools) and madrasas (Muslim secondary and higher schools).

In medieval Western Europe the Catholic Church established a monopoly over education, and all schools came under the control and ideological direction of the church. Beginning in the fifth century, elementary parish schools for boys were created at some churches, monastic schools were established at monasteries, and bishop's schools, also known as cathedral or episcopal schools, were founded in episcopal sees. The growth of the medieval cities was accompanied, in the 12th century, by the founding of the first universities. In the 13th and 14th centuries, to provide an alternative to the church schools, craft and guild schools were opened, which evolved into municipal schools in the 15th and 16th centuries. As the system of church schools developed, new schools were established for the children of secular feudal lords, such as the aristocratic grammar and public schools in England, the *Ritterakademien* in Germany, and the classical *Gymnasiums* in Germany and other countries (*see* CLASSICAL EDUCATION). The children of the townspeople studied at burgher schools, *Realschulen*, trade schools, and technical schools.

With the rise of capitalism in Western Europe, the social-estate school became the class, bourgeois school, in which, as V. I. Lenin pointed out, "education is organised in one and the same way, and is equally accessible to all the *wealthy*" (*Poln. sobr. soch.*, 5th ed., vol. 2, p. 476). In developed capitalist countries, laws were passed in the 19th century to establish universal compulsory primary education for children of both sexes, and schools were declared uniform and secular. In practice, this legislation was never fully implemented. In addition to classical secondary schools, *Realschulen* and vocational schools continued to be established; these schools met the needs of the bourgeoisie for trained personnel in trade and industry (*see* REALSCHULE EDUCATION). The natural sciences were gradually added to the curricula of the classical schools.

Schools in the colonized countries of Asia, Africa, and Latin America served the interests of the ruling classes of the respective mother countries, notably Spain, Great Britain, and France. The need for auxiliary personnel from the indigenous ("aboriginal") population that would be loyal to the colonialists made it necessary to establish a variety of schools for the "coloreds" with instruction in the language of the mother country. In addition to primary schools, these included a small number of advanced primary schools; secondary schools, such as secondary grammar schools, colleges, *collèges*, and *lycées*; and higher educational institutions, including universities. Instruction was given in the language of the respective mother country.

The institutions established by the colonial powers trained future overseers and civil servants, as well as soldiers and junior officers for the "colored troops." Students included the children of the local aristocracy and bourgeoisie; the sons of tribal chiefs attended closed privileged schools. The rise of national liberation movements hastened the establishment of higher educational institutions; India, for example, had 18 universities before World War II. The schools were, however, strictly controlled by the colonial powers. The bulk of the indigenous population remained illiterate. This harsh legacy of colonialism is being overcome in the countries that have achieved independence.

Before the October Revolution of 1917 the emergence of the first schools and the development of school systems among the peoples who make up the USSR were determined by the particular historical features of the development of these peoples. In Armenia and Georgia, information on the first schools dates from the fourth century and in Azerbaijan from the fifth century. In Middle Asia and Azerbaijan, Muslim *maktabs* and madrasas were established beginning in the seventh century and remained unrivaled until the October Revolution.

The chronicles do not provide a complete picture of schools in Kievan Rus', which were established between the tenth and 13th centuries at monasteries, in parishes, and at the courts of princes. The *beresto* writings of the 11th–15th centuries contain information on the methods used to teach reading and writing, and they show that literacy in ancient Rus' extended to the feudal aristocracy, the clergy, and the townspeople, as well as to the *posadskie liudi* (urban merchants and artisans) and other merchants and artisans.

In prerevolutionary Russia various primary schools existed for the broad masses. The wealthy classes educated their children at *Gymnasiums*, *Realschulen*, commercial schools, and higher educational institutions, including universities. Elements of the system of social estates were preserved in the school system, notably in the restricted educational institutions for the nobility: the cadet corps, the *lycées*, the Corps of Pages, and the institutes for wellborn girls. In addition, the educational system did not provide for a transition from the primary (public) schools to the *Gymnasiums*. Entry into schools was subject to national and religious restrictions.

The church was charged with inculcating loyal sentiments and piety in the youth. In addition to special schools for training the clergy, the Synod directly controlled the system of literacy schools, parochial schools, and eparchial schools. Religion was a compulsory subject in all schools. The level of literacy in Russia lagged behind that in the developed capitalist countries, and illiteracy was prevalent among the working people. Lenin noted in 1913 that "four-fifths of the rising generation are doomed to illiteracy by the feudal state system of Russia" (*ibid.*, vol. 23, p. 127).

Schools in the USSR and other socialist countries. After the October Revolution of 1917, schools were declared public and open to all, irrespective of social status or nationality. Coeducational instruction was introduced in 1918. Schools were separated from

the church and became state controlled and secular. The goal of the schools, as stated in the Program of the RCP(B) of 1919, was to "educate a generation that will be capable of fully establishing communism" and to produce well-rounded and harmoniously developed individuals with firm communist beliefs. The structure, curricula, and organization of Soviet schools undergo changes as socialist society develops and as science and culture advance, but they rest on principles that remain constant.

General-education schools train their students for labor and provide a polytechnical education (*see* SECONDARY GENERAL-EDUCATION SCHOOL and POLYTECHNICAL EDUCATION). In addition to vocational training, specialized secondary educational institutions offer a general education. Instruction is free at all types of schools, and at such institutions as boarding schools and vocational-technical institutions some students are maintained at state expense. Students at specialized secondary educational institutions and higher educational institutions receive government stipends (*see* HIGHER EDUCATION).

The school system is uniform, and the various types of schools represent a continuous series, so that a student may advance from the primary to the highest level. The children of each nationality of the USSR have the right to be taught in their native language. Universal primary education was made compulsory in 1934, and universal eight-year education in 1962. By 1976 the transition to universal secondary education had essentially been completed.

The other socialist countries have looked to the USSR as a model for building an educational system; at the same time, they have taken into account their own specific historical conditions and national characteristics. The socialist countries conform to a common pattern in the construction of a new society and the education of well-rounded individuals capable of becoming builders of socialism and communism. The schools of the socialist countries operate according to uniform principles, although they may be of different types and may have different designations and structures; in addition, the length of instruction and the level of compulsory universal education may vary.

Schools in modern capitalist countries. An aspect of the general crisis of capitalism is the educational crisis in bourgeois countries, which is manifested in their inability to restructure the educational system to meet the needs of industrial development. The bourgeois school system, whose goals remain unchanged, seeks to create for the bourgeoisie "useful servants, able to create profits for it without disturbing it" (Lenin, *ibid.*, vol. 41, p. 303).

State appropriations for education in the capitalist countries are not sufficient to operate a school system in a proper fashion. In several countries, such as Great Britain, the USA, France, the Federal Republic of Germany, and Japan, secondary schools are becoming more widespread, and measures are being taken to reorganize the school system, its curricula and instructional methods, and its management. Existing legislation on universal compulsory education for the poorest strata of the population is not being implemented, however, because of widespread unemployment and racial and national discrimination; equal secondary education is not universally available. Subtle methods for preserving class inequalities, reflected in the material being taught and in the quality of instruction, exist in schools of various types. There are also sophisticated ways of selecting by class the students who will advance to the higher educational levels and who will specialize in prestigious areas of study; this selection is accomplished through the track system, the existence of expensive private schools, and special tests.

(Schools are also discussed in the sections on education and cultural affairs in the articles on Union republics, autonomous republics, and foreign countries.)

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P. I. KULIKOV [29–1258–4]

SCHOOL ADMINISTRATION (Russian, *shkolovedenie*), the branch of pedagogy that studies the means and methods of administering schools, reveals the distinctive features in the system of school management, and analyzes the specific problems involved in organizing such a system.

The field of school administration draws primarily on Soviet law, the administration and management of schools in the USSR and abroad, the pedagogical legacy of the past, and the conclusions and recommendations of pedagogical science. In addition to the basic principles of school administration and management, school administration scholars study the work of public-education agencies with respect to the operational, pedagogical, and economic management of schools; specifically, they examine the implementation of universal education, the various types of general-education schools, the building of an efficient network of general-education schools, the pedagogical needs that must be met when designing and constructing schools and school buildings, the financing of schools, and the various ways of providing schools with teaching equipment.

School administration specialists also deal with the activities of public-education agencies involving the educational work of schools; these activities include the organization of methodological assistance for teachers and the inspection of schools. Other subjects of research by school administration scholars include the Soviet schoolteacher, the organization of records and accounts of educational institutions, and school statistics.

The field of school administration is based on the progressive tradition in the administration and management of Soviet schools expressed in Leninist decrees on public education; this tradition has been enriched by the practical activity and theoretical pronouncements of education workers and public-education agencies. Decrees of the Central Committee of the CPSU and the Council of Ministers of the USSR have indicated that the man-

agement of schools must be carried out in a more scientific manner. Proceeding from these instructions, Soviet school administration specialists deal with organizational and pedagogical problems involving the implementation of universal secondary education, the organization of educational work in various types of schools, the management of schools, and the administration of education at all levels.

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[29–1267–1]

SCHOOL OF MATHEMATICAL AND NAVIGATIONAL SCIENCES, an educational institution founded by Peter I the Great in Moscow in 1701 to train navy specialists, shipbuilders, geodesists, and engineers. Graduates of the school were also appointed as teachers in the newly created *tsifirnye shkoly* ("mathematical" schools) and in artillery, engineering, admiralty, and other special schools. In addition, they worked as civil servants in government institutions. The school was located in the building of the Sretenskaia, or Sukharev, Tower, at the top of which an astronomical observatory with a telescope was established. Youths between the ages of 12 and 20 from all social classes except the serf class were admitted to the school. Full financial support was provided by the state for those in need.

The curriculum at the school was divided into three levels (classes, or schools). In the elementary school, known as the Russian school, students were taught reading, writing, and the fundamentals of grammar and arithmetic. In the *tsifirnaia shkola*, they were instructed in arithmetic, geometry, and plane and spherical trigonometry. In the higher classes, the navigational classes, they received instruction in mathematical geography, astronomy, drafting, geodesy, navigation, and other subjects. Most students, primarily those of nongentry origin, were restricted to the first two levels and were appointed to subordinate positions in the navy, such as clerks. Students in the higher classes were required to receive practical training on seagoing vessels, at shipyards, and in roadbuilding. The principal organizers at the school were L. F. Magnitskii and A. Farvarson, who was invited to Russia from Scotland. In 1703 the school had 300 students, and in 1711, 500.

In 1715 the navigational classes of the school were transferred to St. Petersburg, where the Naval Academy (Naval Guards Academy) was established on their basis. The Russian and arithmetic classes continued to operate in Moscow to prepare students for the new academy. They were discontinued in 1752, after the founding of the Naval Cadet Corps.

Among the graduates of the School of Mathematical and Navigational Sciences were the admirals N. F. Golovin and V. Ia. Chichagov, the geodesists I. K. Kirilov, M. S. Gvozdev, I. M. Evreinov, and F. F. Luzhin, and the well-known educator N. G. Kurganov.

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[29–1264–3]

SCHOOLS, INDUSTRIAL TRAINING, beginning-level vocational-technical schools that existed from 1940 to 1963 at industrial enterprises and construction sites within the system of the State Labor Reserves of the USSR.

The industrial training schools prepared workers to occupy the most common jobs in various branches of the economy, including the construction, coal, mining, metallurgical, and petroleum industries; the course of study lasted six months. The schools admitted young people 16–18 years old with any general education whatsoever until 1955, when the admission requirement was changed; thereafter, at least an elementary education was required. Only young men 18 or over were admitted for training in occupations involving work underground, in shops where workers were exposed to high temperatures, and on construction sites. Students were fully maintained by the state.

In 1949 the industrial training schools for the coal and mining industries were reorganized as mining schools, with a six-month and a ten-month course of study. The industrial training schools for construction were reorganized as ten-month construction schools in 1955 and extended to two-year construction schools in 1957. Between 1959 and 1963, all industrial training, mining, and construction schools were reorganized as vocational-technical schools (*see* VOCATIONAL-TECHNICAL EDUCATION and VOCATIONAL-TECHNICAL EDUCATIONAL INSTITUTIONS). The industrial training schools provided instruction for approximately 6 million workers.

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[29–1265–3]

SCHOOLS, LITERACY (1) In prerevolutionary Russia, one- and two-year primary schools, operated under the auspices of various government departments or private individuals until 1891, when they were turned over to the Synod. Education at the literacy schools was limited to memorizing prayers and to mastering the rudiments of reading, writing, and arithmetic. The schools were abolished after the Great October Revolution of 1917.

(2) In the 1920's in Russia, one- and two-year training centers and schools for the elimination of illiteracy (*see* LITERACY and SCHOOLS FOR ADULTS).
[29–1268–2]

SCHOOLS FOR ADULTS, general-education institutions at which workers may receive instruction without leaving their jobs.

The first schools for adults—mainly primary schools—were created by private initiative in Russia in the late 1850's (*see* EVENING SCHOOLS and SUNDAY SCHOOLS). After the October Revolution of 1917, a state system of adult education was established, and in 1918 one- and two-year training centers and schools for the elimination of illiteracy were opened. After publication of the decree of the Council of People's Commissars On Eliminating Illiteracy in the RSFSR (1919), such schools and centers were set up throughout the country. Designed primarily for working people between the ages of 16 and 50, they existed until the late 1930's.

In the 1920's and 1930's instruction for persons who had mastered the rudiments of reading and writing was given in schools for the semiliterate and in advanced schools for adults; the former offered a primary education, and the latter a seven-year education. Workers' universities, peasants' universities, and one- and two-year general-education schools for adults also helped to raise the general cultural level of workers and peasants and provided advanced production training.

In 1936 two types of schools for adults were created: incomplete secondary general-education schools, formed from elementary schools, and secondary general-education schools, formed from seven-year schools. In 1937, the first incomplete secondary and secondary general-education correspondence schools were opened. In 1943 the schools for young workers and schools for rural youth became schools for adults, which in 1958 were renamed evening (shift) secondary general-education schools (*see* EVENING EDUCATION). Foremen's schools (classes) were first established in the USSR in 1962.

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SCHOOLS FOR APPRENTICESHIP IN INDUSTRY, the basic Soviet vocational-technical schools from 1920 to 1940.

The schools for apprenticeship in industry were opened at large enterprises to train as skilled workers young people who were 14–18 years old and had a primary education. The schools had a three- or four-year course of study and offered both vocational training and a general education. From 1930 to 1939 the schools offered instruction primarily to young people who had completed the seven-year primary school; the course of study was reduced to 1.5–2 years by decreasing the number of hours devoted to general-education subjects. The schools turned out 2.5 million skilled workers for the country.

After 1940 the schools for apprenticeship in industry were found chiefly in light industry and in the food-processing industry. Between 1959 and 1963 the schools, together with all vocational-technical educational institutions in the USSR's State Labor Reserves system, were reorganized as vocational-technical schools, with courses of study of varying lengths (*see* VOCATIONAL-TECHNICAL EDUCATION).

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SCHOOLS FOR KOLKHOZ YOUTH, rural general-education schools in the USSR that provided a seven-year education for students having a primary level education. The schools first appeared in 1923 and were called schools for peasant youth; in 1930 they were renamed schools for kolkhoz youth and the course of instruction was shortened to three years. In addition to providing a general education, the schools taught the fundamentals of agronomy and the basic principles for organizing agricultural production as applied to conditions in specific regions or zones.

The first evening schools for kolkhoz youth were established in 1928, and the first accelerated schools in 1930. Production training, which was subordinated to the task of socialist transformation of the countryside, was conducted at training farms, sovkhozes, cooperatives, kolkhozes, and machine-tractor stations. The schools for kolkhoz youth helped create an activist contingent of kolkhoz workers in the countryside, raise the cultural level of the peasants, increase the peasants' knowledge of agronomy, and bring new agricultural machinery into use on the kolkhozes. In 1934 the schools for kolkhoz youth were converted into incomplete secondary schools (seven-year schools).

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SCHOOLS FOR PEASANT YOUTH, rural general-education schools in the USSR from 1923 to 1930 that covered the fifth through seventh grades and offered both day and evening instruction. In addition to general subjects, students were taught the fundamentals of agronomy and were trained for agricultural work. In 1930 the schools for peasant youth were renamed schools for kolkhoz youth. [29–1264–2]

SCHOOLS FOR RURAL YOUTH, general-education institutions in the USSR at which students received instruction without interrupting their agricultural work. The first schools for rural youth were opened in 1944 and offered instruction at the level of the primary and seven-year schools. The schools, which were established in large settlements, and at kolkhozes, sovkhozes, and machine-tractor stations, covered the first through fourth grades or the first through seventh grades. In 1956, the first secondary schools for rural youth, covering the fifth through tenth grades and the eighth through tenth grades, were opened. In 1958 the schools for rural youth were renamed evening (shift) secondary general-education schools.

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SCHOOLS FOR WORKING YOUTH, general-education schools in the USSR at which students may receive instruction without leaving their jobs.

Since 1958, evening (shift) secondary general-education schools and secondary general-education correspondence schools at the oblast, krai, republic (in the autonomous republics), and city (in such major cities as Moscow and Leningrad) levels have been classified as schools for working youth; in 1962, foremen's schools and classes were also placed in this category. In the 1976–77 academic year, 4,917,000 students were enrolled in 14,020 evening (shift) and general-education correspondence schools, 92.7 percent of whom were in grades nine through 11. At various times evening schools for adults, Sunday schools, schools for adults, schools for young workers, and schools for rural youth have been schools for working youth. [29–1269–1]

SCHOOLS FOR YOUNG WORKERS, general-education schools in the USSR at which students received instruction without leaving their jobs. The first schools for young workers were established in 1943 and were called schools for adolescents working at enterprises; in 1944 they were renamed schools for young workers. The schools, which offered general educational training comparable with seven-year and secondary schools, covered the fifth through seventh grades and fifth through tenth grades. In 1958 the schools for young workers were renamed evening (shift) secondary general-education schools (*see* EVENING EDUCATION).

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SCHOOL THEATER, a form of theater that originated in the educational establishments of Western Europe in the Middle Ages as a means of general upbringing and of studying Latin. The school theater was subsequently used to strengthen Catholicism and Protestantism. The plays were eventually performed in the vernacular. School dramas resembled mystery, miracle, or morality plays or plays on historical and mythological themes.

The school theater existed in many countries in Western Europe from the 15th to 18th centuries and in Russia in the 17th and 18th centuries. It had its own basic theoretical principles and rules carefully developed by such humanist writers as G. Pontano in Italy, J. C. Scaliger in France, and the scholar and poet Feofan Prokopovich in Russia.

Because Polish Jesuits encouraged school drama in the 16th and 17th centuries, the art became highly developed in Poland and from there spread to the Ukraine. Many school dramas were written at the Kiev Mogila Academy. The founder of school theater in Rus' was Simeon Polotskii. While outlining a project for establishing a religious academy in Moscow, Polotskii wrote of the need to organize a theater at the academy. He also wrote for the theater the plays *A Comedy Parable About the Prodigal Son* and *King Nebuchadnezzar*. Under Peter I, the school theater stressed political themes, glorifying the new undertakings of the government; a typical example is Feofan Prokopovich's *Vladimir* . . . (staged 1705).

Presentations of school theater were given in educational establishments and in squares during festivals; between the acts interludes were performed, mainly comic scenes from everyday life.

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SCHOONER, a fore-and-aft rigged vessel with at least two masts. With displacements of 100 to 5,000 tons, schooners are used as cargo, fishing, sport, and training vessels. Most modern schooners are equipped with internal-combustion engines, which enable them to travel during calm weather and in narrow fairways. The barkentine and the brigantine are special types of schooners. [29–1560–6]

SCHOPENHAUER, ARTHUR. Born Feb. 22, 1788, in Danzig (now Gdansk); died Sept. 21, 1860, in Frankfurt am Main. German idealist philosopher.

In 1820, Schopenhauer became a privatdocent at the University of Berlin, and from 1831 he lived in Frankfurt am Main. His principal work is *The World as Will and Idea* (vols. 1–2, 1819–44). The Kantian a priori forms—time, space, and the categories of reason—were reduced by Schopenhauer to a single fundamental law of sufficient foundation. Subject and object are considered as corelative factors that make up the world as the "idea" (*Vorstellung*) of the subject. On the other hand, the world taken as a "thing in itself" is represented in Schopenhauer as a blind, irreducible "will to life," which is fractionated into an infinite multiplicity of "objectifications." Peculiar to each objectification is a striving toward absolute domination, which is expressed in an unceasing "war of all against all." At the same time the multiplicity of the objectifications of the will also exists as a hierarchical entity, reflecting the hierarchy of ideas (understood in the Platonic sense), that is, of adequate objectifications of the will. The highest degree in the series of objectifications of the will is man—a creature endowed with a rational awareness. Each cognizant individual is aware of his own will to life, and all other individuals exist in his idea as something dependent on his being; this serves as the source of man's limitless egoism.

The social organization (the state) does not abolish egoism, according to Schopenhauer, since it is merely a system of balanced private wills. The overcoming of egoistic impulses is carried out in the sphere of art and morals. Art is the creation of genius, based on the capacity of "disinterested contemplation," in which the subject acts as a "pure, will-less" subject and the object functions as the idea. The highest of the arts is music, which has as its goal not the reproduction of ideas but rather the direct reflection of the will itself.

In emphasizing the illusory nature of happiness and the inevitability of suffering, rooted in the very "will to life," with its senselessness and eternal dissatisfaction, Schopenhauer—in contrast to Leibniz—called the existing world the "worst of all possible worlds," and he designated his own doctrine as "pessimism." Schopenhauer considered the true foundation of morality to be the sense of compassion, owing to which the deceptive appearance of individuality is dissolved in the awareness of the unity of all being.

Schopenhauer's irrationalistic and pessimistic philosophy, which was not popular during his lifetime, found wide acceptance during the second half of the 19th century; it became one of the sources for the philosophy of life and was a predecessor of a number of the concepts of depth psychology (the doctrine of the unconscious). Schopenhauer's influence was felt by R. Wagner, E. von Hartmann, F. Nietzsche, and T. Mann, among others. In 1911 the Schopenhauer Society was founded in Frankfurt am Main.

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A. A. CHANYSHEV [29–1350–1]

SCHORL, a mineral, a black ferruginous variety of tourmaline with isomorphic admixtures of magnesium, manganese, and trivalent iron (*see* TOURMALINE). Schorl is found in granites, pegmatites, greisens, skarns, gneisses, hydrothermal veins, and various metamorphic shales. [29–1141–1]

SCHORLEMMER, KARL. Born Sept. 30, 1834, in Darmstadt; died June 27, 1892, in Manchester. German organic chemist. Fellow of the Royal Society of London (from 1871).

Schorlemmer was educated at the Justus Liebig University in Giessen. In 1859 he began working at Owens College in Manchester, where he became a professor in 1874. Schorlemmer's main works dealt with saturated hydrocarbons. Schorlemmer proved the equivalence of the four valences of carbon (1868). He proposed a system of classifying organic compounds and used it as a basis for his textbook *Lehrbuch der Kohlenstoffverbindungen* (1872; 3rd ed., 1885–97). He was also the author of works on the history of organic chemistry.

A progressive public figure, Schorlemmer was a member of the German Social Democratic party and a friend of K. Marx and F. Engels.

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SCHÖRNER, FERDINAND. Born June 12, 1892, in Munich; died July 2, 1973. Fascist German field marshal (1945).

A veteran of World War I, Schörner also fought in World War II, commanding the XIX Mountain Corps above the arctic circle in 1942 and 1943 and the 40th Tank Corps in the Ukraine in 1943 and early 1944. In February 1944 he was appointed chief of staff of the Nazi command of the army. Schörner commanded Army Group South Ukraine from April to July 1944 and Army Group North from July 1944 to January 1945, when he assumed command of Army Group Center. Appointed commander in chief of the army on Apr. 30, 1945, he attempted to continue resistance against Soviet forces in Czechoslovakia after fascist Germany capitulated. After surrendering to the American forces, he was turned over to Soviet authorities and convicted as a war criminal by a military tribunal. Schörner was released from prison in 1955. [29–1142–3]

SCHOTT, FRIEDRICH OTTO. Born Dec. 17, 1851, in Witten (Ruhr); died Aug. 27, 1935, in Jena. German chemist. Founder (1884) and head of the Jena Glassworks (Jenaer Glaswerk Schott und Genossen).

Schott studied at the Technische Hochschule in Aachen, as well as at the universities of Würzburg and Leipzig. His research was primarily devoted to the chemistry and technology of glass. By adding various oxides in different proportions—oxides of bar-

ium, zinc, lead, boron, and phosphorus—to the glass composition, Schott developed new types of glass, with highly valuable optical, chemical, thermal, and electrical properties. His research served as the basis for the development of the German optical glassmaking industry. Schott also organized the manufacture of high-quality glass chemical, medical, and electrical-engineering equipment.

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SCHOTT, PAUL GERHARD. Born Aug. 15, 1866, in Tschirma, Thuringia; died Jan. 15, 1961, in Hamburg. German oceanographer (Federal Republic of Germany).

Schott graduated from the University of Berlin in 1891. Beginning in 1921, he was a professor at the University of Hamburg. In 1891–92, Schott took part in scientific expeditions in India and East Asia. In 1898–99 he was a member of the German oceanographic expedition in the Atlantic and Pacific oceans on the ship *Valdivia*. In 1902 he conducted research in the West Indies. Schott was a member of the expedition that circumnavigated the globe on the ship *Meteor* in 1929. He wrote the first monographs on the geography of the Atlantic, Indian, and Pacific oceans, which served as a foundation for the further study of the oceans.

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SCHOTTKY BARRIER, a potential barrier that is formed in the contact region of a semiconductor, that is, in the region that adjoins a metal. The barrier is named after W. Schottky, the German scientist who investigated it in 1939. To obtain a Schottky barrier, the work functions of the metal and the semiconductor must differ, as was first pointed out in 1939 by the Soviet scientist B. I. Davydov.

If an *n*-type semiconductor is brought into contact with a metal whose work function Φ is higher than that of the semiconductor, the metal becomes negatively charged and the semiconductor becomes positively charged, because electrons pass from the semiconductor to the metal more easily than in the opposite direction. If a *p*-type semiconductor is brought into contact with a metal whose work function Φ is lower than that of the semiconductor, the metal becomes positively charged and the semiconductor becomes negatively charged. When equilibrium between the metal and the semiconductor is established, a contact potential U_c appears; $U_c = (\Phi_m - \Phi_s)/e$, where e is the charge of the electron. Owing to the high conductivity of the metal, the electric field does not penetrate the metal, and the potential difference U_c is produced in the surface layer of the semiconductor. The direction of the electric field in the semiconductor's surface layer is such that the energy of majority carriers in the surface layer is higher than that in the bulk of the semiconductor. This means that the energy bands of the contact region are bent upward in an *n*-type semiconductor and are bent downward in a *p*-type semiconductor (see Figure 1). As a result, if $\Phi_m > \Phi_s$ for an *n*-type semiconductor or if $\Phi_m < \Phi_s$ for a *p*-type semiconductor, a potential barrier is produced in the semiconductor near the contact with the metal.

The height of a Schottky barrier $\Phi_0 = \Phi_m - \Phi_s$. In real metal-semiconductor structures, this relationship does not obtain because local electronic states are usually present at the surface of the semiconductor or in the thin dielectric layer that is often formed between the metal and the semiconductor. The electrons in the local surface states shield the effect of the metal, so that the intrinsic field in the semiconductor is determined by the surface states and the height of the Schottky barrier does not depend on Φ_m. As a rule, Schottky barriers obtained by depositing an Au film on an *n*-type semiconductor have the greatest heights. The intensity of an electric image (*see* SCHOTTKY EFFECT) also affects the height of a Shottky barrier.

A Schottky barrier has rectifying properties. When an external electric field is applied, the current through such a barrier is produced almost entirely by majority carriers. The magnitude of the current is determined by the rate at which carriers from the bulk of the semiconductor arrive at the surface or—in the case of a semiconductor with a higher carrier mobility—on the thermionic current in the metal.

Schottky-barrier metal-semiconductor contacts are widely used in microwave detectors and mixers (*see* SCHOTTKY BARRIER DIODE), as well as in, for example, transistors and photodiodes.

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T. M. LIFSHITS [29–1362–1]

SCHOTTKY BARRIER DIODE (also Schottky diode), a semiconductor diode that is based on a metal-semiconductor contact. The Schottky barrier diode is named after W. Schottky, the German scientist who developed the principles of the theory of such diodes in 1938 and 1939.

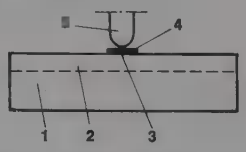

Figure 1. The structure of a Schottky-barrier detector diode: (1) semiconductor substrate, (2) epitaxial film, (3) metal-semiconductor contact, (4) metal film, (5) terminal

Schottky barrier diodes are fabricated by depositing a thin film of metal—for example, Au, Al, Ag, or Pt—on the clean surface of a semiconductor crystal—such as Si, GaAs, or, less often, Ge—by means of vacuum evaporation, cathode sputtering, chemical deposition, or electrodeposition. In the contact region of the semiconductor, as in the junction region of a diode with a *p-n* junction, a potential barrier is formed (*see also* SCHOTTKY BARRIER). The variation of the height of the potential barrier when an external voltage, or bias, is applied results in a change in the current through the device (*see*, for example, Figure 2 in SEMICONDUCTOR DIODE). In contrast to the current through a *p-n* junction, the current through the metal-semiconductor contact is due only to majority carriers.

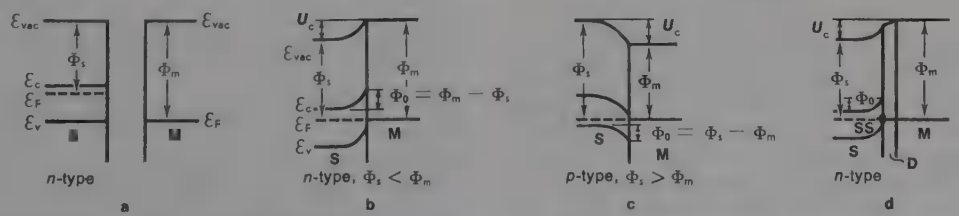

Figure 1. Energy diagrams for metal-semiconductor contacts: (a) semiconductor and a metal before being brought into contact, (b) an ideal metal–*n*-type semiconductor contact, (c) an ideal metal–*p*-type semiconductor contact, (d) a real contact; (M) metal, (S) semiconductor, (D) dielectric layer, (SS) surface electronic states, ($\mathcal{E}_{vac}$) electron energy level in vacuum, ($\mathcal{E}_v$) electron energy level at the top of the valence band, ($\mathcal{E}_c$) electron energy level at the bottom of the conduction band, ($\mathcal{E}_F$) Fermi energy

Several features distinguish Schottky barrier diodes from other types of semiconductor diodes. A desired barrier height may be obtained by choosing an appropriate metal. The volt-ampere characteristic is substantially nonlinear at low forward biases. The time lag is very low, ranging down to 10^{-11} sec, and the high-frequency noise level is low. Schottky barrier diodes are technologically compatible with integrated circuits and are easy to fabricate.

Schottky barrier diodes are used mainly as microwave diodes for various applications, for example, as detector diodes (see Figure 1), mixer diodes, avalanche transit-time diodes, varactors, and multiplier diodes. In addition, they are employed as radiation detectors, nuclear radiation detectors, strain gages, and light modulators. They are also used in, for example, high-frequency current rectifiers and solar batteries.

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See references under SEMICONDUCTOR DIODE.

Iu. R. Nosov [29–1363–1]

SCHOTTKY EFFECT, a reduction in the work function of electrons emitted from solids that occurs under the influence of an applied electric field that accelerates the electrons. The Schottky effect is exhibited as an increase in saturation thermionic current, a decrease in surface ionization energy (*see* ION EMISSION), and a shift of the photoelectric threshold toward longer wavelengths λ. The effect occurs in electric fields E that are strong enough to neutralize the space charge at the surface of the emitter—that is, $E \sim 10$–100 volts per cm (V/cm)—and is substantial in fields up to $E \sim 10^6$ V/cm. At $E > 10^7$ V/cm, the tunneling of electrons through the potential barrier at the boundary of the solid begins to dominate; such tunneling results in field emission.

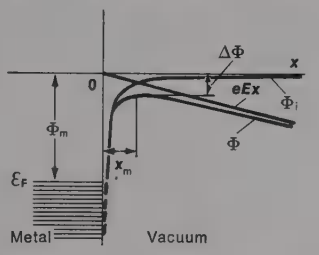

Figure 1. The Schottky effect: (Φ_i) electron potential energy in the field of the image force, (eEx) electron potential energy in the applied electric field, (Φ) electron potential energy near the surface of the metal in the presence of the applied field, (Φ_m) work function of the metal, ($\Delta\Phi$) reduction in the work function under the influence of the applied field, (ε_F) Fermi level in the metal, (x_m) distance from the height of the potential barrier to the surface of the metal; the shaded area indicates the filled electronic states in the metal

The classical theory of the Schottky effect for metals was developed by the German scientist W. Schottky in 1914. Owing to the high conductivity of metals, electric lines of force are perpendicular to the surface of a metal. Therefore, an electron, with a charge of $-e$, that is located at a distance of $x > a$, where a is the interatomic distance, from the surface interacts with the surface as if it induces its electric image—that is, a charge of $+e$—in the metal at a depth of x. The attractive force between the electron and its image is

$$F = e^2/16\pi\epsilon_0 x^2 \quad (1)$$

where ϵ_0 is the permittivity of empty space. The potential of the force, or the image potential, $\phi_i = -e/16\pi\epsilon_0 x$. The applied electric field reduces ϕ_i by the quantity $E \times x$ (see Figure 1); a potential barrier with a maximum value at $x = x_m = (e/16\pi\epsilon_0 E)^{1/2}$ appears at the metal-vacuum interface. At $E \leq 5 \times 10^6$ V/cm, $x_m \geq 8$ angstroms (Å). The reduction in the work function Φ caused by the applied field is $\Delta\Phi = e(eE/4\pi\epsilon_0)^{1/2}$. For example, at $E = 10^5$ V/cm, $\Delta\Phi = 0.12$ electron volt and $x_m = 60$ Å. As a result of the Schottky effect, the current j increases exponentially from j_0 to

$$j = j_0 \exp\left[\frac{e}{kT}(eE/4\pi\epsilon_0)^{1/2}\right]$$

where k is the Boltzmann constant, and the photoelectric threshold frequency $\hbar\omega_0$ is shifted by the quantity

$$\Delta(\hbar\omega_0) = e(eE/4\pi\epsilon_0)^{1/2}$$

In the case where the emitting surface is nonuniform and covered with "spots" having different work functions, a "spot" electric field is produced on the surface. The "spot" field decelerates electrons emitted from cathode regions whose work functions are lower than those of adjacent regions. The applied electric field combines with the "spot" field and increases, suppressing the decelerating effect of the "spot" field. As a result, the emission current from a nonuniform emitter increases with increasing E more rapidly than in the case of a uniform emitter.

The effect of an applied electric field on the emission of electrons from semiconductors is more complicated. In semiconductors, the electric field penetrates to greater depths, ranging from hundreds to tens of thousands of atomic layers. Therefore, the charge induced by an emitted electron is located in a layer with a thickness of the order of the screening radius r_s rather than at the surface. For $x > r_s$, equation (1) is valid, but for fields E that are many times weaker than in the case of metals, that is, for $E \sim 10^2$–10^4 V/cm. In addition, an applied electric field that penetrates a semiconductor causes a redistribution of charges in the semiconductor, leading to an additional reduction in the work function. However, surface electronic states are usually present at the surface of a semiconductor. For a sufficiently high surface-state density ($\sim 10^{13}$ cm^{-2}), the electrons in the surface states screen the applied field. In this case, the Schottky effect is the same as in the case of metals, provided the surface states are filled and emptied rapidly enough under the influence of an emitted electron's field.

The Schottky effect is also observed when a current flows through a metal-semiconductor contact (*see* SCHOTTKY BARRIER and SCHOTTKY BARRIER DIODE).

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T. M. Lifshits [29–1364–1]

SCHRADER, OTTO. Born Mar. 28, 1855, in Weimar; died Mar. 21, 1919, in Breslau (now Wrocław, Poland). German linguist and historian.

Schrader studied in Jena and Leipzig. He became a professor at the University of Jena in 1890 and the University of Breslau in 1909. He helped develop the theories of the cultural history school of linguistics by correlating the findings of comparative-historical linguistics with those of history and such other disciplines as archaeology, ethnography, botany, and zoology. Schrader used his multidisciplinary cultural-historical approach to study the ancient ethnic history of the Indo-European peoples and to reconstruct the social and cultural structure of primitive society. Schrader compiled the *Dictionary of Indo-European Antiquities* (1901).

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SCHRAMM, KONRAD. Born Aug. 21, 1822, in Krefeld; died Jan. 15, 1858, in St. Helier, Jersey, Great Britain. Figure in the German and international working-class movement.

During the Revolution of 1848–49 in Germany, Schramm helped with the publication of democratic newspapers. Arrested

in May 1849, he escaped from prison in September and emigrated to Great Britain. In London he became friends with K. Marx and F. Engels. Schramm joined the Communist League and became a member of its Central Committee; he was one of the editors of the league's journal, *Neue Rheinische Zeitung: Politische-oekonomische Revue*. After the split of the Communist League in the autumn of 1850, he supported the line of Marx and Engels. From 1852 to 1857, Schramm lived in the USA.

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SCHREINER, ALBERT. Born Aug. 7, 1892, in Aglasterhausen. German historian (German Democratic Republic). Professor (1947).

Schreiner was a metalworker in his youth. In 1910 he joined the Social Democratic Party of Germany and became affiliated with its left wing; in 1919 he joined the Communist Party of Germany. He helped publish works on the history of the German working-class movement. Schreiner went abroad after the establishment of the fascist dictatorship in 1933 and did not return to Germany until 1946. From 1936 to 1938 he served in the international brigades in Spain; he was chief of staff of the 13th International Brigade.

In 1950, Schreiner became associated with the Museum of German History in Berlin, the Institute of History of the German Academy of Sciences, and the Institute of Social Sciences of the Central Committee of the Socialist Unity Party of Germany. His principal works deal with the history of German foreign policy and the influence of the October Revolution of 1917 on Germany. Schreiner received the National Prize of the German Democratic Republic in 1952.

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SCHREINER, OLIVE (pen name, Ralph Iron). Born Mar. 24, 1855, in Wittebergen Reserve, Cape Colony (now in Lesotho); died Dec. 11, 1920, in Cape Town. South African writer.

Schreiner was one of the first proponents of Marxism in South Africa. She spoke out against women's lack of rights and against racial discrimination. Her collection of short stories entitled *Dreams* (1890) reflected her faith in the future of humanity. Protest against the colonial war in South Africa and social injustice is strongly expressed in her short story "Trooper Peter Halkett of Mashonaland" (1897; Russian translation, "Trooper Peter Halkett," 1900). Schreiner published the autobiographical novels *The Story of an African Farm* (1883), *From Man to Man* (published 1926), and *Undine* (published 1928). Schreiner warmly greeted the October Revolution of 1917 in Russia.

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SCHREKER, FRANZ. Born Mar. 23, 1878, in Monaco; died Mar. 21, 1934, in Berlin. Austrian composer, conductor, and teacher.

Schreker received his musical education at the Vienna Conservatory, where he studied violin with A. Rosé and theory with R. Fuchs and H. Grädener. In 1908 he organized and led the Vienna Philharmonic Chorus, which under his direction premiered many works by modern composers. He achieved his greatest popularity as a composer of works for the stage, written, as a rule, to his own librettos.

Schreker's works show certain symbolist features and are distinguished by an erotic sensuousness and by subjectivism; at the same time they are notable for their brilliant color and dramatic tension. This combination of qualities explains the widespread, though short-lived, popularity of Schreker's music in the 1920's, when his operas *Der ferne Klang* (A Distant Bell; 1912), *Der Schatzgräber* (The Treasure-seeker; 1920), and *Irrelohe* (Errant Flame; 1924) were widely performed.

Schreker taught composition at the Akademie der Tonkunst in Vienna from 1912 to 1920, when he was appointed director of the Hochschule für Musik in Berlin; in 1932 and 1933 he was a professor at the Prussian Academy of Arts, where he held a master class for composition.

REFERENCE

F. Shreker i ego opera "Dal'nii zvon": Stat'i. Leningrad, 1925. [29–1416–1]

SCHRIEFFER, JOHN ROBERT. Born May 31, 1931, in Oak Park, Ill. American physicist.

Schrieffer graduated from the Massachusetts Institute of Technology in 1953. From 1953 to 1957 he worked at the Illinois Institute of Technology under the guidance of J. Bardeen. From 1957 to 1959 he taught at the University of Chicago, and from 1959 he was at the University of Illinois. In 1962 he became a professor at the University of Pennsylvania in Philadelphia.

Schrieffer's main works deal with solid-state and low-temperature physics. With Bardeen and L. Cooper, Schrieffer worked out the microscopic theory of superconductivity (published 1957; Nobel Prize, 1972).

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SCHRÖDER, ERNST. Born Nov. 25, 1841, in Mannheim; died June 16, 1902, in Karlsruhe. German mathematician and logician.

In 1876, Schröder became a professor at the Technische Hochschule of Karlsruhe. Schröder gave a systematic exposition of mathematical logic, or more accurately, of the algebra of logic. In addition to the term "propositional calculus," he introduced the duality principle and a number of other mathematical laws of logic. Schröder also made contributions to the theory of algorithms.

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Abriss der Algebra der Logik, parts 1–2. Leipzig, 1909–10. [29–1412–2]

SCHRÖDER, FRIEDRICH LUDWIG. Born Nov. 3, 1744, in Schwerin; died Sept. 3, 1816, in Rellingen. German actor, stage director, teacher, and theater figure.

Schröder, son of the famous tragedienne S. S. Schröder, is considered, along with G. E. Lessing, to have been the greatest representative of the German Enlightenment theater. Making his stage debut as a child, he performed in the company of his stepfather, K. Ackermann, until 1756 and again in 1759 and 1760. From 1756 to 1759 he performed in the circus troupe of M. Stuart as a dancer, juggler, and acrobat and appeared in farces with J. F. von Kurz' company. Schröder helped found the Hamburg National Theater, and during the years 1771–80, 1785–98, and 1811–12 he headed the company. From 1781 to 1785 he worked in the Vienna Burgtheater. In Ackermann's company, Schröder played comic roles, becoming known as a master of improvisation. He also staged and composed approximately 70 ballets.

Schröder was the first German actor to play the role of Truffal-

dino in Goldoni's *A Servant of Two Masters*. He was the first to present Shakespeare's tragedies, notably *Hamlet, King Lear, Macbeth*, and *Othello*, on the German stage. These productions were in his own translations, and Schröder played the leading roles. Schröder also performed in the dramas of F. Schiller and in D. Diderot's bourgeois drama *The Father of the Family*.

Schröder established a national German repertoire, affirmed realist principles in stage design, and taught a natural, psychologically truthful and inspired method of acting. His acting harmoniously combined inner emotion with carefully conceived outward means of expression.

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Hoffmann, P. F. *Friedrich Ludwig Schröder als Dramaturg und Regisseur*. Berlin, 1939. [29–1412–1]

SCHRÖDER-DEVRIENT, WILHELMINE. Born Dec. 6, 1804, in Hamburg; died Jan. 26, 1860, in Coburg. German soprano.

Schröder-Devrient studied under J. Mazatti in Vienna. In 1821 she made her debut as Pamina in Mozart's *The Magic Flute*. She toured in various cities of Italy, as well as in Paris, London, and Prague. Her performance as Leonore in Beethoven's *Fidelio* (1822, Vienna) brought her fame as the leading female singer of Europe. From 1823 to 1847 she was a soloist with the court opera in Dresden. For her part in the Dresden uprising of 1849 she was exiled from Saxony, and she did not perform again until 1856. Schröder-Devrient performed as a guest artist in Russia.

Schröder-Devrient, a singer of superb vocal technique and a gifted actress, excelled as Senta in Wagner's *Der fliegende Holländer* and Agathe in Weber's *Der Freischütz*.

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SCHRÖDINGER, ERWIN. Born Aug. 12, 1887, in Vienna; died there Jan. 4, 1961; buried in Alpbach, Tírol. Austrian physicist. One of the founders of quantum mechanics.

Schrödinger received the Ph.D. degree from the University of Vienna in 1910. In 1911 he began working at the Physics Institute of the University of Vienna. In 1920 he was a professor at the Technische Hochschule in Stuttgart, and in 1921, a professor at the Technische Hochschule in Breslau (Wrocław). From 1921 to 1927 he was a professor at the Technische Hochschule in Zürich, and from 1927, a professor at the University of Berlin. From 1933 to 1935 he was a professor at Oxford University, and from 1936 to 1938 at the university in Graz. In 1938–39 he was a professor in Ghent. Beginning in 1940, he was first a professor at the Royal Academy in Dublin, and then director of the Institute for Advanced Studies, which he founded in Dublin. From 1956, he was a professor at the University of Vienna.

Schrödinger's main works dealt with mathematical physics, the theory of relativity, atomic physics, and biophysics. His early studies were devoted to the theory of the crystal lattice and the creation (1920) of the mathematical theory of color, which became the basis for modern colorimetry. His most important contribution was the creation of wave mechanics (late 1925 and early 1926): proceeding from L. de Broglie's hypothesis regarding the wave properties of matter, Schrödinger showed that the stationary states of atomic systems may be considered as the self-oscillations of the wave field that corresponds to the given system. Schrödinger discovered the fundamental equation of nonrelativistic quantum mechanics (the Schrödinger equation) and gave its solution for a number of particular problems; he provided a general method of applying the equation in perturbation theory. Schrödinger established the relationship between wave mechanics and the "matrix mechanics" of W. Heisenberg, M. Born, and P. Jordan and proved that they were physically identical. The mathematical formalism developed by Schrödinger and the wave function ψ introduced by him proved to be the most adequate mathematical apparatus of quantum mechanics and its applications.

Schrödinger received a Nobel Prize in 1933. He was a foreign member of the Academy of Sciences of the USSR (1934).

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L. S. POLAK [29–1413–2]

SCHRÖDINGER EQUATION, the fundamental dynamic equation of nonrelativistic quantum mechanics (*see* QUANTUM MECHANICS); named in honor of the Austrian physicist E. Schrödinger, who proposed it in 1926. In quantum mechanics the Schrödinger equation plays the same fundamental role as Newton's equation of motion plays in classical mechanics and the Maxwell equations play in the classical theory of electromagnetism. The Schrödinger equation describes the time variation of the state of quantum objects, which is characterized by the wave function. If the wave function ψ at the initial moment of time is known, then by solving the Schrödinger equation it is possible to find ψ at any subsequent time t.

For a particle of mass m moving under the action of a force generated by the potential $V(x, y, z, t)$, the Schrödinger equation has the form

$$i\hbar\frac{\partial\psi}{\partial t} = -\frac{\hbar^2}{2m}\Delta\psi + V(x, y, z, t)\psi \tag{1}$$

where $i = \sqrt{-1}$, $\hbar \cong 1.05 \times 10^{-27}$ erg·sec is Planck's constant, and $\Delta = \partial^2/\partial x^2 + \partial^2/\partial y^2 + \partial^2/\partial z^2$ is the Laplace operator (x, y, and z are the coordinates). This equation is called the Schrödinger time-dependent equation.

If the potential V is independent of time, the solutions of the Schrödinger equation may be represented in the form

$$\psi(x, y, z, t) = e^{-(i/\hbar)Et}\psi(x, y, z) \tag{2}$$

where E is the total energy of the quantum system and $\psi(x, y, z)$ satisfies the stationary Schrödinger equation:

$$-\frac{\hbar^2}{2m}\Delta\psi + V(x, y, z)\psi = E\psi \tag{3}$$

For quantum systems whose motion occurs in a bounded region of space, solutions of the Schrödinger equation exist only for certain discrete energy values: $E_1, E_2, \ldots, E_n, \ldots$; the members of this series, which is virtually infinite, are numbered by the set of integral quantum numbers n. A wave function $\psi_n(x, y, z)$ corresponds to every value of E_n, and a knowledge of the complete set of these functions makes it possible to calculate all measurable characteristics of the quantum system.

In the important particular case of the Coulomb potential

$$V(x, y, z) = -\frac{e^2}{\sqrt{x^2 + y^2 + z^2}} \tag{4}$$

(where e is the elementary electric charge), the Schrödinger equation describes the hydrogen atom, and the E_n are the energies of the stationary states of the atom.

The Schrödinger equation is a mathematical expression of a fundamental property of microparticles—the wave-particle duality—according to which all particles of matter that exist in nature are also endowed with wave properties (this hypothesis was first advanced by L. de Broglie in 1924).

The Schrödinger equation satisfies the correspondence principle and, in the limiting case where the de Broglie wavelengths are much smaller than the dimensions characteristic of the motion under examination, describes particle motion according to the laws of classical mechanics. The transition from the Schrödinger equation to classical trajectories is similar to the transition from wave optics to geometrical optics. The analogy between classical mechanics and geometrical optics, which is the limiting case of wave optics, played an important role in establishing the Schrödinger equation.

From the mathematical standpoint, the Schrödinger equation is a wave equation and is similar in structure to the equation that describes the vibrations of a weighted string. In contrast, however, to the solutions of the equation of the vibration of a string, which give the geometrical shape of the string at a given time, the solutions $\psi(x, y, z, t)$ of the Schrödinger equation do not have direct physical meaning. What has meaning is the square of the wave function, namely, the quantity $\rho_n(x, y, z, t) = |\psi_n(x, y z, t)|^2$, which is equal to the probability of finding a particle (or system) at a time t in the quantum state n at a point of space having the coordinates x, y, z. This probabilistic interpretation of the wave function is one of the principal postulates of quantum mechanics.

The mathematical formulation of the postulates of quantum mechanics that is based on the Schrödinger equation is called wave mechanics. It is fully equivalent to the matrix mechanics of W. Heisenberg, formulated in 1925.

The Schrödinger equation makes it possible to explain and predict a large number of phenomena of atomic physics and to calculate the experimentally observable fundamental characteristics of atomic systems, such as the energy levels of atoms and the change in atomic spectra under the influence of electric and magnetic fields. By using the Schrödinger equation, it has also been possible to understand and describe quantitatively a broad range of phenomena in nuclear physics, such as the regularities underlying alpha decay, the gamma radiation of nuclei, and the scattering of neutrons by nuclei.

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L. I. PONOMAREV [29–1414–1]

SCHUBART, CHRISTIAN FRIEDRICH DANIEL. Born Mar. 24, 1739, in Obersontheim; died Oct. 10, 1791, in Stuttgart. German journalist and poet.

Schubart was the son of the village choir leader and organist. He traveled widely and held a variety of jobs. His newspaper *Deutsche Chronik* (1774–77) won enormous popularity; taking democratic positions, it exposed feudal customs in Germany and helped spread the ideals of the Enlightenment. At the order of the duke of Württemberg, Schubart was confined to a fortress for 10 years. Freed in response to public protest, he continued his militant journalistic activity by publishing the journals *Schubarts vaterländische Chronik* (1787), *Vaterlandschronik* (1788–89), and *Die Chronik* (1790–91).

Schubart's poetry developed in the *Sturm und Drang* tradition. His mature verses, such as "The Masters' Grave" (1780), "The Poor Soldier" (1783), and "Song of the Cape of Good Hope" (1787), contain elements of social criticism; they constitute one of the earliest examples of the political German lyric poem. Schubart enthusiastically welcomed the French Revolution.

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A. A. GUGNIN [29–1511–3]

SCHUBERT, FRANZ PETER. Born Jan. 31, 1797, in Lichtenthal, near Vienna; died Nov. 19, 1828, in Vienna. Austrian composer.

The son of a schoolmaster, Schubert began his musical education by studying violin with his father, piano with his elder brother Ignaz, and voice with M. Holzer, the choirmaster of the parish church. In 1808 he was awarded a place in the court chapel as a choirboy; he studied figured bass under W. Ruzicka and, until 1816, counterpoint and composition under A. Salieri. Schubert attended a training school for elementary teachers in 1813 and 1814, then worked as an assistant teacher at his father's school until 1818, when he struck out on his own. For several years he gave music lessons and repeatedly, but unsuccessfully, tried to obtain a permanent position as a musician.

Schubert was surrounded by friends and supporters who rendered him as much financial assistance as they were able; they included the civil servant J. von Spaun, the amateur poet F. von Schober, the poet J. Mayrhofer, the painter M. von Schwind, the poet and comic dramatist E. von Bauernfeld, and the composer A. Hüttenbrenner. The singer M. Vogl popularized Schubert's songs. Schubert's friends and acquaintances often gathered to perform his works at evenings that became known as *Schubertiaden*. Schubert's works were first published in 1821.

Schubert left Vienna only rarely, usually in the summer. In 1818 and 1824 he was a music teacher to the daughters of Count J. Esterházy in Hungary, where he became acquainted with Hungarian folk music and Gypsy music. He visited Upper Austria with Vogl in 1819, 1823, and 1825 and Graz in 1827. Schubert's songs achieved wide renown, and in 1823 he was elected an honorary member of the Styrian and Linz musical societies. On Mar. 26, 1828, a concert of his works was given in Vienna, with great success. In the fall of that year Schubert contracted typhoid fever and died.

Schubert, who lived in the harshly reactionary Austria of Metternich, was the first great representative of romantic music. In his works he sought to re-create the shining ideal absent from life; his music reflects a longing for that ideal and the sufferings of a man in an alien and hostile social milieu. The warm, heartfelt quality of Schubert's music, its immediacy and open expressiveness, flow from the composer himself. Schubert's music is closely connected with the folk art of Austria (although actual folk themes rarely appear in his work) and with Viennese music evocative of everyday life; it also reflects the folklore of the Hungarians and the Slavic peoples, some of which were at that time part of the Austrian Empire. Although first and foremost a melodist, Schubert is noted for his inventive use of tonality, his original and richly colored harmonies, and his brilliant orchestration. Innovative as his music was, it remained firmly rooted in the traditions of the Viennese classical school.

An important place in Schubert's oeuvre is occupied by the lied, which Schubert, by more closely uniting words and music and by enhancing the meaning and distinctiveness of the musical images, transformed into a genre capable of expressing a profound content. In the Schubertian lied the vocal melody, which often includes recitative elements, generally can stand alone as a coherent musical creation. The piano accompaniment, profoundly expressive, at times takes on a pictorial quality. Schubert, by developing and enriching previous types of songs, created a new genre in which a musical idea is developed throughout the song and the varying themes in the piano are woven into a whole; he also created the first mature song cycles.

Schubert set his more than 600 lieder to the poems of approximately 100 poets. For each major poet he found an appropriate musical style. The poets who figure most prominently in his songs are Goethe (approximately 70 songs, including "Erlkönig" and "Gretchen am Spinnrade"), F. Schiller (more than 40 songs, including "Des Mädchens Klage" and "Gruppe aus dem Tartarus"), W. Müller (the song cycles *Die schöne Müllerin* and *Die Winterreise*), H. Heine (six songs, including "Der Doppelgänger"), and Mayrhofer (47 songs). He also wrote notable songs to the texts of C. F. D. Schubart ("Die Forelle"), F. O. Stolberg ("Auf dem Wasser zu singen"), M. Claudius ("Der Tod und das Mädchen"), G. P. Schmidt ("Der Wanderer"), L. Rellstab ("Ständchen" and "Aufenthalt"), F. Rückert ("Sei mir gegrüsst" and "Du bist die Ruh'"), M. von Collin, J. N. von Craigher, F. Schober ("An die Musik"), W. Scott ("Ave Maria"), and Shakespeare ("Hark! hark! the lark!").

Schubert's choruses, cantatas, oratorios, and quartets for male and females voices are related to his songs. In his church music, notably the last two masses (1819 and 1828), he expressed, as did J. S. Bach, simple human emotions. Although Schubert composed three operas and six Singspiels, they were never performed in his lifetime and have not found a place in the repertoire, primarily because their librettos are inferior. The three plays for

which he composed music did not long remain on the stage, but the overture and dances from the music for H. von Chézy's play *Rosamunde von Cypern* (1823) are often performed.

In his instrumental works, Schubert used the melodic and graceful themes typical of his songs, generally developing them into finished wholes and heightening their effect in various ways. Of the seven completed symphonies the last, in C major (final version, 1828), achieves a heroic, epic quality. This majestic composition is, in the words of V. V. Stasov, truly a work of genius "in its power, its passion, its beauty, its expression of close ties with the people, and its evocation of the broad masses." The lyric and dramatic Symphony No. 8 in B minor (*Unfinished Symphony*; 1822), of which two movements were completed, is imbued with psychological profundity. The most popular of Schubert's concert overtures are the two *Overtures in the Italian Style*.

Many of Schubert's chamber works reflect the domestic music-making popular in Austria at that time, notably the joyous Piano Quintet in A major (*The Trout*; 1819), the penultimate movement of which contains variations on the song "Die Forelle" (The Trout). Several of the chamber works are often orchestral in nature, such as the String Quartet in C major (1828) and the three final string quartets: the quartets in A minor (1824), G major (1826), and D minor (*Death and the Maiden*; 1824–26), which includes variations on the song "Der Tod und das Mädchen."

Works for the piano occupy an important place in Schubert's oeuvre. In his piano sonatas he was influenced by L. von Beethoven but made his own distinctive contributions to the genre. His finest sonatas are those in A major (1819), A minor (1823), A minor (1825), D major (1825), G major (1826), and B flat major (1828). The Fantasy in C major (1822), which uses the melody from the song "Der Wanderer," foreshadows the structure of F. Liszt's symphonic poems. The 11 *Impromptus* (1827–28) and six *Moments musicaux* (1818–28) are romantic miniatures for piano that anticipate the characteristic features of the piano music of F. Chopin and Liszt. The dances for piano, including waltzes, *Ländler* (Austrian slow waltzes), *deutsche Tänze* (German waltzes), *écossaises*, and galops, mark an important stage in the poeticization of the dance. Schubert composed numerous piano duets, including the Fantasy in F minor (1828), the *Divertissement à la hongroise*, variations, marches, and polonaises.

Some of Schubert's late works, such as *Die Winterreise* and the lieder set to Heine's poems, show an intensification of dramatic, even tragic, feeling. Even in his final years, however, he composed works, including songs, imbued with energy, strength, fortitude, and joy. During his lifetime Schubert was known primarily as a composer of lieder, and many of his large-scale instrumental works were not performed until decades after his death; the Symphony in C major (*The Great Symphony*), for example, was first performed in 1839, with F. Mendelssohn conducting, and the *Unfinished Symphony* received its first performance in 1865. Not until the early 20th century was Schubert's greatness as a composer of instrumental works recognized.

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Reed, J. *Schubert: The Final Years*. London, 1972.

IU. N. KHOKHLOV [29–1512–3]

SCHUCHARDT, HUGO. Born Feb. 4, 1842, in Gotha; died Apr. 21, 1927, in Graz. German and Austrian linguist.

Schuchardt studied at the universities of Jena and Berlin; he was a student of F. Diez' and A. Schleicher's. He became a professor in Halle in 1873 and was a professor in Graz from 1876 to 1900.

Schuchardt's principal works deal with Romance philology and general linguistics. He studied Vulgar Latin, the Romance languages, and other Indo-European languages, as well as Basque, the Caucasian languages, the Hamito-Semitic languages, and Hungarian. Schuchardt propounded ideas on the mixing of languages, on ergative sentence constructions in several languages, and on the interaction of lexicon and grammar. He criticized the neogrammarians' interpretation of the laws of sound changes and Schleicher's genealogical classification of the Indo-European languages. A representative of the *Wörter und Sachen* trend, he believed that words should be studied in relation to the history of extralinguistic *realia*. Schuchardt's views influenced several foreign schools of philology.

WORKS

Der Vokalismus der Vulgärlateins, vols. 1–3. Leipzig, 1866–68.

Uber die Lautgesetze. Berlin, 1885.

Ein Vademecum der allgemeinen Sprachwissenschaft, 2nd ed. Halle, 1928.

In Russian translation:

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V. P. NEROZNAK [29–1554–2]

SCHUCHERT, CHARLES. Born July 3, 1858, in Cincinnati, Ohio; died Nov. 20, 1942, in New Haven, Conn. American paleontologist and geologist.

Schuchert worked at Yale University in New Haven in 1892–93 and for the US Geolgoical Survey in 1893–94. Beginning in 1904, he was a professor at Yale University and the Sheffield Scientific School. At the same time, he was curator of the geological collection of the Peabody Museum of Natural History at Yale University. Schuchert's principal works dealt with the taxonomy of brachiopods, paleogeography, historical geology, the stratigraphy of North America, and the classification of geosynclines.

WORKS

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REFERENCE

Lull, R. S. "Charles Schuchert." *American Journal of Science*, 1943, vol. 241, no. 2. [29–1554–3]

SCHUCHHARDT, KARL. Born Aug. 6, 1859, in Hanover; died Dec. 7, 1943, in Aarolsen. German archaeologist.

Schuchhardt was director of the Ethnological Museum in Berlin from 1908 to 1925. He was a specialist in the archaeology of the Western European Bronze and Iron ages and in the early history and archaeology of the Germanic tribes.

WORKS

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Die Burg im Wandel der Weltgeschichte. Wildpark-Potsdam, 1931. [29–1556–1]

SCHULHOFF, JULIUS. Born Aug. 2, 1825, in Prague; died Mar. 13, 1898, in Berlin. Bohemian pianist and composer.

Schulhoff studied piano with I. Tedesco and theory with V. J. Tomášek (Tomaschek) in Prague. He made his debut in Dresden in 1842, and in 1845 he took up residence in Paris, where his playing and his compositions for piano attracted the attention of F. Chopin. Schulhoff gave concerts in many European countries and in 1853 toured Russia. He taught in Paris from 1853 to 1870 and Dresden from 1870 to 1897. He eventually took up residence in Berlin, where he became a professor in 1897.

Schulhoff composed approximately 60 works of salon music for piano, including two sonatas, 12 études, and *Prague Allegro brillant*. His dances include two collections of mazurkas: *Poland* and *Memories of Warsaw and Kiev*. Among Schulhoff's other works are transcriptions of Czech folk songs. [29–1526–1]

SCHULTZE, MAX JOHANN SIGISMUND. Born Mar. 25, 1825, in Freiburg; died Jan. 16, 1874, in Bonn. German zoologist and histologist.

Schultze graduated from the University of Griefswald and attended lectures at the University of Berlin. He was a professor at the universities of Halle (from 1854) and Bonn (1859–74). His main works dealt with protozoans. Schultze came to the conclusion that the "sarcode" of protozoans and the protoplasm of plant cells were one and the same. In the article *Ueber Muskelkörperchen und das was man eine Zelle zu nennen habe* (On Muscle Corpuscles and on What May Properly be Called a Cell; 1861), he stated the necessity for reexamining the notion of the cell advanced by T. Schwann and defined the cell as a "globule of protoplasm surrounding a nucleus." He was the author of a number of zoological and histological studies, in particular, studies on the histology of the eye in animals and on the electric organs of fishes.

WORKS

Das Protoplasma der Rhizopoden und der Pflanzenzellen. Leipzig, 1863. [29–1527–2]

SCHULZ, MAX WALTER. Born Oct. 31, 1921, in Scheibenberg. German writer of the German Democratic Republic (GDR). Member of the Socialist Unity Party of Germany.

Schulz served in World War II (1939–45). He attended the J. R. Becher Literary Institute in Leipzig, becoming director in 1964. He became a professor in 1969. He is vice-president of the Writers' Union of the GDR.

Schulz' novel about the non-lost generation, *We Are Not Dust in the Wind* (1962; Russian translation, 1964), received wide renown. Depicting Germany during and after the war, it shows how Nazi ideology was overcome and how the hero goes over to the side of socialism. The novel *Triptych With Seven Bridges* (1974) traces the lives of the first novel's heroes to 1968. Schulz is also a publicist and a literary critic.

Schulz was awarded the National Prize of the GDR in 1964.

WORKS

Stegreif und Sattel. Halle-Saale, 1967.

In Russian translation:

"Realizm segodnia." In *Inostrannaia literatura*, 1967, no. 3.

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Geerdts, H. J. "Menschen in der Bewährung." *Neue deutsche Literatur*, 1974, no. 10. [29–1526–3]

SCHULZE, FRANZ EILHARD. Born Mar. 22, 1840, in Elsen, near Greifswald; died 1921. German zoologist.

Schulze was a professor at the universities of Rostock, Graz, and Berlin. His main works dealt with the anatomy and embryology of sponges and other invertebrates. Schulze was the author of monographs on a number of genera and orders of sponges. He also investigated the sense organs in lower vertebrates and described the most primitive multicellular animal—*Trichoplax*.

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"Untersuchungen über den Bau und die Entwicklung der Spongien (Mitteilungen II–X)." *Zeitschrift für wissenschaftliche Zoologie*, 1877–81, vols. 28–35.

"Uber die Sinnesorgane der Seitenlinie bei Fischen und Amphibien." *Archiv für mikroskopische Anatomie*, 1870, vol. 6. .

Uber Trichoplax adhaerens. Berlin, 1891.

Hexactinelliden des Indischen Oceanes, parts 1–3. Berlin, 1894–1900. [29–1527–3]

SCHULZE-BOYSEN–HARNACK ORGANIZATION (also Rote Kapelle, or Red Orchestra), an underground antifascist organization that operated in Berlin; one of the largest organizations of the German resistance.

The Schulze-Boysen–Harnack Organization was created in 1938 and 1939 by the merger of the underground groups of H. Schulze-Boysen and A. Harnack. The members of the organization included Communists, Social Democrats, former members of the Nazi Party, and persons who belonged to no party at all, including Schulze-Boysen and Harnack; by occupation they were blue- and white-collar workers, servicemen in the Wehrmacht, and students. The Communist Party of Germany's policy of creating a united democratic, antifascist front was embodied most fully in the activities of the Schulze-Boysen–Harnack Organization. Members of the organization carried out sabotage at military plants of the Reich, helped escaped prisoners who had fled from concentration camps, and conducted antifascist propaganda among soldiers in Hitler's army. The organization maintained ties with other groups of the resistance.

In August and September 1942, the Gestapo learned of the organization's activities and arrested many of its members; 49 persons were executed, and several others, unable to endure torture, committed suicide. On Oct. 7, 1969, Schulze-Boysen, Harnack, A. Kuckhof, and I. Stöbe were posthumously awarded Orders of the Red Banner, and a number of other members of the organization were awarded Orders of the Patriotic War First and Second Class.

REFERENCE

Blank, A. S. *V serdtse "tret'ego reikha."* Moscow, 1974. [29–1527–4]

SCHULZE-DELITZSCH, FRANZ HERMANN. Born Aug. 29, 1808, in Delitzsch; died Apr. 29, 1883, in Potsdam. German economist and political figure.

During the Revolution of 1848–49, Schulze-Delitzsch was a member of the Prussian National Assembly, where he aligned himself with the liberal "left center." He became a leader of the Progressive Party (Deutsche Fortschrittspartei) after its founding in 1861. Schulze-Delitzsch, who belonged to the vulgar economists, reiterated J. B. Say's theory of productive services and the propositions of F. Bastiat's *Economic Harmonies*. In 1849 he launched a campaign among German workers and artisans to establish cooperative societies and savings and loan institutions. Regarding these measures as the only way to eliminate poverty, he and his followers distracted the workers from the class struggle and helped bring about the preponderant influence of the liberal bourgeoisie over the working-class movement.

In his cooperative plans, Schulze-Delitzsch supported the "harmony of interests" between labor and capital, just as he did in his theoretical works on economics. Cooperation, in his view, was to transcend class and unite the members of all classes; its goal was to bring about social peace within the framework of a capitalist society. Schulze-Delitzsch's plans of cooperation collapsed as the societies founded by him went bankrupt and an independent German working-class movement developed.

WORKS

Schriften und Reden, vols. 1–5. Berlin, 1909–13. [29–1528–2]

SCHULZE-GÄVERNITZ, GERHART VON. Born July 25, 1864, in Breslau; died July 10, 1943, in Crainsdorf, near Neurode. German economist.

In 1891 and 1892, Schulze-Gävernitz studied the textile industry and agrarian relations in Russia and taught at Moscow University. From 1893 to 1926 he was a professor of political econ-

omy at the University of Freiburg. An adherent of the historical school in bourgeois political economy, he sought to prove that it is possible to establish social peace in a capitalist society. He considered monopoly capital and the hegemony of the large banks an expression of organized capitalism, in which the industrial state consciously regulates the economy, thereby supplanting the action of automatically functioning economic laws.

The bourgeois apologetic views of Schulze-Gävernitz were subjected to a profound critique by V. I. Lenin. In his *Imperialism, the Highest Stage of Capitalism*, Lenin cited several passages from Schulze-Gävernitz's *The German Credit Bank* (1915), a work on German banks, and pointed out that "the task of a bourgeois professor is not to lay bare the entire mechanism, or to expose all the machinations of the bank monopolists, but rather to present them in a favorable light" (*Poln. sobr. soch.*, 5th ed., vol. 27, p. 335).

WORKS

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SCHUMACHER, KURT. Born Oct. 13, 1895, in Kulm (now Chełmno); died Aug. 20, 1952, in Bonn. Figure in the Social Democratic Party of Germany (SPD).

Schumacher joined the SPD in 1918. From 1920 to 1924 he edited the Social Democratic newspaper *Schwäbische Tagwacht* in Stuttgart. He was a member of the Reichstag from 1930 to 1933. During the fascist dictatorship, Schumacher was a prisoner in a concentration camp from 1933 to 1943 and again in 1944 and 1945.

After the defeat of fascism, Schumacher helped reestablish the Social Democratic Party in West Germany; he opposed the merger of the Social Democrats and Communists into one party. At the founding congress, held in Hanover in May 1946, he was elected chairman of the new SPD. He became a deputy to the Bundestag of the Federal Republic of Germany in 1949. Schumacher was a vigorous champion of reformism, class cooperation, and anticommunism. [29–1537–2]

SCHUMAN, ROBERT. Born June 29, 1886, in Luxembourg; died Sept. 4, 1963, at Chazelles, near the city of Metz. French political figure. Member of the Mouvement Républicain Populaire.

Schuman was a deputy to the French National Assembly from 1919 to 1940 and from 1946 to 1962 and a deputy to the constituent assemblies elected in 1945 and 1946. He served as minister of finance in 1946 and 1947, premier in 1947 and 1948, minister of foreign affairs from 1948 to January 1953, and minister of justice in 1955 and January 1956. He was closely associated with the de Wendel financial group. Schuman contributed to the establishment of the European Coal and Steel Community (1951), which marked the beginning of the process of Western European integration (*see* SCHUMAN PLAN). [29–1534–1]

SCHUMANN, GEORG. Born Nov. 28, 1886, in Leipzig; died Jan. 11, 1945, in Dresden. Figure in the German working-class movement.

Schumann joined the Social Democratic Party of Germany in 1905 and became associated with its left wing. During World War I he was tried several times for spreading antiwar propaganda. He joined the Communist Party of Germany (CPG) in 1919 and served on the party's Central Committee in the 1920's. From 1921 to 1924 he was a deputy to the Prussian *Landtag*, and from 1928 to 1933 he was a deputy to the Reichstag.

After the establishment of the fascist dictatorship in 1933, Schumann was sent to a hard labor prison and later to the Sachsenhausen concentration camp. After his release in 1939, he established an underground organization of the CPG in Leipzig; the organization was to become the center of the antifascist struggle in Saxony. In 1943, Schumann became a member of the underground operational leadership of the CPG. Together with a number of other leaders of the antifascist underground, he was arrested by the Gestapo in July 1944. Schumann was subsequently executed. [29–1533–3]

SCHUMANN, ROBERT ALEXANDER. Born June 8, 1810, in Zwickau; died July 29, 1856, in Endenich, near Bonn; buried in Bonn. German composer and musicologist.

The son of a book publisher, Schumann showed a talent for the arts, including music, while still a child. He studied under the teacher and organist J. G. Kuntzsch and made his debut as a pianist at the age of 13. He entered the University of Leipzig to study law in 1828 and continued his studies at the University of Heidelberg the following year; during this period he studied piano with the celebrated teacher F. Wieck. In 1831 and 1832 he studied music theory with the composer and conductor H. Dorn. While experimenting with a mechanical device to strengthen the muscles of the fingers, Schumann injured his right hand and destroyed all hope of becoming a piano virtuoso.

Schumann founded the *Neue Zeitschrift für Musik* in Leipzig in 1834 and was its editor and a contributor until 1844. The journal served as a rallying point for progressive German music; Schumann called the circle of friends and musical allies who gathered around the journal the Davidsbund, after the Biblical king and bard who defeated the Philistines. In 1840 he married the pianist Clara Wieck, a daughter and student of Wieck. In 1843 he accepted a post at the Leipzig Conservatory, where for a time he taught piano, composition, and playing from score. He and his wife made several concert tours, including one to Russia in 1844. Schumann moved to Dresden in 1844, and in 1850 he took up residence in Düsseldorf, where, in addition to composing, he directed choruses and conducted a symphony orchestra. From the late 1840's the mental illness that had plagued him gradually worsened, and he spent the final two years of his life in a hospital in Endenich, where he died.

Schumann is one of the most brilliant representatives of 19th-century romantic art. His music, which in many respects shows an affinity with the poetry of H. Heine, challenged the spiritual poverty of philistine Germany of the 1820's to 1840's and offered in its stead a lofty humanism. Following the tradition of F. Schubert and C. M. von Weber, Schumann further developed the democratic and realistic tendencies in German and Austrian romantic music; his work is closely tied to folk art and the traditions of German classical music.

At the same time, Schumann stands out in the history of music as a daring innovator who expanded and enriched the musical language. He sought to convey fully and precisely the processes of spiritual life, on the one hand, and exterior life—the relations and contrasts between phenomena that constitute the drama of life—on the other. This impulse partially accounts for his attempt to bring music closer to literature, especially poetry.

Most of Schumann's piano works are cycles whose small pieces in the lyric, dramatic, mimetic, and "portrait" genres are interrelated and form a thematic and psychological sequence. One of the most characteristic examples is the cycle *Carnaval* (1835), which presents a variegated series of miniature scenes, dances, masques, depictions of women (among them Chiarina, who represents Clara Wieck), and musical portraits of Paganini and Chopin. Similar to *Carnaval* are the cycles *Papillons* (1831), which was inspired by the works of Jean Paul, and the *Davidsbündlertänze* (1837).

Among Schumann's greatest achievements is the piano cycle *Kreisleriana* (1838), named after E. T. A. Hoffmann's work, whose hero is the musician and dreamer Johannes Kreisler. Passionate longings, heroic ardor, and the world of romantic images are reflected in such piano works as the *Etudes symphoniques* (1834), various sonatas (1835, 1835–38, and 1836), *Fantasy* (1836–38), and the Concerto in A for Piano and Orchestra (1841–45). In addition to variations and sonatas, Schumann composed piano cycles that resemble suites or albums of piano pieces, such as *Fantasiestücke* (1837), *Kinderszenen* (1838), and *Album für die Jugend* (1848).

In his vocal works, Schumann further developed the lyric song created by Schubert. His songs subtly render details of mood, the poetry of the text, and the intonations of living speech. The role of the piano accompaniment is considerably enhanced, richly filling in the poetic image and sometimes completing the content of the song. Schumann's most popular song cycle is *Dichterliebe* (1840), to poems by Heine. The cycle of 16 songs includes "Und wüssten's die Blumen," "Hör ich, das Liedchen klingen," "Am

leuchtenden Sommermorgen," "Ich grolle nicht," "Ich hab' im Traum geweinet," and "Die alten, bösen Lieder." Another cycle of thematically united songs is *Frauenliebe und Leben* (1840), to poems by A. Chammisso.

Songs on a variety of subjects are included in the cycle *Myrthen* (1840), set to poems by F. Rückert, Goethe, R. Burns, Heine, and Lord Byron, and the *Leiderkreis* (1840), set to poems by J. Eichendorff. Schumann's songs and ballads touch on a wide variety of subjects. The ballad "Die beiden Grenadiere," to the poem by Heine, is a brilliant example of Schumann's civic lyricism. Many of his songs create miniature scenes or portraits of everyday people, and their music recalls the German folk song; an example is "Volksliedchen," to the poem by Rückert.

In the oratorio *Das Paradis und die Peri* (1843), which is based on a theme from T. Moore's series of oriental tales *Lalla Rookh*, and in *Szenen aus Goethes "Faust"* (1844–53), Schumann came close to realizing his old dream of writing an opera. His only completed opera, *Genoveva* (1848), which is based on a medieval legend, did not gain recognition in the theatrical world. Schumann's music to Byron's dramatic poem *Manfred* (1849), which consists of an overture and 15 numbers, was a great success. His four symphonies—the *Spring Symphony* (1841), the Symphony No. 2 (1845–46), the *Rhenish Symphony* (1850), and the Symphony No. 4 (1841–51)—are marked by a bright and joyous mood, and they are dominated by episodes that suggest songs and dances and by passages of a lyric and descriptive character.

Schumann composed three string quartets (1842), three piano trios (1847, 1847, and 1851), a piano quartet (1842), and a piano quintet (1842) that has achieved wide renown. He is the author of choral works and of chamber music for solo strings and winds.

Schumann made a major contribution to music criticism. His journal disseminated the works of classical composers, fought against conservatism and philistinism, and championed the new romantic school in European music. Schumann castigated virtuosic posturing and an indifference to art that hid behind a mask of approved notions and fake erudition. His ideas were expressed through fictional personae, notably the impulsive, insolent, and mordantly ironic Florestan and the sensitive dreamer Eusebius, both of whom embodied aspects of the composer's own personality.

Schumann's ideals were close to those of the progressive 19th-century composers. He was regarded highly by F. Mendelssohn, H. Berlioz, and F. Liszt. In Russia, Schumann's work was popularized by A. G. Rubinstein, P. I. Tchaikovsky, and G. A. Larosh, as well as by the Russian Five.

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D. V. ZHITOMIRSKII [29–1534–2]

SCHUMAN PLAN, a plan for integrating the coal, iron, and metallurgical industries of several Western European states proposed in 1950 by the French foreign minister R. Schuman.

The Schuman Plan served as the basis for the European Coal and Steel Community (ECSC), which was established by a treaty signed by the governments of the Federal Republic of Germany, France, Italy, Belgium, the Netherlands, and Luxembourg at a meeting in Paris on Apr. 18, 1951. The ECSC is one of the largest international state monopoly organizations in the capitalist world. In 1975 it controlled about 90 percent of the steel, almost 100 percent of the coal, and 50 percent of the iron ore produced in Western Europe. Great Britain, Ireland, and Denmark joined the ECSC on Jan. 1, 1973. The implementation of the Schuman Plan was one the first steps toward the capitalist economic integration of Western Europe.

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SCHUMPETER, JOSEPH. Born Feb. 8, 1883, in Triesch (now Třešť), Moravia; died Jan. 8, 1950, in Taconic, Conn. Economist and sociologist.

Educated at the University of Vienna, Schumpeter served as finance minister of Austria in 1919 and 1920. He was a professor at the University of Bonn from 1925 to 1932 and at Harvard University from 1932 until his death. He regarded the history of the discipline of political ecorlomy as the development of an analytical framework and of research methods for studying economic phenomena.

Schumpeter is known primarily for his concept of economic dynamics, which assigned a central place to the entrepreneurial function. He advanced the theory of efficient competition, which depicts the market mechanism in the era of big business as the fruitful interaction of the forces of monopoly and competition. These forces are fueled by innovations and impart a particular dynamism to economic development.

Schumpeter worked out the dynamic concept of the business cycle, in which recurrent business cycles are seen as a law of economic growth. According to this concept, the driving force behind prosperity is mass investment, embodying certain innovations, in fixed capital. In Schumpeter's view, crises are not inevitable but occur when the natural cessation of an economic boom is met by panic. The theory of cycles assigns a major role to credit, which brings additional economic resources into play and thereby helps to implement innovations. Schumpeter attempted to refute the Marxist theory of socialist revolution by arguing that capitalist free enterprise would inevitaby be transformed, gradually, into an economic system whose development would be regulated and directed by the state.

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SCHUNGITE (after the village of Shun'ga, Karelian ASSR), a Precambrian rock saturated with carbonaceous (schungite) matter in a noncrystalline state. During metamorphosis, schungites alter to graphitoids and cryptocrystalline graphites.

Unstratified (migrational) schungites, which contain up to 99 percent carbon, occur in the form of blanket veins, crossveins, pockets, and amygdules. They are black and have a strong semimetallic luster. They exhibit a conchoidal fracture. They have a hardness of 3–3.5 on Mohs' scale and a density of 1,840–1,980 kg/m^3. In ash they contain vanadium, nickel, molybdenum, copper, cerium, arsenic, tungsten, and other elements.

Stratified schungites form sheets of different thickness within the volcanogenic and sedimentary strata of Middle Proterozoic age. They are classified according to the mineral base (aluminosilicate, siliceous, and carbonate) or the amount of schungite matter. Schungite rocks with a silicate mineral base are further subdivided into low-carbon schungite rocks (up to 5 percent carbon), medium-carbon schungite rocks (5–25 percent carbon), and high-carbon schungite rocks (25–80 percent carbon).

Schungites are a valuable raw material in construction and industry. Owing to the ability of some schungites to swell during heat treatment, they are used as lightweight aggregate for concrete (schungisite). Their excellent reaction properties (schungites are powerful reducing agents) may be used in the production of yellow phosphorus, iron alloys, and other products. Release agents are manufactured using schungite. Some varieties of schungites are used as decorative building materials.

Industrial deposits of schungites occur in the Lake Onega region of the Karelian ASSR.

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SCHUPPE, WILHELM. Born May 5, 1836, in Brieg (now Brzeg), Silesia; died Mar. 29, 1913, in Breslau. German idealist philosopher, representative of immanent philosophy. Professor at the University of Greifswald from 1873 to 1910.

Schuppe considered the ultimate irreducible element (the basis of philosophy) to be the experimentally established "I," the content of the consciousness of which is, according to Schuppe, "reality" (cognizable reality). To avoid solipsism, Schuppe supplemented his theory by postulating a theory of consciousness in general, which lends to reality an objective character. Thus, a subjectivist idealist theory became in Schuppe's philosophy an objectivist idealist theory. V. I. Lenin sharply criticized Schuppe as "a reactionary in philosophy" in *Materialism and Empiriocriticism*.

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Kljukowsky, L. *Das Bewusstsein und das Sein bei Wilhelm Schuppe*. Heidelberg, 1912. [29–1549–4]

SCHURTZ, HEINRICH. Born Dec. 11, 1863, in Zwickau; died May 2, 1903, in Bremen. German ethnographer.

Schurtz headed the ethnography division of the Bremen Museum from 1893. He studied the ethnography of North Africa, Spain, and Asia Minor. He investigated problems of general ethnography, such as the origin of money, clothing, food taboos, and ornaments. He introduced the study of men's societies in clan-tribal societies. He combined the anthropogeographic method of his teacher F. Ratzel with an idealist interpretation of evolution.

WORKS

Istoriia pervobytnoi kul'tury, fascs. 1–2. Moscow, 1923. (Translated from German.) [29–1552–2]

SCHUSCHNIGG, KURT VON. Born Dec. 14, 1897, in Riva, Italy; died Nov. 18, 1977, in Innsbruck, Austria. Austrian political and state figure; a leader of the Christian Socialist Party.

Schuschnigg was minister of justice from 1932 to 1934 and minister of education in 1933 and 1934. He became chancellor in 1934 after the assassination of E. Dollfuss. In 1936 the Schuschnigg government and the government of fascist Germany concluded an agreement by which Austria virtually subordinated itself to Germany; Austria officially adopted the reactionary thesis of Pan-Germanism, which viewed Austria as a second German state. In February 1938, Schuschnigg signed an agreement with Hitler that resulted in the appointment of National Socialists to important positions in the Schuschnigg government; the agreement hastened the annexation of Austria by Germany.

After the *Anschluss* (annexation), which took place in March 1938, Schuschnigg was placed in a concentration camp. Schuschnigg was released in 1945 and emigrated to the USA, where he lived until 1967. [29–1559–1]

SCHÜTZ, HEINRICH (latinized name, Henricus Sagittarius). Born Oct. 14, 1585, in Köstritz, Thuringia; died Nov. 6, 1672, in Dresden. German composer, *Kapellmeister*, and teacher.

In 1599, Schütz became a chorister in the chapel of the landgrave of Hesse-Cassel. From 1609 to 1612 he studied composition in Venice under G. Gabrieli. Schütz was the founder of many genres of German music and played an important role in stimulating musical life in Germany. He wrote numerous religious works—including passions, oratorios, cantatas, and the *German Magnificat*—that paved the way for many of the innovations of J. S. Bach and G. F. Handel. Schütz drew on the achievements of Italian choral, instrumental, and stage music, as well as the traditions of German religious and folk music.

Schütz was the composer of the first German opera, *Daphne* (1627), and the first German ballet, *Orpheus and Eurydice* (1638); neither of these works has been preserved.

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SCHUTZBUND (Defense League), a paramilitary organization of the Social Democratic Party of Austria in the 1920's and 1930's. The Schutzbund was founded in 1923 in response to the demand of the popular masses for defense against reactionary armed organizations. The Social Democratic leaders pursued a policy of capitulation with respect to the reactionaries; they restrained the actions of the Schutzbund and barred Communists from membership in it.

In February 1934, Schutzbund members in Linz, followed by their comrades in Vienna and many other Austrian cities, took up arms against the reactionaries and fascists (*see* FEBRUARY ARMED DEMONSTRATION OF 1934). Communists and unaffiliated workers fought alongside the members of the Schutzbund. Through the fault of the Social Democratic leaders, however, the demonstrators lacked leadership, and they were not supported by the main forces of the working class. The uprising was brutally suppressed after several days of bitter fighting.

After the events of 1934, many members of the Schutzbund left the Social Democratic Party and joined the Communist Party of Austria. [29–1556–2]

SCHWALBE, GUSTAV. Born Aug. 1, 1844, in Quedlinburg; died Apr. 23, 1916, in Strasbourg. German anatomist, histologist, and anthropologist.

Schwalbe studied medicine in Berlin, Zürich, and Bonn. He was a professor of histology at the Institute of Physiology in Leipzig from 1871, a professor of anatomy at Jena from 1873, and a professor of anatomy at Königsberg from 1881. Beginning in 1883 he was a professor of anatomy and director of the Institute of Anatomy in Strasbourg.

Schwalbe's principal works dealt with the anatomy and histology of bones, the sense organs, and the nervous and vascular systems of animals and man. Beginning in 1886, Schwalbe worked mainly in the field of anthropology. He proposed craniometric and cranioscopic methods of investigating the bones of fossil man. He was the author of classical descriptions of *Pithecanthropus* and Neanderthal man. He viewed the latter as a particular species of fossil man, the precursor of modern man. The journal *Zeitschrift für Morphologie und Anthropologie* began publication in 1899 upon Schwalbe's initiative.

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V. M. KHARITONOV [29–925–4]

SCHWANK, in German literature, a short satirical story written at first in verse and later in prose. The *Schwank* was widely popular from the 13th to 17th centuries. It was similar to the French *fabliau* and the Italian novella of the Early Renaissance, and from time to time it was directly influenced by these genres. Reflecting the views of the townspeople, the *Schwank* was devoid of the idealization typical of courtly literature. It depicted the life of the various social estates, mainly the comic side. Its favorite heroes were cunning, clever commoners.

The masters of the *Schwank* were Der Stricker (mid-13th century) and the Austrian poet P. Frankfurter (late 14th or early 15th century). The genre was widely exploited in the popular book about Til Eulenspiegel (1515). Hans Sachs wrote *Schwänke* in verse form.

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B. I. PURISHEV [29–926–1]

SCHWANN, THEODOR. Born Dec. 7, 1810, in Neuss; died Jan. 14, 1882, in Cologne. German physiologist and histologist; creator of the cell theory (*see* CELL THEORY).

After graduating from the medical faculty of the University of Berlin in 1834, Schwann worked under Johannes Müller in the anatomical museum of the University of Berlin from 1834 to 1839. He was a professor at the universities of Louvain (1839–47) and Liège (1848–80) in Belgium.

Schwann conducted research in various fields of biology. He investigated the effects of oxygen on the development of avian eggs and the process of putrefaction and established the involvement of yeast fungi in fermentation. In 1836 he discovered the digestive enzyme pepsin. He also studied the microscopic structure of chorda and cartilage in amphibian larvae. Schwann was acquainted with the work of the German botanist M. Schleiden on the function of the nucleus in the plant cell (already fairly well studied by that time) and concluded after comparing Schleiden's findings with his own that the structure and development of plants and animals from cells is based on the same principle. In 1838 he published three preliminary reports, and in 1839, his classic work, whose very title reflects the essence of the cell theory: *Mikroskopische Untersuchungen über die Uebereinstimmung in der Struktur und dem Wachstum der Tiere und Pflanzen* (Microscopic Researches on the Similarity in Structure and Growth in Animals and Plants). According to F. Engels, the creation of the cell theory, along with the law of the transformation of energy and the theory of evolution, was one of the three greatest discoveries in natural science in the 19th century.

Schwann was a fellow of the Royal Society of London (1879), the Paris Academy of Sciences (1879), and the Academy of Sciences in Brussels (1841).

WORKS

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Z. S. KATSNEL'SON [29–926–2]

SCHWANN'S CELL, a cell of nerve tissue forming the membranes of the long processes of the nerve cells (axons) in the peripheral nerves and ganglia; first described by T. Schwann in 1838.

The nucleus of a Schwann's cell is oval and contains one or two nucleoli. Masses of chromatin are found on the inner surface of the nuclear membrane. Mitochondria, lysosomes, the Golgi complex, microtubules, microfibrils, free ribosomes, and ribosomes attached to the membranes are concentrated around the nucleus in the cytoplasm. Schwann's cells may have cilia. They act as supporting cells in the processes of nerve cells and help form (and in unusual cases destroy) myelin in the medullated fibers. Metabolites penetrate the process of a nerve cell through the substance of Schwann's cells or at the point where the cells meet. It is possible that some substances are formed in Schwann's cells and then proceed to the processes. The capacity of Schwann's cells for wavelike movements may be related to the transport of various substances along the processes of nerve cells. [29–927–1]

SCHWARZ, HERMANN AMANDUS. Born Jan. 25, 1843, in Hermsdorf; died Nov. 30, 1921, in Berlin. German mathematician. Member of the Berlin Academy of Sciences (1893).

Schwarz' early works were devoted to the study of minimal surfaces. He obtained important results in the theory of conformal mappings. Schwarz proposed a solution of the Dirichlet problem for arbitrary bounding curves.

WORKS

Geseammelte mathematische Abhandlungen, vols. 1–2. Berlin, 1890.

REFERENCE

Mises, R. von. "Hermann Amandus Schwarz." *Zeitschrift für angewandte Mathematik und Mechanik*, 1921, vol. 1, p. 494. [29–928–2]

SCHWARZENBERG, FELIX VON. Born Oct. 2, 1800, in Krummau (now Český Krumlov, Czechoslovakia); died Apr. 5, 1852, in Vienna. Austrian statesman; field marshal; prince.

Between 1838 and 1848, Schwarzenberg served as a minister first in Turin and Parma and then in Naples. In 1848, commanding a division of Radetzky's army, he helped suppress the revolution in Italy. He became prime minister and foreign minister of Austria in November of the same year. His government crushed the revolution in Austria and, with the aid of troops from tsarist Russia, the revolution in Hungary.

Schwarzenberg's politics were aimed at establishing Austrian hegemony in Central Europe. In November 1850, at Olomouc (Olmütz), he concluded an agreement with Prussia that contributed to an increase in Austrian influence within the German Confederation. [29–931–3]

SCHWARZKOPF, ELISABETH. Born Dec. 9, 1915, in Jarotschin, near Poznań. German singer (soprano).

Schwarzkopf received her musical education at the Higher Music School in Berlin and studied voice under M. Ivagün. She made her debut in 1938 at the Berlin Municipal Opera, and from 1942 to 1951 she was a leading soloist at the Vienna State Opera.

In 1948 she began to perform on the major operatic stages of Europe and America and regularly took part in the Salzburg and Bayreuth festivals. She moved to London in 1951, and for a number of years she was a soloist at Covent Garden. She left the stage in the mid-1970's, continuing to perform in concert and to make records.

Schwarzkopf has an exceptionally versatile and pure voice of great beauty. She is also known for her sense of style and uncommon dramatic skills. She is an outstanding performer of the works of Mozart and R. Strauss.

REFERENCE
Rubin, M. "Tri portreta." In *Sovetskaia muzyka*, 1962, no. 4.
[29–931–4]

SCHWARZSCHILD, KARL. Born Oct. 9, 1873, in Frankfurt am Main; died May 11, 1916, in Potsdam. German astronomer. Member of the Berlin Academy of Sciences (1912).

From 1901, Schwarzschild was a professor at the University of Göttingen and director of the university's observatory. Beginning in 1909, he was director of the astrophysical observatory in Potsdam. In 1912 he became a professor at the University of Berlin.

Schwarzschild worked out the methodology of photographic stellar photometry and compiled a catalog that contained the photographic determinations of the brightnesses of 3,500 stars. A number of his studies were devoted to the theoretical investigation of various problems of stellar astronomy and astrophysics. Schwarzschild established the ellipsoidal distribution of stellar velocities and gave a general solution of the integral equations of stellar statistics. He created the theory of the radiative equilibrium of stellar atmospheres and studied binary and variable stars, comets, and problems of quantum mechanics and relativity theory as applied to astronomy. Schwarzschild is also known for his studies in optics.

REFERENCE
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[29–932–2]

SCHWASSMANN-WACHMANN I COMET, a periodic comet discovered in 1927 by the German astronomers A. Schwassmann and A. Wachmann at the observatory in Bergedorf. The Schwassmann-Wachmann I comet is distinguished by its near-circular, planet-like orbit, located between the orbits of Jupiter and Saturn, by virtue of which it can be observed at any point in its orbit. It is characterized by irregular bursts, during which its brightness increases by a factor of 100 or more, and a uniformly expanding shell—a halo—forms around its head. A connection between these bursts and manifestations of solar activity is hypothesized. The comet can be seen only through strong telescopes. [29–932–4]

SCHWEDT, a city in the German Democratic Republic, near Frankfurt. Located on the Hohensaaten-Friedrichsthal Canal, on the left bank of the Oder. Population, 47,300 (1975). Fuel and nitrogen fertilizers are produced at a petroleum-refining and petrochemical combine, which was built at the international Druzhba (Friendship) Petroleum Pipeline. Schwedt has oil pipelines to the city of Rostock and to the Leuna-2 Petrochemical Combine. The city serves as a produce distributor to the Berlin area. A newsprint factory is located in Schwedt. [29–935–3]

SCHWEICKART, RUSSELL. Born Oct. 10, 1935, in Neptune, N.J. American astronaut; air force pilot (1956–63).

Schweickart received a bachelor of science degree in aeronautical engineering from the Massachusetts Institute of Technology in 1956 and a master of science degree in aeronautics and astronautics in 1963. He conducted research on the atmosphere at the Experimental Astronomy Laboratory of the Massachusetts Institute of Technology. In 1963 he became a member of the group of astronauts of the National Aeronautics and Space Administration.

Between Mar. 3 and Mar. 13, 1969, Schweickart, as the lunar module pilot, completed a spaceflight in the Apollo 9 spacecraft, together with J. A. McDivitt and D. R. Scott. During the test flight in earth orbit, which lasted 241 hr 01 min, the docking with the lunar module and its independent flight were performed and other systems of the spacecraft were tested; various studies were also carried out. During the flight, Schweickart undertook a space walk, which lasted 47 min. [29–936–2]

SCHWEINFURT, a city in the Federal Republic of Germany, in the *Land* (state) of Bayern (Bavaria). Population, 55,600 (1976). Schweinfurt, a railroad junction and a port on the Main River, produces bearings, internal-combustion engines, and dyes.
[29–942–1]

SCHWEINFURTH, GEORG AUGUST. Born Dec. 29, 1836, in Riga; died Sept. 19, 1925, in Berlin. German botanist and African explorer.

Schweinfurth studied at the universities of Heidelberg, Munich, and Berlin between 1856 and 1862. From 1863 to 1866 he conducted botanical research in Egypt, eastern Sudan, and on the coast of the Red Sea. Between 1869 and 1871 he was commissioned by the Prussian Academy of Sciences to explore the Bahr al-Gazal River basin. After arriving at Khartoum, Schweinfurth traveled to the Tonj and Jur rivers and discovered the Wau River and the sources of the Jur. In 1870 he discovered the Uélé River in the Congo basin. In 1873–1874 he participated in the Rolfs expedition into the Libyan Desert.

WORKS
Im Herzen von Afrika, 4th ed. Leipzig, 1922.
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REFERENCE
Gornung, M. B., Iu. G. Lipets, and I. N. Oleinikov. *Istoriia otkrytiia i issledovaniia Afriki*. Moscow, 1973.
[29–941–2]

SCHWEITZER, ALBERT. Born Jan. 14, 1875, in Kayserberg, Alsace; died Sept. 4, 1965, in Lambaréné, Gabon. German-French thinker influenced by the "philosophy of life" movement; theologian, physician, musicologist, and organist. World-famous for his antiwar statements.

Schweitzer was educated at the universities of Strassburg, Berlin, and Paris. He earned the degree of doctor of philosophy in 1899 with a dissertation entitled *Kant's Philosophy of Religion*. He received a doctorate in theology in 1900 and a doctorate in medicine in 1913.

In the early 20th century Schweitzer gained prominence as a concert organist. As a musicologist, his main importance is his work on J. S. Bach. Schweitzer influenced contemporary styles of performance of Bach's music and promoted a rebirth of interest in the composer's works.

In 1913, Schweitzer and his wife, the nurse Hélène Bresslau, established a hospital in Lambaréné with their own resources. The hospital became Schweitzer's main preoccupation and the platform from which he propounded his ideas. In 1928, Schweitzer was awarded the Goethe Prize of the city of Frankfurt am Main. Awarded the Nobel Peace Prize in 1952, he used the prize money to build a leprosarium in Lambaréné.

Schweitzer's world view is founded on the concept of "life," which he opposed to the concept of "thought"; he regarded thought as derivative. In contrast to Descartes's "I think, therefore I am," Schweitzer offered the formula "I am life, which wants to live among life." From this formula he developed his basic ethical principle of reverence for life, which demands that life be preserved and improved. Morality, according to Schweitzer, is not just a law but a fundamental condition for the existence and development of life. Schweitzer believed that reverence for life should be the foundation of an ethical renewal of the human race and the development of precepts of a universal, cosmic ethical system.

Schweitzer defended the idea of the free and moral individual and opposed domination of the "concretely personal" by the "general." In an existential spirit he contrasted two vital principles: (1) the will as an expression of the free and moral essence of the human being and (2) knowledge (or understanding) as an attitude toward life based on a desire to submit to external necessi-

ty. In Schweitzer's thought, an "understanding" attitude toward the world leads to skepticism, which is an expression of the spiritual bankruptcy of civilization. Schweitzer opposed culture to civilization and criticized the age of technology and "external progress." According to Schweitzer, ethics must merge with culture organically to ensure human progress and the spiritual improvement of the individual. He considered the level of humanism reached by a particular society to be the criterion of its cultural development.

Schweitzer set as his goal the formulation of a philosophically sound optimistic world view that would have practical application; such a world view would strengthen the human personality in difficult times and restore its creative energy. From this humanist standpoint he criticized the moral state of modern bourgeois society, which is undergoing a profound spiritual crisis.

Monuments to Schweitzer were built in 1969 in Weimar and Günsbach; there is a memorial museum in Kaysersberg.

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V. A. PETRITSKII and I. V. VENGROVA [29–995–4]

SCHWEITZER, JOHANN BAPTIST. Born July 12, 1833, in Frankfurt am Main; died July 28, 1875, in Giessbach, near Bern, Switzerland. Figure in the German working-class movement.

Schweitzer was a lawyer by profession. Influenced by F. Lassalle's ideas, he joined the Lassallean General German Workers' Association and became one of its leaders. He actively supported O. von Bismarck on the question of unifying Germany under Prussian hegemony. Schweitzer's political line led to the growth of an oppositional wing in the association; some of the members of the opposition broke with Lassalleanism and joined the Social Democratic Workers' Party (the Eisenachers). [29–997–2]

SCHWEIZERISCHE KREDITANSTALT (also Crédit Suisse), a Swiss commercial bank established in 1856.

The Schweizerische Kreditanstalt engages in a variety of banking operations and, through specialized subsidiaries, carries out financial transactions involving mortgages and the buying and selling of securities; the bank also acts as a middleman for the leasing of equipment. The bank's headquarters are in Zürich. In 1977 the Schweizerische Kreditanstalt had 118 branches and 13 subsidiaries in Switzerland and six branches, 20 offices, and six subsidiaries in foreign countries. It had an interest in several financial concerns and banks in Switzerland and abroad.

As of June 1977 the bank had total assets of 43.0 billion Swiss francs; current accounts and deposits of other banks totaled 12.3 billion francs, and those of other clients, 15.4 billion francs. The bank had capital and reserves of 2.7 billion francs, loans and discounted bills of 19.9 billion francs, mortgages of 3.0 billion francs, and accounts in other banks totaling 12.3 billion francs. [29–990–4]

SCHWEIZERISCHER BANKVEREIN (also Swiss Bank Corporation), a major Swiss commercial bank. Established in 1872 as the Basler Bankverein, the bank took its present name in 1897 after absorbing several other banks.

The Schweizerischer Bankverein has gained a reputation in international financial circles for its efficient organization and the wide range of transactions it carries out in secrecy, in accordance with the Swiss Banking Law of 1934. Because of their secret operations and their interest in precious metals, the Schweizerischer Bankverein and other Swiss banks have been called the gnomes of Zürich.

The Schweizerischer Bankverein, whose headquarters are in Basel and Zürich, has 156 branches and nine subsidiaries in Switzerland and seven branches, 13 companies, and 21 offices in foreign countries; the London branch was opened in 1898, and the New York branch in 1939. The bank works closely with multinational banks. As of June 1977 it had total assets of 53.8 billion Swiss francs; current accounts and deposits of other banks totaled 16.8 billion francs, and those of other clients, 25.5 billion francs, loans and discounted bills of 21.1 billion francs, and accounts in other banks totaling 24.1 billion francs. [29–990–3]

SCHWERIN, a district in the northwestern part of the German Democratic Republic (GDR). Situated in the Elbe River basin, mainly on the Mecklenburg Upland. Area, 8,700 sq km. Population, 590,300 (1975). The administrative center is the city of Schwerin. Schwerin is an industrial and agricultural region. Industry, including construction and handicrafts, employs 33.5 percent of the total labor force, and agriculture and forestry employ 22.6 percent.

The district accounts for 2.4 percent of the country's industrial output, including 6.9 percent of the food production. The main branches of industry are food processing (about one-half of the district's gross output), machine building (23 percent), light industry (excluding textiles, 10.2 percent), and the chemical industry (7.3 percent). The main industrial centers are Schwerin, Wittenberge (sewing machines, synthetic fiber), Güstrow (sugar, machinery), Boizenburg (river vessels) Neustadt-Glewe (machine building), and Ludwigslust (machinery, printing, food products).

Schwerin is an important agricultural region, specializing in the raising of dairy cattle and swine and the cultivation of grains, potatoes, and sugar beets. There are large agrarian-industrial complexes. Fish are caught and raised in the lakes. The Elbe is used for navigation. [29–998–2]

SCHWERIN, a city in the German Democratic Republic. Capital of Schwerin District. Population, 107,400 (1975). Schwerin is picturesquely located on the shore of Lake Schwerin. It is a railroad junction and a lake port. The district's main industrial center, it manufactures floating cranes, cable, hydraulic equipment, and building materials. Industry also includes clothing, leather haberdashery, furniture, and food processing. The Mecklenburg State Theater is located in the city. [29–998–3]

SCHWIND, MORITZ VON. Born Jan. 21, 1804, in Vienna; died Feb. 8, 1871, in Munich. Painter and graphic artist; representative of late romanticism in 19th-century German and Austrian art.

Schwind studied at the Vienna Academy of Arts from 1821 and at the Munich Academy of Arts under P. von Cornelius from 1828. He worked mainly in Munich after 1847. His works include genre pictures, for example, *The Wedding Trip* (1862); cycles of pictures and large watercolors, including *Beautiful Melusine* (1868–70, Gallery of the Nineteenth and Twentieth Centuries, Vienna); and numerous paintings and illustrations. Motifs from folktales and legends abound in these works, which are idyllic in mood but suffer from a certain measure of academism.

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[29–1061–4]

SCHWINGER, JULIAN. Born Feb. 12, 1918, in New York. American physicist.

After receiving the Ph.D. degree from Columbia University in 1939, Schwinger worked at the University of California (Berkeley), Cambridge University, the University of Chicago, and Boston University. From 1943 to 1946 he worked at the Radiation Laboratory of the Massachusetts Institute of Technology. From 1947 to 1972 he was a professor at Harvard University. In 1972 he became a professor at the University of California (Los Angeles).

Schwinger's main works deal with quantum field theory, the theory of nuclear forces, the theory of scattering and radiation, and the quantum theory of many-particle systems based on Green functions. Schwinger was the first to set down the foundations of quantum electrodynamics in covariant form and to calculate a number of radiation corrections. Schwinger worked out the variational method in the theory of scattering.

In 1965, Schwinger, R. P. Feynman, and S. Tomonaga were awarded a Nobel Prize. Schwinger is a member of the US National Academy of Sciences and the American Academy of Arts and Sciences.

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[29–1061–3]

SCHWYZ, a canton in Switzerland. Area, 908 sq km. Population, 92,000 (1970). The capital is the city of Schwyz.

Schwyz is first mentioned in written sources as a community of free peasants in 972. It later became dependent on the Hapsburgs. In its struggle against the Austrian dynasty, Schwyz concluded in 1291 a treaty of perpetual alliance with the other forest cantons of Uri and Unterwalden, thus forming the nucleus of the Swiss state. One of the economically backward cantons, Schwyz opposed the Protestant cantons and remained Catholic during the Reformation in the 16th century. As part of the Helvetian Republic from 1798 to 1803, it resisted centralization. During the 1830's and 1840's, Schwyz was a member of the League of Sarnen and the Sonderbund. [29–1062–1]

SCIACCA, MICHELE FEDERICO. Born July 12, 1908, in Giarre, Catania. Italian idealist philosopher; representative of Christian spiritualism.

Sciacca became a professor in Pavia in 1938 and in Genoa in 1947. He was one of the founders and leaders of the Gallarate movement, a group of Italian Catholic philosophers. Sciacca's views combine the Platonic and Augustinian tradition with the ideas of A. Rosmini-Serbati and, especially, G. Gentile. At the center of Sciacca's "philosophy of integralism" is the doctrine that the individual intuitively perceives in his "objective" inner experience the idea of absolute being (god); the idea of god transcends and at the same time is immanent in the individual consciousness. The author of works on the history of philosophy, Sciacca founded in 1946 the journals *Giornale di metafisica* and *Humanitas*.

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S. A. EFIROV [29–812–2]

SCOTLAND, an administrative and political division of the United Kingdom of Great Britain and Northern Ireland, comprising the northern part of the island of Great Britain and adjacent islands: the Hebrides, Shetland, and the Orkneys. Scotland, which maintains a degree of autonomy, has an area of 78,800 sq km; the population of 5.2 million (1971) is made up primarily of Scots, who speak a dialect of English. The literary language is English. The Gaels form a distinct ethnic group. Religious believers profess Protestantism.

For purposes of local administration, Scotland is divided into nine regions—Dumfries and Galloway, Borders, Strathclyde, Lothian, Fife, Central, Tayside, Grampian, and Highland—and the three island areas of Shetland, Orkney, and Western Isles. The regions and island areas are divided into administrative districts. The capital is the city of Edinburgh.

The terrain of Scotland is dominated by hills and mountains: the Highlands, which reach an elevation of 1,343 m at Ben Nevis (the highest point in Great Britain), and the Southern Uplands. Between these areas lie the Central Lowlands. Narrow, low-lying plains run along the coasts. Scotland has a temperate oceanic climate, with a mean temperature in Edinburgh of 3.4°C in January and 14.4°C in July. Annual precipitation is approximately 2,000 mm in the west and 700 mm in the east. The country has a dense network of rivers, the most famous of which is the Clyde. The numerous lakes include Loch Lomond and Loch Ness. Tracts of moorland are found throughout Scotland.

Economically, Scotland is divided into the Central Lowlands, a densely populated, primarily industrial region in which three-fourths of the population lives, and the Southern Uplands and the Highlands, which are sparsely populated and primarily agricultural. More than one-third of the economically active population works in industry, and less than one-tenth in agriculture. The main industrial centers are Edinburgh and the conurbation of Clydeside, whose center is Glasgow; other important industrial cities are those along the eastern coast, such as Aberdeen, Dundee, and Grangemouth.

Major industries include the coal, steel, petrochemical and chemical, printing, aluminum, electrical engineering, and food industries. The shipbuilding industry produces about one-third of all British ships. Scotland also produces electronic goods, office equipment, clocks, textiles, and paper. Petroleum is extracted off the eastern coast, on the North Sea shelf.

Agriculture is dominated by livestock raising. Large numbers of sheep are grazed in the hill country; in the plains of western Scotland chiefly beef and dairy cattle are raised. Along the coasts and the Central Lowlands, livestock raising is combined with the cultivation of barley, wheat, and potatoes. N. M. POL'SKAIA

Historical survey. The earliest archaeological remains discovered on Scottish soil date from the third millennium B.C. In the centuries immediately preceding the Common Era, Celtic tribes settled in Scotland; in the first centuries of the Common Era, the Picts were the principal inhabitants of the country. Among some tribes a class society began developing early in the Common Era. Beginning in the first century A.D. the Romans made repeated, but unsuccessful, attempts to conquer Scotland, which they called Caledonia. Between 360 and 367 the Picts invaded Roman Britain, reaching as far as the southern coast.

In the late fifth and early sixth centuries, tribes of Scots evidently began migrating from Ireland to Scotland. The name "Scotland," derived from the Scots, became established in the 11th century. During the Anglo-Saxon conquest of Britain in the fifth and sixth centuries, large numbers of Britons were driven into Scotland. In the seventh century Scotland was invaded by the Angles, who settled in the south. Norsemen raided the country from the ninth to 13th centuries.

The emergence of feudalism was accompanied by the preservation of the clan system, which had developed as the primitive communal system disintegrated (*see* CLAN). The process of feudalization was eased by the spread of Christianity in the sixth century. During the early feudal period the first state formations appeared. The Scottish kingdom was formed in the 11th century. In the second half of the 11th century Scotland was attacked by the Normans who had conquered England, and the Scottish king, Malcolm III (ruled 1058–93), acknowledged himself a vassal of the English king, William I (William the Conqueror). Beginning

in the 12th century feudal relations gradually emerged in the southern plains of Scotland, where land cultivation was developed. In the north, where stock raising formed the basis of the economy, feudalism spread only in the 14th and 15th centuries. The majority of Scottish peasants were serfs, or velleins. Handicrafts and trade developed in southern Scotland.

In the late 13th century, English feudal lords increased their efforts to subjugate Scotland. The English king Edward I proclaimed himself suzerain of Scotland, which was invaded by English troops in 1296; this incursion touched off a revolt against the English that lasted from 1296 to 1314. In 1305 the rebel troops, under W. Wallace, were defeated, but the following year a new revolt was led by Robert Bruce, who was proclaimed King Robert I of Scotland (1306–29). In 1314, Scottish troops defeated the English army of Edward II at Bannockburn. An invasion of Scotland in 1322 by English troops was unsuccessful.

In 1328, England recognized Scotland's independence, but English lords retained the holdings in Scotland that they had received earlier. The Scottish Parliament was formed in the late 13th and early 14th centuries. Gradually, the Scottish nationality took form, although centralization was hampered by feudalism and tribal separatism. Royal authority was weakened considerably in the late 14th century under the first Stuart kings. Internecine feudal wars undermined Scotland's position in wars with England, which flared up anew in the late 14th century and in which Scotland was often allied with the French.

In the 16th century elements of capitalist production emerged in the south, although Scotland remained, on the whole, a country whose productive forces were little developed. The cities of the south carried on a brisk trade with English cities. In the mid-16th century the Calvinist Reformation, headed by J. Knox, spread throughout the country. It embodied the interests of the nobility and the rising bourgeoisie. The former had concentrated five-sixths of the church property, which had gradually become secularized, in its hands, and the latter stood to gain an "inexpensive" church. In 1560, Parliament adopted Presbyterianism as the national religion.

As a result of an uprising by the Calvinist aristocracy in 1567, Mary Stuart, who had tried to restore Catholicism in Scotland, was overthrown. With the accession of the Stuarts to the English, in addition to the Scottish, throne in 1603, Scotland was bound by a personal union to England. The absolutist government used every means to strengthen its authority over Scotland. The rights of the Scottish Parliament were restricted, and measures were taken to Anglicanize the Scottish Church (*see* CHURCH OF ENGLAND). Attempts by Charles I to introduce a liturgy on the Anglican model triggered an uprising, and, in 1638, Scottish Presbyterians signed the National Covenant, in which they swore to defend the true faith against all encroachments (*see* COVENANT). Charles tried to suppress the uprising using armed force but was defeated in the ensuing Bishops' Wars of 1639–40, which served as an immediate cause of the English Bourgeois Revolution (English Civil War).

During the first stage of the revolution, Scottish Presbyterians who had signed the Covenant—the Whigs—entered into an alliance with the English Long Parliament against the king. In late 1647, however, the leaders of the Presbyterian elite, fearing that the conflict might deepen, concluded a secret agreement with the king in which they promised to help him in his struggle against the rebel army; in return, Charles would preserve Presbyterianism in Scotland. The Scottish army that invaded England was defeated in August 1648 near Preston by O. Cromwell.

Charles' execution in January 1649 and the declaration of the Independent republic in England were met with hostility by the Presbyterian leadership of Scotland. In February 1649 the Scottish Parliament recognized Charles II, the son of the executed king, as its sovereign; for his part, Charles accepted the National Covenant and other conditions limiting his power. In early 1650 the Marquess of Montrose staged an unsuccessful coup that would have allowed Charles to occupy the throne without submitting to any conditions; Montrose was executed.

England's ruling classes took advantage of the royalist danger threatening the English republic from the north in order to completely subjugate Scotland. In July 1650, Cromwell's army entered Scotland, and on September 3 it was victorious at Dunbar. Exactly one year later, Scottish troops under Charles invaded England and suffered a shattering defeat at the battle of Worcester. By May 1652 all Scotland had been taken by English troops. In April 1654 Cromwell issued an ordinance that made official the union of Scotland with England.

The lands of the Scottish aristocracy and royalist nobility were confiscated and given to new owners, mainly members of the English bourgeoisie and new nobility; this policy led to the destruction of the old agrarian relations in Scotland. Peasant holdings were partially expropriated, and many peasant landowners became tenant farmers. Increasing numbers of landless poor left to seek work in the cities.

The Restoration (1660–88) was a period of political reaction in both Scotland and England. The reestablished Scottish Parliament abolished the Covenant. The peasant movement became stronger, as evidenced by the march on Edinburgh of 1666 and the uprising of 1678–80. Anti-English uprisings in 1679 and 1685 were put down. The bourgeoisie and part of the nobility of southern Scotland supported the Glorious Revolution of 1688–89. Several Highland clans that rose in defense of the deposed Stuarts were crushed.

By the Act of Union of 1707, Scotland was fully united with England to form Great Britain. Under the act, the Scottish Parliament was dissolved, but Scotland was given the right to elect representatives to the Parliament in London; in addition, the Presbyterian Church remained independent. The Scottish commercial bourgeoisie entered into trade with the English colonies and helped exploit them. At the beginning of the 18th century, Scotland, which lagged behind England to a marked degree in economic development, principally exported food and raw materials. Workers in the coal and salt mines remained virtual serfs until the late 18th century. Peasants in southern Scotland held their farms under one-year leases. The main occupation of the Highlanders remained stock raising.

In the first half of the 18th century, much of the hereditary aristocracy of northern Scotland supported the claims of Stuarts to the throne. Various armed uprisings on behalf of the Stuarts by some of the Highland clans, notably those of 1715–16 and 1745–46 were, however, unsuccessful. The abortive uprising of 1745–46, which also reflected the protest of the Highlanders against their landlessness and oppression by the exploiting classes of England and Scotland, was followed by the final destruction of the outmoded clan system. In the second half of the 18th century tenants of small farms were driven off the land in increasing numbers; these land clearances continued until the 1880's and served as a source for the primitive accumulation of capital in Great Britain.

As a result of the industrial revolution, which began in the last third of the 18th century, a highly developed industrial capitalist system was established in Scotland and England. The textile industry, and later mining, metallurgy, and shipbuilding, underwent extensive development. Southern Scotland became one of Great Britain's chief industrial regions. During the industrial revolution the popular masses of Scotland suffered on a greater scale than did those of England. Emigration became commonplace; it has been estimated that more than 2 million persons left Scotland in the 19th and first half of the 20th century.

Under the influence of the French Revolution, organizations were formed that favored radical democratic change; such groups were crushed by the British government. The working-class movement developed in earnest in the early 19th century. A mass strike that took place in 1820, although essentially spontaneous, was the first general political strike in Great Britain; it received unusually strong support in Glasgow. Scottish workers took an active part in the Chartist movement (*see* CHARTISM).

In 1858 the Trades Union Council was formed in Glasgow. Progressive Scottish workers took part in the First International. In 1884 the Scottish Land and Labour League, founded in Edinburgh, merged with the British Social Democratic Federation. In 1888 the Scottish Labour Party was founded by J. Hardie, who became its leader; in 1893 the party merged with the Independent Labour Party. In 1897 the Scottish Trades Union Congress was founded.

With the transition to imperialism, the exploitation of Scotland by British monopoly capitalism accelerated, becoming particu-

larly marked as Great Britain lost its world industrial monopoly. In Scotland, as in the rest of Great Britain, the labor movement revived and experienced an upsurge between 1907 and 1912. During World War I the shop steward movement in the industrial region of Clydeside took on a wide scope and eventually spread throughout Great Britain (*see* SHOP STEWARD). V. I. Lenin described the shop steward movement as a profoundly proletarian, mass movement (*Poln. sobr. soch.*, 5th ed., vol. 41, p. 266). In 1915 and 1916 shop stewards led several strikes in Clydeside. In 1916 J. MacLean, W. Gallacher, and other leaders of the shop stewards were arrested and imprisoned, and A. MacManus was expelled from Clydeside.

The October Revolution fostered a new upswing in the struggle of the Scottish workers. A mass movement, under the slogan "Hands off Russia," developed in Scotland in the course of a revolutionary upsurge that enveloped the entire country. A strike in Clydeside in January and February 1919 involved over 100,000 workers (*see* CLYDE STRIKE OF 1919). Many participants in the Scottish working-class movement joined the Communist Party of Great Britain, formed in 1920. Scottish workers took part in the miners' strike of May to November 1926, the General Strike of 1926 in Great Britain, and other strikes in the 1920's and 1930's.

Britain's weakened position in the world market after World War I led to a substantial deterioration of British export industries, including the textile, coal, and shipbuilding industries, which had undergone extensive development in Scotland. In the period from 1931 to 1935 there were mass demonstrations of the unemployed. From Sept. 15 to 17, 1931, sailors mutinied at the port of Invergordon, on Scotland's northern coast (*see* INVERGORDON REVOLT OF 1931).

After World War II, Scotland was greatly affected by the widespread changes that took place in British industry and by the general weakening of the economic and political position of British imperialism. As new and advanced industries grew rapidly—notably the automobile, electrical engineering, electronics, chemical, and nuclear industries—the old, traditional Scottish industries, including the textile, mining, and shipbuilding industries, suffered a further decline. The modern industries that were being developed in Scotland, such as the chemical, electronics, and petroleum-refining industries, were to a considerable extent controlled by foreign, chiefly American, capital. In the 1960's and 1970's, American companies controlled the exploration and development of rich petroleum and gas deposits on the continental shelf of the North Sea off the northern coast of Scotland.

For many years, unemployment in Scotland has been much higher than in the rest of Great Britain; the mining industry has been particularly hard hit. As a result, emigration has doubled since the war. In the 1960's and 1970's the Scottish National Party, founded in 1928, became more active, and its leaders capitalized on the heightened national consciousness of the Scottish people.

Scotland has remained a major center of the working-class movement in Great Britain. For several months in 1971 and 1972, workers along the upper Clyde managed the shipyards when the owners tried to close them down. Supported by trade unions throughout Great Britain, the workers of the upper Clyde forced the government to keep the shipyards open. A characteristic feature of the working-class movement in Scotland, as in Great Britain as a whole, from the 1950's to the 1970's was its close association with the peace movement. A drive to remove American military bases found widespread response. Cultural and other ties with the USSR have been strengthened; this trend has been facilitated by the Scottish USSR Society, founded in 1945.

Communists have played an active role in the struggle of Scottish working people for their rights. A special resolution of the Thirty-first Congress of the Communist Party of Great Britain (November 1969) emphasized that the Scottish people have the right to determine their own fate. The Communist Party has supported autonomous parliaments for Scotland and Wales. At the same time, the party opposes bourgeois separatist slogans calling for the complete separation of Scotland from Great Britain and does not support attempts by the leaders of the Scottish National Party to divert the nationalist movement from the resolution of the class and social problems facing Scottish working people. The Communists have repeatedly stressed that the primary goal remains the common struggle of all British working people against monopolies and for democracy and socialism.

L. A. ZAK

Literature. Scottish literature has developed in the English and Scots languages. The earliest extant poetic texts date from the 14th century, but Scottish literature emerged before that time. Popular ballads first appeared no later than the 13th century, flourished in the 15th century, and were set down in printed leaflets beginning in the 16th century. The poet and chronicler Andrew of Wyntoun (15th century) attributed to Huchown, among the first to use alliterative verse, the narrative poems *The Awntyrs of Arthure, Sir Gawain and the Grene Knight*, and *The Pistil of Susan*. The victories of the Scottish people in its struggle for independence from England in the late 13th and early 14th centuries inspired such patriotic poetry as the epic *Bruce* (published 1571) by J. Barbour (c. 1316–95) and the narrative poem *Schir William Wallace* (modernized text published 1722) by Harry the Minstrel, or Blind Harry (fl. 1470–92).

Scottish poetry of the 15th and 16th centuries reflects a set of ideas common to European literature in the period when humanism emerged and became established. Notable works of this period are *The Kingis Quair* (1423) by the lyric poet and king James I (1394–1437), the fables and the narrative poem *Testament of Cresseid* (published 1593) by R. Henryson (c. 1430–1506), and the narrative poems and satires of W. Dunbar (1460–c. 1517). A precursor of the Renaissance was the poet G. Douglas (c. 1474–1522), who translated Vergil's *Aeneid* and wrote the narrative poem *King Hart* (1516). Brilliant examples of the humanist lyric were created by A. Scott (1525?–85?) and A. Montgomerie (1556?–1610?).

The union of Scotland and England influenced the development of Scottish literature. Although the literature of the 17th century reflects the political and religious struggle of the time, it is markedly inferior to that of the preceding period. In the 18th century many Scottish writers wrote in English but made use of local color; writers of this period include J. Home (1722–1808) and W. Wilkie (1721–72).

The contradictions of bourgeois development in Scotland and the loss of national independence aroused in literature a nostalgia for a vanished past, a yearning that awakened an interest in folklore and medieval literature. A. Ramsay (1686–1758) and R. Fergusson (1750–74) reproduced in Scots verse the features of folk poetry, its joyousness and love of freedom. The Ossianic fragments (1765) of J. Macpherson, which were written in a style suggestive of ancient Erse poetry, were influential throughout Europe; imbued with melancholy, they became one of the most important examples of preromantic poetry.

The profoundly democratic and original poems of R. Burns (1759–96), the best known of which appear in the collection *Poems, Chiefly in the Scottish Dialect* (1786), embodied the freedom-loving spirit of the people and its dreams of justice and equality. Walter Scott (1771–1832), who wrote in English, created the genre of the historical novel in modern literature. He began his artistic career as a collector of Scottish folk poetry, which he published in *Minstrelsy of the Scottish Border* (1802), and he wrote several romantic narrative poems on medieval subjects. Scott's historical novels, beginning with *Waverly* (1814), depict Scottish life in the 16th to 18th centuries.

The Edinburgh Review (1802–1929) and *Blackwood's Magazine* played an important role in the development of British literature in the romantic period. Scottish romantic poets of note included John Wilson (1785–1854), whose *City of the Plague* (1816) was used by A. S. Pushkin in *The Feast During the Plague*. R. L. Stevenson (1850–94), a representative of late romanticism, achieved world renown with his novels of adventure and his historical novels. The naturalistic prose of the Kailyard school, represented by such writers as G. Macdonald (1824–1905) and J. Watson (1850–1907), showed that literature had turned to modern subjects. In the novel *The House With the Green Shutters* (1901), G. Brown (1869–1902) exposed avarice and self-interest.

The social novel appeared in the first half of the 20th century. D. Allan (*Hunger March*, 1934), A. McArthur (1901–47; *No Mean City*, 1935), and G. Blake (1893–1961; *The Shipbuilders*, 1935), turning to industrial subject matter, depicted Scotland during the world economic crisis and described the class struggle in their country. L. Grassic Gibbon (1901–35) wrote the epic tril-

ogy *A Scots Quair* (1932–34), which traces the stories of Scottish farmers against the background of the events of the early 20th century.

The 1920's witnessed the beginning of the Scottish renaissance, a period in which poetry in the Scots language flourished. The central figure in this renaissance was the brilliant poet Hugh MacDiarmid (real name, C. M. Grieve; born 1892), the author of two "Hymns to Lenin" (1931 and 1935) and the founder of a new school of modern Scottish poetry. Many poets, although influenced by W. H. Auden and other English poets of the 1930's, kept alive the Scottish literary tradition in their work; these include E. Muir (1887–1959; *Collected Poems*, 1960), G. Bruce (born 1909; the collection *Sea Talk*, 1944), R. Todd (born 1914; *Garland for the Winter Solstice*, 1962), W. Soutar (1898–1943; *Collected Poems*, 1948), A. Young (1885–1971), S. G. Smith (born 1915), and A. Mackie (born 1925; *Clytach*, 1972).

The most important contemporary prose writers include R. Jenkins (born 1912; the novels *Guest of War*, 1956, and *The Changeling*, 1958), G. M. Brown (born 1921; *Calendar of Love*, 1967), I. C. Smith (born 1928; *Consider the Lilies*, 1968, and *The Lost Summer*, 1969), and Muriel Spark (born 1918; *The Prime of Miss Jean Brodie*, 1961).

The drama has been relatively little developed. Among playwrights writing in English were James M. Barrie 1860–1937), whose works include *The Admirable Crichton* (staged 1902), *Peter Pan* (1904), and *What Every Woman Knows* (1918), and James Bridie (real name, O. H. Mavor; 1881–1951), whose works include *Sunlight Sonata* (1930), *Tobias and the Angel* (1931), and *Dr. Angelus* (1950). Social themes are particularly evident in the plays of Joe Corrie (1894–1968; *In Time of Strife*, 1929), W. D. Home (born 1912), and Ewan MacColl.

A. A. ANIKST

Architecture and art. Dating from the period of the clan system are stone ramparts, cylindrical towers (brochs), and the remains of shepherds' settlements with stone huts. Early Christian churches are closely related to the art of Ireland, as are stone crosses decorated with pagan and Christian images that are combined with complex geometric and plant designs.

Romanesque architecture appeared in Scotland in the 12th century, and Gothic in the 13th. The Romanesque and Gothic structures of Scotland, which include many castles, are notable for their severe formal simplicity; in addition to lierne vaults, tunnel vaults were used extensively in Gothic structures. A distinct type of Scottish castle is the peel tower, which has four sides and rises vertically from the ground. In the 15th and 16th centuries the castles were transformed into palaces with towers, in a style known as Scottish Baronial; this style gradually absorbed features of French Renaissance architecture.

The finest Scottish architects of the 17th and 18th centuries—J. Vanbrugh, J. Gibbs, W. Chambers, and the Adam brothers—built little in their own country, preferring the rapidly growing industrial centers of England. Scottish classicism, however, engendered not only many interesting structures but many noteworthy examples of city planning, such as Edinburgh's New Town, built according to the plan of J. Craig in the second half of the 18th century. The romantic period, in which the Gothic revival dominated Scottish architecture, is the golden age of Scottish visual art. Notable painters of this period are the portraitists A. Geddes and H. Raeburn, the landscape painters A. Nasmyth, P. Nasmyth, and J. Thomson, and the genre painter D. Wilkie.

National and romantic trends were continued in the work of such masters as B. Scott, who developed in the late 19th and early 20th centuries new types of cottages and established a school of interior design. A prominent figure in *art nouveau* was the Scottish architect C. R. Mackintosh. In the 20th century Scottish architecture has developed along the same lines as that of England, as evidenced in the construction of satellite cities in the 1950's and 1960's. Large-scale residential housing is dominated by low-rise, multi-unit buildings, that, although somewhat severe in outline, are nevertheless united in attractive complexes.

Scottish visual art of the 20th century has produced the works of W. Macgregor (and other members of the Glasgow school) and W. McTaggart and the expressionist canvases of the Scottish colorists S. Peploe, L. Hunter, and J. Maxwell. From the 1950's to 1970's such Scottish artists as J. Eardley and R. Philipson have turned away from France as the sole source of artistic ideas.

In addition to wood carvings and woven articles, Scottish folk art is represented by such textiles as the woolen fabrics tweed, cheviot, and tartan.

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Music. The sources of Scottish music lie in the folk songs and dances of the tribes that inhabited the country, notably the Celts, Scots, and Norsemen. Music has long been an important part of the everyday life of fishermen, shepherds, and farmers, as well as fullers and other artisans; such working people composed a variety of songs, including work songs, love songs, and humorous songs. The distinctive national narratives were disseminated and preserved by wandering Celtic popular singers and tellers of tales, who were known as bards and who flourished from the earliest times to the 19th century, and later by minstrels and harpers. The bards, minstrels, and harpers composed and performed epics, heroic songs, sagas, ballads, and love songs.

Scottish folk songs typically are written in the pentatonic scale or are modal. Melodies often contain leaps of great intervals. The rhythm of the folk song, such as the Lombardic rhythm and the Scotch snap, are associated with the specific features of such folk dances as the reel, the strathspey, and the Highland fling (*see* ÉCOSSAISE). Singing and dancing were accompanied by the clarsach (a kind of harp that appeared in the 12th century), the bagpipe, and the fiddle and later by the violin and viola. The bagpipe has been the principal national instrument of Scotland since the 15th century; there are military orchestras made up of bagpipes.

Church and secular court music developed on a formal basis in the 12th century. In the 13th century singing schools (*sang scuils*) were established, in which instruction was provided in the Gregorian chant and in instrumental, primarily organ, performance. The first organs were installed in churches in the 1440's. Notable organists and composers of the 15th century were J. Malison, J. Fethy, J. Black, P. Davidson, A. Melville, and L. de France.

After Edinburgh became the capital of Scotland, in the mid-15th century, a royal chapel was built there and many foreign musicians were attracted to the court. Extant 16th-century manuscript collections contain religious and secular vocal and instrumental works; religious compositions include masses, motets, anthems, and psalms, and secular music is represented by dances and potpourris. Scottish composers of the first half of the 16th century include R. Carver, R. Johnson, D. Peebles, R. Douglas, and A. Blackhall.

The spread of the Reformation and the establishment of Presbyterianism retarded Scotland's musical development, but music flourished anew in the 17th century. Scottish music reached a high level of development under the Stuarts, beginning in 1603, as attested by numerous manuscripts, including the Skene Manuscript (1615–35), which contains the melodies to songs, dances, arias, and instrumental music, all notated in lute tablature. Scottish national melodies were used by such English composers as H. Purcell and G. Playford (works for the virginal) and later appeared in the works of F. Mendelssohn (*Scottish Symphony*) and M. Bruch (*Scottish Fantasy for Violin and Orchestra*).

In the 18th century, musical societies and choral, orchestral, and opera societies and associations were founded. Interest in Scottish folk music increased in Scotland and England. Many collections of folk music were published, notably *Orpheus Caledonius* (1726) and *The Scots Musical Museum* (1787–1803). Scottish folk songs provided a basis for the first Scottish ballad opera: A. Ramsay's *The Gentle Shepherd* (1725), which served as a model for other Scottish and English works in this genre and influenced the German Singspiel.

The performing arts attained a high level of professionalism in the 18th and 19th centuries. Musical education underwent development: in 1838 a chair of music was endowed at the University of Edinburgh, and in 1890 the Glasgow Athenaeum School of Music (now the Royal Scottish Academy of Music and Drama) was founded. Prominent composers of the second half of the 18th and 19th centuries were T. Erskine, J. Fergus, W. McGibbon, D. Dow, and N. Howe. A. Mackenzie, who flourished in the late

19th and the first third of the 20th century, founded the modern school of Scottish composition; his works include five operas, oratorios, cantatas, fantasias, and piano concerti. Mackenzie's followers include H. MacCunn, C. Macpherson, W. Wallace, F. G. Scott, and L. Drysdale.

Contemporary composers include C. Davie, R. Crawford, and T. Musgrave. Outstanding German and English conductors, notably C. von Bülow, C. Hallé, and J. Barbirolli spent part of their careers in Scotland, as did the musicologists J. Thomson, H. R. Bishop, F. Niecks, and D. Tovey. An international festival of music, drama, and ballet has been held annually in Edinburgh since 1947. The country's chief musical centers are Glasgow and Edinburgh, the latter of which has a symphony orchestra and choruses.

I. V. ROZANOV

Theater. The dramatic theater in Scotland dates from the mid-18th century. In 1767 a patent was granted to the Concert Hall in Edinburgh, which thereupon became the Theatre Royal. By the mid-18th century three theaters had been built in Glasgow, all of which were burned down by religious fanatics. In 1769 the actor and entrepreneur D. Ross built a new Theatre Royal in Edinburgh, at which the plays of English authors were staged, primarily with English actors. In 1883 the Lyceum Theatre opened. Initially, the finest English companies, such as that of H. Irving's, appeared at the theater, and their performances were an important influence on the formation of a national school of drama. In 1964 the Lyceum was acquired by a company in Edinburgh, and since 1965 it has been a repertory theater; its artistic director is C. Perry.

In Glasgow, the Dunlop Street Theatre existed from 1782 to 1863, the Queen Street Theatre from 1805 to 1829, and the Adelphi from 1842 to 1848; the City Theatre opened in 1845, followed by the Queen's Theatre and the Prince's Theatre. In 1909 the Glasgow Repertory Theatre was founded, with A. Wareing as its director. Although the theater survived for only five seasons, it played an important part in the establishment of a national theatrical art. In addition to the plays of English and foreign writers, several works by Scottish playwrights were staged, including J. Ferguson's highly successful *Campbell of Kilmohr*. The theater closed down during World War I, and its funds were used to launch the movement that in 1921 produced the Scottish National Players, a company that performed the works of Scottish dramatists. When the company ceased its activities in the early 1930's because of financial difficulties, its work was carried on by the Curtain Theatre in Glasgow (1933–40).

The first Scottish Theatre Festival was held in 1939. Since that time the Scottish Community Drama Association has organized annual festivals in which all professional and amateur groups in Scotland take part. In 1943 the Glasgow Citizen's Theatre was founded. In the 1970's interesting productions have been staged by the Traverse Theatre Club in Edinburgh and the Close Theatre Club in Glasgow. There are repertory theaters in Perth, Dundee, Pitlochry, and St. Andrews. Theaters are subsidized by the Scottish Committee of the Arts Council and by municipal arts councils. The Edinburgh Festival of Music and Drama has been held annually since 1947.

F. M. KRYMKO

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[29–1365–1]

SCOTS, a nation (*natsiia*, nation in the historical sense) inhabiting the northern half of the island of Great Britain and adjacent islands. According to a 1975 estimate, the Scots number more than 5.2 million. Often the Scots are counted together with the Gaels, the remaining descendants of the Celtic-speaking population of the Highlands. Scottish immigrants and their descendants also live in the USA (250,000), Canada (more than 200,000), Australia (more than 150,000), and New Zealand (more than 50,000). The Scots speak a dialect of English; their literary language is English. The majority are Presbyterians, although approximately 15 percent are Catholics.

The Scots are descended from local tribes of Picts and from Celtic tribes called Scots, who came from Ireland in the fifth and sixth centuries. In the seventh century these tribes partly intermingled with Germanic tribes of Angles and Saxons that had arrived in Scotland and whose language they adopted. The Scottish nationality formed during the consolidation of the Scottish state (11th century) and the struggle against the English conquerors. The political union of Scotland with England in the early 18th century and the British government's policy of assimilating the Scots did not succeed in fusing the Scots with the English.

In certain features of their traditional culture and daily life, the Scots resemble the Irish. In the Highlands, the clan system was preserved into the 18th century. Elements of the traditional male costume, such as the kilt, the plaid, and knitted knee socks, have been retained, as have special foods and holidays. The Scots have a singing tradition that goes back to the historical ballad and the heroic Celtic tale.

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V. I. KOZLOV [29–1378–2]

SCOTTISH SCHOOL (also philosophy of common sense), a school of philosophy that developed and flourished from the 1760's to 1780's in the universities of Scotland. The Scottish school was founded by T. Reid, and its leading representatives were J. Oswald, J. Beattie, and D. Stewart. It was formed in response to the skepticism of D. Hume, and it rejected the philosophy of G. Berkeley.

According to the Scottish school, truths incontrovertible by common sense are founded on direct intuitive certainty, which is inherent in the very nature of human beings and is of divine origin. In essence, the philosophy of common sense reinforced generally accepted convictions and prejudices, making them the foundation of science, ethics, and religion. Asserting that faith constituted the foundation of philosophy, the Scottish school advanced arguments, based on direct knowledge, in favor of the existence of god, the soul, and the purposefulness of all that existed.

Using similar arguments, the school defended the material world from attack by subjective idealism, skepticism, and agnosticism and refuted the phenomenalistic theory of perceptions (ideas). According to the Scottish school, a fundamental law of cognition is the certainty that the material world exists independently of consciousness. Of basic importance for the members of the school, however, was the recognition that religious truths are

self-evident and the acceptance of irrefutable moral laws rooted in "moral feeling." Proceeding from these beliefs, the members of the school fought against the sensualism of J. Locke and the materialism of D. Hartley, J. Priestley, and, subsequently, D. Diderot. For their part the materialists, especially Priestley, sharply criticized the Scottish school. The most active proponent of the philosophy of common sense in the USA was J. McCosh; in France the Scottish school influenced the thought of P. Royer-Collard.

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B. E. BYKHOVSKII [29–1377–2]

SCOW (in Russian, *shalanda*), a small, shallow-draft vessel used in loading and unloading large ships lying in roads and for transporting earth or small cargoes. Large scows are usually self-propelled. Scows that are used to remove earth excavated by dredges are usually equipped with doors in the bottom for dumping. The Russian word *shalanda* is also used for flat-bottomed, sail-rigged fishing boats that have a centerboard and that operate on the Black Sea. [29–813–5]

SCRAPER, a metal-cutting tool in the form of a metal rod with cutting edges on the end, used for scraping. Flat, three-sided, and shaped scrapers differ in the shape of the cutter; scrapers may be designed as one-piece tools, or they may have removable cutting plates. In addition to hand scrapers, pneumatic and electromechanical power scrapers are also used.

In the graphic arts, scrapers are used to remove the burr formed in engraving on metal and to smooth the grainy surface of the metal plate used in mezzotint engraving. They are also sometimes used by lithographers and sculptors. [29–791–4]

SCRAPING, the cutting or shaving of thin metal particles from the surface of a workpiece with a scraper. Usually performed after finishing the workpiece on a metal-cutting machine tool, scraping makes it possible to fit contacting surfaces to each other or join them with a hermetic seal. [29–793–2]

SCREEN ADAPTATION, a cinematographic interpretation of a work from another art form—prose, drama, poetry, song, or opera or ballet libretto.

Immediately after its inception, the art of the cinematographer turned to literature for its plots and themes. The first Russian feature film, *Sten'ka Razin and the Princess* (1908, also known as *The Freemen of the Lower Reaches*), was a screen adaptation of the song "From the Island to the Channel" ("The Song of Sten'ka Razin"). By 1917 approximately 100 motion pictures had been made in Russia based on novels and novellas by A. S. Pushkin, F. M. Dostoevsky, A. P. Chekhov, L. N. Tolstoy, and other writers. Works of foreign literature were also widely adapted for the screen, including Shakespeare's *Hamlet*. After the October Revolution of 1917, the mastery and further development of the realistic traditions of classic and modern literature made a significant contribution to the art of the Soviet motion picture. With the appearance of sound motion pictures, the expressive possibilities and selection of genres available to cinematography were greatly increased, and the motion-picture novel and novella were created.

Outstanding Soviet screen adaptations have included *The Mother*, based on the novel by M. Gorky (1926, directed by V. I. Pudovkin); *The Poor Bride*, based on the play by A. N. Ostrovskii (1936, directed by Ia. A. Protazanov); *Peter the First*, based on the historical novel by A. N. Tolstoy (1937–38, directed by V. M. Petrov); *The Childhood of Gorky, In the World*, and *My Universities*, based on works by Gorky (1938–40, directed by M. S. Donskoi); *The Young Guard*, based on the novel by A. A. Fadeev (1948, directed by S. A. Gerasimov); *Othello*, based on the play by Shakespeare (1956, directed by S. I. Iutkevich); *The Quiet Don* (1957–58, directed by Gerasimov) and *A Man's Fate* (1959, directed by S. F. Bondarchuk), based on works by M. A. Sholokhov; *Hamlet*, based on the play by Shakespeare (1964, directed by G. M. Kozintsev); *War and Peace*, based on the novel by L. N. Tolstoy (1966–67, directed by Bondarchuk); *The Brothers Karamazov*, based on the novel by Dostoevsky (1969, directed by I. A. Pyr'ev); and *The Dawns Here Are Quiet*, based on a work by B. L. Vasil'ev (1972, directed by S. I. Rostotskii).

A popular device in foreign screen adaptations is the transfer of the action of a classic work into another time, usually modern. Screen adaptations are also frequently used in television programming, for example, the Soviet serial *How the Steel Was Tempered*, based on the novel by N. A. Ostrovskii, and the British serial *The Forsyte Saga*, based on the series of novels by J. Galsworthy.

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M. S. SHATERNIKOVA [29–1886–2]

SCREENED DEPOSIT. (1) In petroleum geology, a deposit of oil or gas bounded along the strike by strata of petroleum-impermeable rocks.

Three types of screened deposits are distinguished: tectonic screened deposits, where the stratum containing the oil or gas deposit is bounded by a disjunctive tectonic displacement (normal fault, slip-strike fault); lithological screened deposits, which are characterized by an abrupt alteration in the lithological composition of the collector rocks by impermeable rocks; and stratigraphic screened deposits, in which the collector strata are cut off by the surface of a stratigraphic unconformity above which are petroleum-impermeable rocks.

Tectonic screened deposits are widespread in petroleum and gas provinces that are associated with regions of subsidence of mountain ranges, intermontane depressions, and foredeeps characterized by various types of large-scale faulting. In platform conditions such deposits are usually found in areas of tectonic salt structures. Accumulations of oil in lithological screened deposits occur widely in both platform regions and folded areas.

Stratigraphic screened deposits are rare in the USSR; they contain small quantities of petroleum. They are widespread on the North American Platform in the United States.

The term "screened deposit" of oil or gas was first proposed in 1937 by the Soviet geologist I. O. Brod.

(2) In mining geology, screened deposits of mineral products are ore bodies occurring beneath water-impermeable rock strata from ascending ore-bearing hydrothermal solutions. They are common in layered strata, especially among carbonate rocks alternating with clay shales, which form the screen that blocks the movement of the ore-bearing solutions.

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L. M. BOGDANOVA [29–1887–2]

SCREW CONVEYOR, a mechanism whose working member is a shaft with a continuous helical blade (the screw) or individual, pitched vanes. The rotating shaft, housed in a horizontal or inclined trough, moves loose or small piece cargoes or liquids along

the trough. Screw conveyors are used in extruders, feeders, and other machines. They offer design simplicity and even feeding, but they have low productivity and efficiency because of the friction of the material against the walls. Feeding is regulated by the frequency of rotation of the screw. A screw conveyor was used in Archimedes' screw, a device designed to raise water. Screw conveyors in which the screws of two adjacent machines rotate in opposite directions are used to mix materials. [29–1327–2]

SCREW TIE-DOWN (Russian, *shtopor*), a coiled rod made of a thick, usually steel wire, 10–20 mm in diameter, with a ring attached to the end. When screwed into the ground, a tree, or ice, it serves for tying down airplanes, gliders, and helicopters, for mooring small ships, and for anchoring tents. [29–1484–4]

SCUTAGE, a monetary levy collected from the holders of knightly fiefs in medieval England beginning in the mid-12th century; collected for the king in lieu of military service or as partial compensation for service. Although the levy was prohibited by the Magna Carta of 1215, it was collected arbitrarily ("at the will of the king") until the beginning of the 14th century. A considerable portion of the total was actually paid not by fief holders but by serfs and free peasants. [29–1612–4]

SCUTELLARIA (skullcap), a genus of plants of the family Labiatae. The plants are perennial herbs or subshrubs; annual herbs occur infrequently. The leaves vary from entire to pinnatisect. The flowers are arranged in twos in the axils of the upper leaves; they are frequently clustered together in a dense racemose inflorescence. The calyx is two-lipped, with a shield-like formation on the upper lip. The corolla has a helmet-shaped upper lip. There are four stamens; the fruit consists of four nutlets.

There are about 300 species, distributed in temperate, subtropical, and tropical regions. The USSR has about 120 species (with subspecies), growing mainly in the mountains of the Caucasus and Middle Asia. The most common species is *S. galericulata*, which grows in the European USSR, Siberia, and Middle Asia on floodplain meadows, in swamps, along the shores of reservoirs and canals, and in flooded forests. The plant is used in folk medicine to arrest bleeding. *S. baicalensis*, which is found in Transbaikalia and the Far East on rocky slopes, in sandy steppes, and along river banks, is a medicinal plant. A tincture of its rootstock and roots is used as a mild hypotensive agent and sedative. Several species, including *S. alpina, S. baikalensis*, and *S. orientalis*, are cultivated as ornamentals.

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SCUTELLUM, one of the principal organs in the embryo of grasses of the family Gramineae. During seed sprouting, the scutellum secretes enzymes that make soluble the reserve substances of the endosperm that nourish the developing embryo. Some botanists regard the scutellum as a cotyledon, and others as a modified axis of the embryo. [29–1613–1]

SCUTUM (Shield), an equatorial constellation that contains no stars brighter than the fourth visual stellar magnitude. The best conditions for observation of the constellation are in June and July. Scutum can be seen everywhere in the USSR except the Far North. [29–1606–1]

SEAM, in garment manufacturing, the point where sections are joined in clothing, footwear, and the like. There are three types of seams: stitched, glued, and welded. Stitched seams are the most common. Welded seams are used for garments made of thermoplastic fabric or films; they are ordinarily produced by the heat, ultrasound, or high-frequency method. Welded seams may be segmented to reduce rigidity if the seal does not have to be airtight. [29–1330–1]

SEAM WELDING, a type of resistance welding for joining overlapped metal sheets of steel, aluminum, and other metals 0.2–5 mm thick. [29–1332–2]

SECHIUM, a genus of herbaceous plants of the family Cucurbitaceae. The genus has only one species—chayote (*S. edule*)—a large perennial with a climbing tendriled stem that reaches several meters in length. The leaves have five lobes and reach 20 cm in length. The yellowish white flowers are unisexual (the plant is monoecious). The staminate flowers are in racemes, and the pistillate ones are solitary. The fruits are large, weighing 100 g to 1 kg (most often 250 to 500 g); they contain one very large seed.

Chayote is cultivated in Mexico, Central America, the southern USA, and several other countries as a valuable high-yielding food plant. It is unknown in the wild. The unripe fruits are eaten raw, or they are stewed, roasted, boiled, salted, or pickled. The roots form starchy tubers that taste something like yams. Chayote is often used in the same way as spinach or asparagus. The stems yield a material used for making hats and other woven articles.

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SECTION, in geology, a thin, flat piece of rock, mineral, or fossil coal used in microscopic studies. The most commonly used sections are thin sections—flat pieces 0.02–0.03 mm in thickness prepared mainly from silicate rocks. At such a thickness, most minerals are translucent, which makes it possible to study them with a polarizing microscope to determine the optical properties of the minerals, the crystal structure, the nature of interrelationships, and other aspects of minerals. The study of thin sections is one of the primary techniques of petrography. Sections 0.005–0.035 mm in thickness are used to study fossil coals. Sections are made by grinding one side of a fragment of rock or mineral of any thickness on a special grinding machine, cementing the polished side to a glass slide with Canadian balsam or some other organic resin, and then grinding the other surface until the section reaches the proper thickness.

Polished translucent sections, in which the upper surface of the section is polished with special care, are made to study the composition of minerals by spectral X-ray analysis. For opaque minerals, mostly ores, polished sections are used, which are usually 0.5–1.0 cm in thickness, polished on one side, and mounted on a glass slide with mastic or modeling clay. The study of polished sections of ore minerals is the task of mineragraphy, or mineralography, an important branch of mineralogy.

A. M. BORSUK [29–1294–1]

ŠEDUVA, a city in Radviliškis Raion, Lithuanian SSR. Šeduva is situated on the Šiauliai-Panevėžys highway, 42 km southeast of Šiauliai, near the Šeduva railroad station on the Šiauliai-Panevėžys line. The city produces building materials and has a garment factory of the Lelija Production Association, whose main facility is in Vilnius. Šeduva has a branch of the Aušra Museum of History and Ethnography, which is located in Šiauliai. [29–1078–5]

SEEDLESS SPIKE, the incomplete setting of seeds in cereal crops, for example, winter rye and corn, as a result of incomplete pollination. Seedless spikes result from unfavorable weather conditions during flowering, for example, high temperatures, rain, or high winds. To prevent the formation of seedless spikes, artificial supplementary pollination is performed on hybridization and experimental plots two or three days after the onset of flowering. [29–193–1]

ŞEHDİ OSMAN. Dates of birth and death unknown. Turkish state figure of the mid-18th century.

In 1758, Şehdi Osman headed a Turkish embassy to St. Petersburg. His account of the journey included information on such Russian cities as St. Petersburg, Moscow, Kiev, Kronstadt, and Tula.

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ŞEMSETTİN SAMİ (also Şemseddin Sami Fraşeri). Born June 1, 1850, in Frăsheri, Albania; died July 1, 1904, in Istanbul. Turkish writer and lexicographer.

Şemsettin Sami moved to Istanbul in 1872. He published the newspaper *Sabah* and the journal *Aile*. After serving at the court from 1880 to 1890, he was exiled to his villa in Erenköy, where he spent the rest of his life. He was the author of the novel *The Love of Talât and Fitnet* (1872) and of the first Turkish play, *Besa, or Loyalty to the Oath* (1875), the heroes of which are peasant shepherds. Şemsettin Sami is known primarily as a lexicographer and as the author of a two-volume Turkish-French and French-Turkish dictionary (1880), an encyclopedia of historical geography (vols. 1–6, 1889–98), and *Dictionary of Turkish* (vols. 1–2, 1900).

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SENCHUS MOR, a collection of ancient Irish laws. Compiled in the fifth century, the *Senchus Mor* is a record of the customary law of the ancient Irish. The oldest extant copy dates from the 14th century. Embracing all branches of law, including procedural, property, and family law, the collection reflects the process whereby clan relations in ancient Irish society were broken down and feudalization began. The *Senchus Mor* is the main source for information on the early history of Ireland.

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ŠENOA, AUGUST. Born Nov. 14, 1838, in Zagreb; died there Dec. 13, 1881. Croatian writer.

Šenoa studied law in Zagreb and Prague between 1857 and 1865. He was first published in 1861. In his short stories and novellas he denounced bourgeois-landowner society, exposed the arbitrariness of the bureaucracy, and depicted the peasantry's lack of rights. Such historical novels as *The Goldsmith's Treasure* (1871; Russian translation, 1963), *Beware of the Hands of Senj* (1875), and *Damnation* (1881) are distinguished by their documentary nature. The periods dealt with are portrayed in a thorough and objective manner, and the author displays a fine understanding of progressive trends. The novel *Peasant Uprising* (1877; Russian translation, 1955) deals with the Matija Gubec Revolt of 1573 and portrays the people as a progressive historical force.

Despite the presence of some elements of romantic didacticism, Šenoa's works on the whole affirm the principles of realism, national content, and national uniqueness in literature and art. Šenoa also wrote publicist articles and works of literary criticism.

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E. I. RIABOVA [29–1130–1]

SENSE ORGANS, highly specialized organs that arose in the course of evolution to enable the organism to obtain information about changes in the environment. Sensitivity to light, temperature, chemical agents, and other stimuli is evident even in protozoans. However, the reaction to external influences by lower organisms is usually caused not by special organs but by a general property of living matter—irritability (or excitability). In higher animals, adaptation to the environment, the search for food, reproduction, and escape from enemies are complex activities, effective only if information about the environment is fairly complete and timely. Such information is transmitted by sense organs adapted to perceive signals of a certain kind.

The traditional idea of five specialized sense organs—eye, ear, nose, tongue, and skin—that make possible vision, hearing, smell, taste, and touch was considerablely expanded and deepened with the development of physiology. The vestibular apparatus, the receptor systems of the motor apparatus, and the numerous visceral receptors were investigated in both animals and man, as were the electroreceptors in fish. It was found that the perception of touch, pain, pressure, heat, and cold, combined in the sense of touch, is effected by various receptor structures of the skin. However, light can be perceived by, for example, such different organs as the human eye and the compound eye of insects. The variety of receptor elements of the sense organs led to the idea of the main types of reception, or sensibility—mechanoreception (for example, touch, phonoreception, or perception of sound, and vestibular reception, or perception of the spatial position of the body), chemoreception (taste, smell), and photoreception (light)—and the corresponding perceiving apparatus—the receptors (*see* RECEPTOR). In various groups of animals, differing in evolutionary development and ecology, the perception and analysis of environmental signals can be accomplished by structures of different degrees of complexity, while the development and principal use of a particular type of sensibility also depend on the animals' mode of life and habitat. In man, more than 80 percent of the information about the external world is received through the eyes.

In modern physiology, the sense organs, in the broad meaning of the term, are taken to mean the complex sensory systems (analyzers in I. P. Pavlov's terminology), including perceiving elements (receptors), conducting nerve pathways, and the corresponding regions in the brain where a signal is converted into sensation (*see* SENSATION and ANALYZERS). In the narrow meaning, sense organs are only receptor elements and auxiliary structures, such as the eye and ear, that perceive signals and convert them into nerve impulses.

The development of ideas about the activity of the sense organs and their function of obtaining information about the external world has a long history. The ancient Greek and Roman philosophers did not doubt the reality of external objects and phenomena and the adequacy of its perception by the sense organs. Empedocles was one of the first ancient thinkers to attempt to understand the nature of light and color perception. The scientific study of the sense organs was stimulated by the work of Galileo and R. Descartes, who insisted that the study of natural phenomena be strictly limited and confined to the formulation of questions to which concrete answers could be obtained by experimentation or mathematical calculation. Following these principles, J. Kepler regarded the eye as an optical instrument, and on the basis of the laws of geometrical optics, showed that external objects produce a reverse and reduced image on the retina. In doing so, he deliberately avoided the question of why the world is not perceived upside down. Kepler's work laid the foundation of physiological optics and paved the way for the development of physiological acoustics and the physiology of other sense organs.

The foundations of modern experimental physiology of the sense organs were laid in the 19th century by the classical studies of H. von Helmholtz, G. T. Fechner, I. M. Sechenov, and other scientists. Pavlov's conditioned reflex method was of enormous importance for objective research on sensory activity. The sense organs have been successfully studied since the 1920's by the electrophysiological method, which makes it possible to record electrical phenomena arising in different parts of the sensory systems under the influence of external stimuli. Research on the physicochemical and biochemical bases of visual reception was begun in the late 1930's, and research on the physicochemical and biochemical bases of olfactory and gustatory reception, in the late 1960's. However, despite the advances in 20th-century physiology, which have made use of the results of biophysics, biochemistry, cytology, psychology, and other sciences, many problems related to the activity of the sense organs remain unresolved. For example, such major processes as the transformation of the energy of external stimuli into receptor signals in the receptor cells,

the coding and decoding in various sensory systems of information contained in the spatial and temporal code of nerve impulses, and the neurophysiological mechanisms of external image recognition have still not been conclusively studied. Lenin's words are still timely: "there still remains to be investigated and reinvestigated how matter, apparently entirely devoid of sensation, is related to matter which, though composed of the same atoms (or electrons), is yet endowed with a well-defined faculty of sensation" (*Poln. sobr. soch.*, 5th ed., vol. 18, p. 40).

The human sense organs were studied in great detail in the late 1930's and early 1940's. Thresholds of stimulation—both the absolute threshold (limits of sensibility) and the differential threshold (the capacity of sense organs to recognize the minimal difference between two stimuli)—were established for all the sense organs. Research of the 1970's was directed at elucidating the mechanisms controlling the sense organs, thereby making it possible to study the molecular, membranal, and cellular mechanisms of visual reception, the delicate mechanisms of smell and taste, mechanoreception, and electroreception.

Changes in the environment are perceived by the sense organs in the form of light, mechanical (including acoustic), or chemical stimuli. The "signal" interacts with the cellular membrane of a receptor or specialized receptor protein molecule, triggering a chain of ionic, enzymic, and electrical processes. This gives rise to an electrochemical signal or nerve impulse, identical for all types of receptors, that is transmitted to the brain by way of the conducting pathways. A series of such impulses constitutes a sort of code that is decoded in the corresponding nuclei (visual, auditory, and so on) of the cerebral cortex and transformed therein into an image of the external world. Some of the principles and mechanisms of information processing by the sensory systems have been largely elucidated. Sensory analysis at all levels—from the receptors to the cerebral cortex—is a comparative process directed at identifying the characteristics of the signal. The principal neurophysiological mechanism of such comparison is the correlation of the excitatory and inhibitory processes in the nerve networks or at the entry of individual neurons. Specifically, what is involved is the mechanism of lateral inhibition, when the physiological condition of every nerve cell depends on the activity of the adjacent cells. Such inhibition helps strengthen contrasts or contours and localize the site of contact, that is, eliminate redundant information and distinguish the most important information.

The mechanisms of object recognition are, for the most part, still not completely known. However, some neurophysiological data can probably be regarded as providing the first steps toward such knowledge, namely, the discovery of the specific neurons—detectors—capable of reacting selectively to certain biologically important characteristics of objects, for example, only a moving dark spot or only a sound of a certain pitch. Such neurons were first discovered in the visual and then in the other sensory systems. The properties of the detectors become increasingly complex as sensory information is analyzed and transmitted from the receptors to the cortical centers. Specialization of the detectors increases even more from layer to layer in the cortex itself. Thus, visual images, sound patterns, or blends of odors are broken down in the sensory systems into simple constituents and are analyzed separately. The final stage in the analysis of sensory information is its synthesis—the formation of a subjective integral image of the objective external world. Further research in this direction will elucidate the complex mechanisms governing the functioning of the sense organs in the cognitive process.

The elucidation of the mechanisms of activity of the sense organs is not only of great scientific and philosophical interest but is of importance for various practical purposes in medicine, technology, and psychology.

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M. A. OSTROVSKII [29–722–1]

SENSIBILITY (physiology), the capacity of a living organism to perceive stimuli from the external or internal environment.

An organism's sensitivity to corresponding stimuli varies with the sensitivity of its sensory systems (analyzers). Sensibility is characterized by the threshold of stimulation: the lower the threshold, the higher the sensibility. A distinction is made between absolute and differential sensibility, that is, discriminative sensibility, and, accordingly, absolute and differential thresholds of stimulation. The absolute threshold is the minimum force of stimulation capable of producing a reaction. The differential threshold is the minimum amount of stimulation that has to be changed in order to change the response. Somatosensory sensibility (cutaneous sensibility and proprioceptive, that is, muscle-joint, sensibility), visceral sensibility, and sensibility based on the activity of the sense organs are distinguished according to the sensory systems responsible for the perception of stimulation. Cutaneous sensibility is sometimes divided into coarse, protopathic, sensibility and fine, epicritic, sensibility. With respect to the type of stimulus, one can speak of sensitivity to mechanical, chemical, light, temperature, and other stimuli.

The sensibility of an organism may be judged from sensations and from objective criteria, for example, autonomic reactions and bioelectrical reactions. The thresholds, which are determined by various methods, may differ. For example, photosensitivity, determined from the bioelectrical activity of the brain, is higher than sensibility determined from the verbal responses of a subject regarding his sensations. Sensitivity to a stimulus is not a constant quantity and may change under the influence of a variety of factors, for example, during physiological adaptation, under the influence of efferent regulation, and as a result of the action of other stimuli. Pathological processes may cause a variety of disturbances of sensibility, depending on the place where a sensory system is affected: the peripheral portion (receptor), the conducting portion, or the central (including the cortical) portion.

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O. B. IL'INSKII [29–725–2]

SENSING ELEMENT, in measuring systems or automatic control systems, a component of a sensor that directly senses the physical quantity acting on the sensor. Devices that may be used as sensing elements include diaphragms, gyroscopes, thermal resistors, strain gages, induction coils, and piezoelectric quartz plates. [29–728–2]

SENSITIVITY, of an automatic control system, the dependence of the dynamic properties of an automatic control system on a variation of the system's parameters or characteristics. A variation of a system's parameters is taken to mean any deviations of the system's parameters from the values adopted as the initial values. Such deviations may be completely known and described by certain functions of time or may be known only to the extent of belonging to a specified class, for example, limited in magnitude. The variations of a system's parameters may be finite or infinitesimal. Hence, the order of the differential equations that describe the variations may remain unchanged or may vary.

Sensitivity functions are used for the direct evaluation of sensitivity. Such functions play a major role in the quantitative evaluation of the extent to which variations of a system's parameters affect the dynamic properties of the system.

Sensitivity functions contain extremely valuable information, for example, for solving problems of the synthesis of automatic control systems. A very important problem is the synthesis of systems that have a minimum sensitivity to variations of their parameters. The problem of sensitivity may be considered a problem of the theory of games for automatic control, if we assume that a disturbance caused by a variation of a system's parameters is in conflict with both the dynamic properties of an object and a control action. Such an application of the methods of the theory of games in sensitivity theory is promising, especially for the synthesis of optimal control systems, which are insensitive to varia-

tions of the parameters of a controlled object and have minimax properties.

Of great practical importance is the inverse problem, which consists in the estimation of a variation of a system's parameters by observing the disturbance of an output signal that is caused by the variation. Parameter variations computed on the basis of a deviation of an output signal may be used to modify the parameters of a control system in order to improve the quality of the operation of the system as a whole.

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SENSITIVITY, a property of a measuring instrument that is expressed by the ratio of the linear displacement (Δl) or the angular displacement ($\Delta\alpha$) of the pointer on the scale of the instrument—that is, the signal at the output of the instrument—and the change in a measured quantity that causes the displacement. A distinction is made between absolute sensitivity and relative sensitivity. Absolute sensitivity $S = \Delta l/\Delta x$ or $\Delta\alpha/\Delta x$, where Δx is the change in a measured quantity x and is expressed in the same units as the quantity. Relative sensitivity $S_0 = \Delta l/(\Delta x/x)$ or $\Delta\alpha/(\Delta x/x)$. [29–726–2]

SENSITIVITY, RECEIVER, a radio receiver's capability of receiving weak signals or a quantitative criterion of that capability. In many cases, the criterion is defined as the minimum level, at a receiving antenna, of a radio signal at which the useful information contained in the signal may be reproduced with the required quality, for example, with sufficient loudness or adequate picture contrast. The signal level may be either the electromotive force (usually expressed in millivolts or in microvolts) induced by the signal in the antenna or the field strength (expressed in millivolts per m) near the antenna.

In the simplest radio receivers, sensitivity depends mainly on the extent to which signals are amplified. As the gain is increased, normal reproduction of information may be achieved for weaker radio signals; that is, the receiver sensitivity is raised. However, in complicated radio receivers, such as communications receivers, the method of raising the receiver sensitivity by increasing the gain is of no value, since the strength of the useful radio signals may turn out to be comparable to the intensity of external radio interference. Such interference acts on the antenna at the same time as the useful signals and distorts the information received. In this case, the ultimate sensitivity of a receiver is said to be interference-limited; such sensitivity not only is a receiver parameter but also depends on external factors.

Under the most favorable conditions—mainly in the reception of metric waves or waves of shorter wavelength and especially in space communications—external interference is weak and the intrinsic random noise (*see* FLUCTUATIONS, ELECTRICAL) of a receiver itself becomes the main factor that limits receiver sensitivity. Under normal operating conditions, the intrinsic random noise of a receiver has a constant level. Therefore, noise-limited sensitivity is a completely specified parameter. In this case, the random-noise level, which is characterized by a noise factor and a noise temperature, is often used directly as a measure of receiver sensitivity. (*See also* THRESHOLD SIGNAL.)

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SENSORY NERVE FIBER, a process of a nerve cell (axon), along with its membrane, that conducts excitation from the exteroreceptors and interoreceptors to the central nervous system. Sensory nerve fibers are divided into several groups according to their diameter. For example, among different afferent fibers of muscles, groups 1 to 4 are distinguished. The thickest fibers in the organism (about 20 micrometers with a rate of conduction of about 120 m/sec) belong to group 1a and terminate in muscle receptors called primary muscle spindle endings. In the specialized literature, sensory nerve fibers are also called afferent nerve fibers (*see* AFFERENT NERVE FIBER). [29–728–1]

SENTENCE PARTS, words or word groups that perform a specific semantic-syntactic function in a sentence. A dual classification of words—according to morphological features (parts of speech) and syntactic function (sentence parts)—is most often used for languages with a developed morphology. The need for such a classification is determined by the lack of unambiguous correspondence between the morphological class of a word and the syntactic function performed by the word. Some grammatical theories do not use the concept of sentence parts. Some such theories are based on the combinatory capacities of parts of speech, which provide for the transition from word to sentence (the syntax of parts of speech, dependency grammar, and chain syntactic analysis); others make use of distribution classes, which unite all words and word groups that can replace each other in a particular syntactic position.

The theory of sentence parts arose within the framework of logical and semantic approaches to syntax; the former approach associated sentence categories with categories of thought, and the latter associated sentence categories with extralinguistic reality. The origin of the theory determined the diversity of the functions of the sentence parts selected or their universality. The following sentence parts are generally recognized: subject, predicate, complement (direct and indirect, such as agent, instrument, and addressee), adverbial modifiers (of place, time, manner, cause, purpose, concession, condition, and extent), and attributes. The sentence parts correspond to types of information that can be communicated concerning some event or situation. Each sentence part is therefore associated with a specific type of question and is often determined on the basis of this correspondence (*Chto ty dal mal'chiku?*, "What did you give the boy?" [the question for direct objects]; *Ia dal mal'chiku* **miach**, "I gave the boy the **ball**").

The functions performed by sentence parts are not consistent. Some sentence parts are more closely associated with the logical-communicative organization of the sentence (subject and predicate); others complete the informational insufficiencies of the governing word (complements); still others have a relatively independent semantic function (attributes).

Two groups are distinguished by the logical-communicative division of a sentence: the subject group and the predicate group, which are joined by the predicative relationship (*Malen'kii mal'chik/otnial u devochki igrushku*, 'the small boy/ took from the girl the toy"). The nuclear elements of each group—the subject (*mal'chik*, "boy") and predicate (*otnial*, "took")—are principal parts of the sentence and determine the sentence's syntactic organization. They mainly perform logical-communicative functions. The sentence subject (*podlezhashchee*) corresponds to the formal subject (*sub''ekt*) of a proposition as well as to the theme of communication (the given). The semantic function of agent or bearer of a quality, property, or state is not obligatory for the sentence subject (as is demonstrated in passive sentences). The sentence predicate corresponds to the predicate of a proposition as well as to the rheme (new information). In an expanded sentence the greatest communicative value is possessed not by the nuclear element of the predicate group but by one of the elements subordinate to it, which usually appears in final position. In this case the central position does not carry communicative significance.

Since the truncation of a sentence to a lone predicate (*Deti stuchat*, "The children are knocking" → *Stuchat*, "They are knocking") does not affect the function of the whole unit, the predicate constitutes a minimum sentence and is considered a constituent. The many instances in which the formal-syntactic and logical-communicative structures of a sentence do not coincide (encountered in various languages, such as Russian) often deprive the principal parts of the sentence of a content function, changing them into elements of the structural arrangement of the sentence. For example, the sentences *Mal'chik prishel* ("The boy has come") and *Prishel mal'chik* (literally, "Came the boy") have the same structure but different logical-communicative meanings. In the second sentence the subject is the rheme, not the theme.

Secondary sentence parts are distinguished within the subject and the predicate. They are on the level of the word group. Attributes, both in agreement and not in agreement, can combine with any of the nouns in the sentence to form attributive word groups. Complements and adverbial modifiers are distinguished within the predicate. Direct and indirect complements are associated with the verb (less often, with an adjective) in a complementary relationship; that is, they complete the semantic insufficiency of a word, completing its structure of government. If the predicate is expressed by a transitive verb, a direct object, the most strongly governed element of the structure, is semantically necessary, although it is not a primary part of the sentence. It makes concrete that component of the semantics of the verb that can be called the orientation of the action. In describing the same real situation, a verb can be oriented toward different "participants" in the action (*vygruzhat'* ***ugol'*** *iz vagona*, "to unload **the coal** from the car"; *razgruzhat'* ***vagon***, "to unload **the car**"). The weaker the government, the more defined the semantics of the complement. For this reason, indirect complements characteristically have clearer semantic functions (for example, the instrumental complement in *zabivat' gvozd'* ***molotkom***, "to drive the nail in **with a hammer**").

Adverbial modifiers are sentence parts that govern weakly or not at all. The boundary between adverbial modifiers and complements is not clearly defined. For example, the verb *priezzhat'* ("to arrive [by vehicle]") requires an indication of the destination; that is, it is in complementary relation with the noun following (*priekhat'* ***v gorod***, "to arrive in **town**"). By this characteristic the noun can be considered a complement. At the same time, it has the meaning of location and can be replaced by an adverb of place (*priekhat'* ***tuda***, "to arive **there**"), which makes it similar to an adverbial modifier. The essential difference between an adverbial modifier and a complement is that each type of complement has one corresponding syntactic position, which is opened by verbal government and which permits completion by a number of nominals only if the nominals can be joined by a coordinating conjunction (*Ia prochital* ***eti knigi i zhurnaly***, "I read **those books and magazines**"). Each type of adverbial modifier can occupy several syntactic positions (***Letom s kontsa iulia do kontsa avgusta ia otdykhal na beregu Chernogo moria v Krymu v dome otdykha***, **"In summer from the end of July to the end of August** I vacationed **on the Black Sea Coast in the Crimea at a house of rest**").

The independence of adverbial modifiers from the meaning and the category features of the predicate provides some grounds for considering certain of their forms as expansions of a sentence structure deriving from a word group (***V Krymu*** *nastupili kholoda*, "**In the Crimea** it turned cold"; ***Na dvore*** *liven'*, "**Outside** it's pouring"). Adverbial modifiers expressing a logical relation between events or situations (adverbial modifiers of cause, purpose, condition, or concession) correspond to a truncated subordinate clause (*On ne priekhal* ***iz-za snezhnykh zanosov na dorogakh***, "He didn't come **because of the snowdrifts on the roads**," = *On ne priekhal,* ***potomu chto na dorogakh byli snezhnye zanosy***, "He didn't come **because there were snowdrifts on the roads**"). In expressing a feature, or characteristic, adverbial modifiers of manner are functionally similar to attributes (*bezhat' bystro*, "to run **fast**"; *bystryi beg*, "a **fast** run").

Sentence parts are distinguished on the basis of their form and content, as well as by the syntactic relation that inserts them into a sentence. Ambiguity in the interrelations between morphological, syntactic, and semantic features makes it difficult to separate sentence parts. In distinguishing a sentence part, different criteria are given preference in different cases. Thus, in distinguishing the sentence subject, whose semantic and communicative functions are not fixed, only a nominative case form is accepted. The forms of complements, which are established by verbal government, very often do not coincide with their function. For example, in the sentence *Direktor rukovodit bol'shim kollektivom* ("The director manages a large collective"), the noun complement *kollektivom* ("collective") is strongly governed by a verb that requires a complement in the instrumental case, rather than the accusative case, which is characteristic of the direct object. Each type of complement has several forms of expression, one of which is primary; for example, in Russian the accusative case form is the primary form for expressing the direct object. Adverbial modifiers and, to some extent, indirect complements are divided into types mainly on the basis of content features. Thus, a morphological criterion is crucial in determining the sentence subject. The syntactic relation realized by complements and attributes, which is attributive for attributes and complementary for complements, is used in distinguishing complements and attributes. Adverbial modifiers are determined on the basis of their semantic content.

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N. D. ARUTIUNOVA [29–671–3]

SENTRY, an armed guard with the combat mission of protecting and defending an assigned post. According to the Regulations on Garrison and Guard Duty of the Armed Forces of the USSR, a sentry is inviolable, his rights and person specially protected by law. He is responsible only to the guard commander, the commander's assistant, or the sergeant of the relief and must be obeyed unquestioningly. He has the right to use arms in circumstances defined in the regulations.

A sentry must guard his post vigilantly and defend it staunchly and is authorized to use weapons without warning in the event of a clear attack on him or his post. While on duty, a sentry is prohibited from leaving his post, from sleeping, sitting, talking, eating, drinking, or smoking, or from engaging in activities that would prevent him from carrying out his mission. [29–75–2]

SERE, the totality of plant communities (phytocoenoses) that are present in response to changes of the principal environmental factor or factors. The main ecological factors may include moistening or salinization of the soil, the content of humus or mineral nutrients in the soil, and differing grassland and bottomland regimes. The sere is most often associated with changes in the moisture content or salinity of the soil or with simultaneous changes in both these factors.

The sere that best reflects changes in the soil moisture content is best observed on slopes in the floodplains of rivers. The soil at the bottom of the slopes usually has a higher moisture content than the soil at the top, with the result that the phytocoenoses of the lower portions contain plants that are more hygrophilous. Moreover, changes in the moisture content are usually accompanied by changes in a number of other factors (temperature, humus content in the soil), although the moisture content remains the principal ecological factor. Seres that are associated with simultaneous changes in both the salinity and moisture content of the soil may be observed along the shores of salt lakes and when the bottoms of such lakes become overgrown with vegetation as they dry out. Seres are also clearly manifested on the gently sloping shores of freshwater lakes that are in the process of bog formation.

A. M. BYLOVA [29–1774–2]

SERICULTURE, a branch of agriculture, the raising of silkworms for their cocoons, which are the raw materials used in the manufacture of silk. In the USSR the domesticated Asiatic silk-

worm moth *Bombyx mori* is cultivated; other countries also use the cocoons of some wild silkworms (*Antheraea pernyi, Philosamia cynthia*, and *Philosamia ricini*). The raising of Asiatic silkworm moths to obtain silk began about 5,000 years ago in China. In the territory of what is now the USSR, sericulture developed in Middle Asia and Transcaucasia between the fifth and seventh centuries. In Russia silkworm raising was mainly concentrated in the households of peasants; the facilities were usually not large, producing 10–15 g of silkworm eggs.

The first large-scale specialized sericultural sovkhozes were established in the USSR. State silkworm egg farms, centers for the primary processing of cocoons, and silk-reeling factories have also been built, and state and kolkhoz silkworm farms have been organized. A unified state system has been created for breeding and pedigree work and for the procurement and primary processing of cocoons. Soviet scientists have developed highly productive white-cocoon breeds and hybrids of silkworms and highly productive varieties of mulberry trees; more effective methods for cultivating the trees have also been developed. Such efforts have resulted in an average yield of 56–57 kg of cocoons per box of silkworm eggs containing 29 g of eggs. Cocoon production was 34,800 tons in 1965 and 45,000 tons in 1976. The production of raw silk totaled 2,600 tons in 1965 and 3,400 tons in 1976.

Production processes in sericulture include cultivation of mulberries, the leaves of which are the only food for the larvae of the silkworm moth (*see* MULBERRY CULTIVATION); production of silkworm eggs (*see* SILKWORM EGG FARMING); incubation and hatching of the eggs; rearing of the silkworms; and primary processing of cocoons, including killing and drying.

Incubation takes place in incubators having a capacity of 150–200 boxes of silkworm eggs. It is timed to coincide with the appearance of the first five–six leaves on the mulberry trees. The hardiest larvae obtained in the course of the first three days of hatching are kept for rearing. The silkworms are reared in special breeding houses, where a constant temperature and humidity are maintained according to the age of the silkworms. Larvae in the first three stages of growth are fed chopped leaves and young shoots. An average of 17–18 kg of leaves is needed to produce a 1 kg cocoon; 11–12 kg of leaves suffices on the best-run farms. Feeding is halted during the periods of sleep and molting, and the temperature is raised somewhat. Rearing is completed in approximately 35 days; the best-run farms complete rearing in 22–25 days. The majority of the cocoons are obtained from the spring generation. On some farms in the Ukraine, Moldavia, and the Northern Caucasus, several generations are reared by using the silkworm eggs of the hardiest varieties and hybrids and by planting the mulberries so that they produce young leaves during the period from summer to fall.

The aim of selective breeding in sericulture is the development of new, highly productive varieties. A notable achievement in the selective breeding of silkworms has been the genetic development of varieties that, when crossed, lay viable eggs of only the male sex. The males produce cocoons with more silk, and such an advance eliminates the labor-intensive operation of sorting out female eggs. Of crucial importance in the development of sericultural selective breeding were the works of B. L. Astaurov on the regulation of sex and the development of polyploid strains of silkworms, the introduction of commercial hybridization, and the use of the biological effects of thermal shock to disinfect live silkworm eggs infected with the pathogenic organism of pébrine (*Nosema bombycis*). Research in selective breeding is conducted at the Middle Asia Scientific Research Institute of Sericulture in Tashkent, the Azerbaijan Scientific Research Institute of Sericulture in Kirovabad, the Georgian Agricultural Institute, various institutes of the academies of sciences of the USSR and of the Union republics, and test stations. Sericultural stations or the corresponding shops on silkworm egg farms are responsible for increasing the number of silkworm varieties and improving their economic characteristics.

World production of silkworm cocoons totaled 438,700 tons in 1938 and 270,000 tons in 1974. Other major producers include Japan (106,000 tons in 1974), China (90,000 tons), and India (30,000 tons). Sericulture is also developed in Korea, Indochina, southern Europe, and Brazil.

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S. D. LAVRENT'EV [29–1106–2]

SERRATIA MARCESCENS, a species of bacteria among the pigmented microorganisms. The gram-negative, motile, peritrichous, nonspore-forming bacilli are 0.6–1.0 micrometer long and 0.5 micrometer wide. According to metabolism, the bacteria are facultatively anaerobic. On an agar surface they form smooth or grainy dark and bright red columns with a metallic shine. *Serratia marcescens* live in the soil, in water, and in foodstuffs. The bacteria develop in milk and on bread when there is increased moisture. The milk and bread turn reddish and may not be sold. The bacteria are a potential pathogen for animals and man and can cause suppuration. [29–735–3]

SERVICE BALLOON, a free balloon that, with a volume of up to 150 cu m, is designed to lift a person to an altitude of 100–150 m. The lifting force of the service balloon at the earth's surface is equal to the weight of a person or, sometimes, slightly less. During the 1930's service balloons were used to examine the envelopes of stratosphere balloons at their launch sites. [29–870–5]

ŠEŠUPĖ (Russian, Shiashupe; Polish, Szeszupa), a river that flows in the Lithuanian SSR and Kaliningrad Oblast, RSFSR, and has its source in Poland. A left tributary of the Neman, the Šešupė is 298 km long and drains an area of 6,100 sq km. The river, which rises in the Baltic Ridge, is fed primarily by rain. The mean flow rate 43 km from the mouth is 33.2 cu m per sec. The river freezes over between mid-November and January, and the ice breaks up between late February and early April. Cities on the Šešupė include Kalvarija, Kapsukas, Kudirkos Naumiestis, and Krasnoznamensk. [29–1569–1]

SETARIA, a genus of plants of the family Gramineae. The plants are perennial or annual herbs with flat leaf blades. The inflorescence is a cylindrical or, less commonly, somewhat lobular spicate panicle with very short branchlets. The spikelets are two-flowered and surrounded by rough bristles, or setae.

There are more than 120 species, distributed in tropical, subtropical, warm-temperate, and—to a lesser extent—temperate regions. The USSR has nine species. Particularly widely distributed are *S. glauca* and *S. viridis*, both of which are weeds that contaminate mainly spring crops, for example, millet. The plants occur along garden paths, in sands along rivers, in gravelly areas, and in pine forests. Young plants serve as pasturage for all domestic animals; the grain is readily eaten by domestic fowl. The genus includes a number of important cultivated crops, for example, several varieties of foxtail millet (*S. italica*).

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T. V. EGOROVA [29–1600–2]

SEWING MACHINE, a machine for joining or finishing sections of garments. It is used in the clothing, knitwear, footwear, and other branches of light industry as well as in the home.

The sewing machine was invented in the second half of the 18th century. The first designs typically imitated the method of hand stitching. After J. Madersperger invented the needle with the eye at the point in 1814, a number of investigators (Fisher, Gibbons, W. Hunt, E. Howe, and others) began working to devise stitching that would make use of such a needle. In 1845, Howe obtained a US patent for a lockstitch sewing machine that operated at a rate of 300 stitches per min. The needle in Howe's machine moved horizontally, and the fabrics being sewn were positioned in a vertical plane and could only be moved along a straight line. In the machines designed by Gibbs, I. M. Singer (1851), and A. B. Wilson (1850), the needle was arranged in a vertical position, and the fabric, which was held by a presser foot, was posi-

tioned on a horizontal platform and advanced intermittently by a gear wheel (later, by a rack). With development the sewing machine became more complex and was improved; it has become faster and more specialized.

Depending on the application, sewing machines may be classified as conventional stitching (single-needle and multineedle), serging, blind-stitching, button-sewing, and other types. A distinction is also made between universal machines that can sew various kinds of seams, stitches of different lengths, and stitches in different directions and specialized machines designed to perform specific operations; the latter are usually semiautomatic. Sewing machines are also subdivided into two groups according to the interlacing of the thread in a stitch: machines with a lockstitch and those with a chain stitch. All machines in each subgroup have many features in common, such as the principle of operation and the design of the operating members.

The most common universal machines are single-needle, lockstitch types, in which the needle, thread tensioner, shuttle, and cloth-moving mechanisms are the major elements. The needle mechanism imparts a reciprocating or oscillating motion to the needle, which has the thread passing through its eye. The material is punctured by the needle, the needle thread is drawn through the material from above, and a loop is formed by the eye of the needle. The shuttle mechanism captures the loop and passes it around a bobbin case. The thread tensioner unwinds thread from a spool, pulls it from the shuttle, and tightens the stitch. The cloth-moving mechanism shifts the material a distance equal to the length of the stitch. All mechanisms are driven from a main shaft that is rotated by an electric or mechanical drive.

The design, dimensions, shape, speeds, and other characteristics of the sewing machines used industrially (as in the clothing industry) are dictated by the assigned tasks, the size of the articles, the properties and thickness of the material, and other considerations. Many machines are equipped with mechanisms for trimming the fabric, pinking, and other functions. Machines used in the home are also of the universal lockstitch type. In addition to straight sewing, they can sew zigzag stitches, which are used to serge cloth parts, attach lace and appliqué, and finish articles. The use of additional, interchangeable attachments on such machines makes it possible to serge buttonholes and sew on hooks and buttons.

The largest group of universal stitching machines is composed of single-needle machines for single-thread and especially two-thread chain stitching, which provides more flexible and stretchable seams compared with those of lockstitch machines. The most common multineedle machines are two-needle types, but machines having three and four needles are also in use. Models with up to 12 or 14 needles are used to fasten materials in parallel stitches.

Serging machines may be used to stitch a material and simultaneously serge parts or only to serge the edge of the material to provide bar tacks. They usually produce a chain stitch and are used especially in the manufacture of knitwear and fur articles. Zigzag machines are used to join materials edge to edge, to serge a section of fabric, to make seams for certain linings, to sew on lace, and to finish articles. Machines in this group produce both simple and complicated stitches with a lockstitch or chainstitch type of thread interlacing. Machines capable of blind stitching are intended for making running stitches on collars and side interlinings and for various other operations in which topstitches and running stitches are used. In such machines a curved needle oscillates along an arc, penetrates the first fabric completely, but only partially penetrates the second (face) fabric, so that the stitches are not visible from the front. The threads may be interlaced as in a lockstitch or a chain stitch.

Button sewers are used to attach flat buttons having two or four holes and shank buttons, as well as to wind thread around the button shank. Buttonholers fashion the edges of buttonholes, cut the apertures to the required size and shape, provide bar tacks on slit ends, and cut off the ends of the thread when the sewing is completed. They use carcass thread to sew straight buttonholes without bars or with two bars at each end and fancy buttonholes with an eyelet. In embroidery machines, several needles, shuttles, and fabric-moving mechanisms operate in synchronism and produce the same pattern simultaneously on several pieces of cloth held in embroidery frames. The frames are moved simultaneously in a specific direction over the necessary distance corresponding to the pattern being embroidered. Button sewers, buttonholers, embroidery machines, bar-tack machines, and various other types of sewing machines are semiautomatic. Similar machines are used to join fabrics with welded or glued seams.

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I. S. MOROZOVSKAIA [29–937–1]

ŞEYHİ, SİNAN. Born 1370's in Kütahya; died 1422 or 1431 in Dumlupınar. Turkish poet. One of the founders of the secular *mathnawi* (long narrative poem consisting of rhymed distichs) in medieval Turkish literature.

Şeyhi was educated in medicine in Iran. He was the court physician of Sultan Mahmud I and the pupil and friend of the poet Ahmedi. He was the author of a divan of lyric poems that included ghazals, qasidas, and *rubais*. He became famous for his narrative poem *Khusrau and Shirin*, a "reply" to Nizami's poem of the same name, and for his *Book of an Ass*, one of the earliest works of medieval Turkish satire. Şeyhi was the first Turkish writer to use *aruz*, a complex system of versification borrowed from classical Persian poetry.

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[29–1087–2]

SHAAMIRIAN, SHAAMIR SULTANUM. Born 1723 in Iran; died 1798. Armenian public figure and Enlightenment thinker.

A wealthy merchant, Shaamirian conducted trade in India. From 1770 to 1790 he headed a printing house and an Armenian patriotic circle in Madras; M. Bagramian was a member of the circle. Shaamirian helped develop the idea that Armenia should be liberated from Iranian and Turkish supremacy through a people's revolution, and he affirmed that only in alliance with Russia could Armenia attain and preserve its national independence. In the publicist work *The Pitfall of Ambition* (most recent edition: Tiflis, 1913, in Armenian), Shaamirian criticized feudal monarchical state systems and set forth the republican principles that he believed should be the foundation of the state system of a free Armenia.

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[29–787–2]

SHAARTUZ, an urban-type settlement and the administrative center of Shaartuz Raion, Kurgan-Tiube Oblast, Tadzhik SSR. Shaartuz is located in the Kafirnigan River valley. It has a railroad station and a cotton-ginning plant. [29–787–3]

SHABA (until 1972, Katanga), a province in southeastern Zaïre; the chief mining region of the country and one of the most important mining regions in Africa. Area, 497,000 sq km. Population, 3.1 million (1974). The city of Lubumbashi is the capital of the province.

In the southern part of Shaba, along the border with Zambia, stretches a belt of rich copper deposits; the copper is found together with cobalt, zinc, uranium, and other metals. There are three main groups of deposits: the central group is centered at Likasi, the southeastern group at Lubumbashi, and the western group at Kolwezi. The western group yields more than two-thirds of Shaba's total output of copper and complex ores.

Metallurgical works are located in Lubumbashi (copper), Li-

kasi (copper and cobalt), Kolwezi (zinc, cadmium, and germanium), and Luilu (copper and cobalt). Electricity for the mining and metallurgical industries in the copper belt is supplied by the hydroelectric power plants of Le Marinel (258 megawatts) and Delcommune (108 megawatts) on the Lualaba River. In 1975 the companies of the copper belt produced a total of 495,000 tons of copper in the form of concentrates (452,000 tons of smelted copper), 12,100 tons of cobalt in the form of semifinished material (the highest amount in the capitalist world), and 79,000 tons of zinc (66,000 tons of smelted zinc).

Manganese ore is mined in Kisenge, in the southwestern part of the province (308,500 tons in 1975). Manono, which is located in the north, is the center for the mining of tin. Coal is mined in the Luena coalfield (0.1 million tons in 1975).

The cities of Shaba have chemical, cement, metalworking, textile, and food-processing plants. Mining and metallurgical products are exported through the ports of Matadi, Lobito (Angola), Beira (Mozambique), and Dar es Salaam (Tanzania); these ports all have rail or combined water-and-rail links with Shaba.

[29–787–4]

SHABAD, LEON MANUSOVICH. Born Jan. 6 (19), 1902, in Minsk. Soviet oncologist. Academician of the Academy of Medical Sciences of the USSR (1962). One of the founders of experimental oncology in the USSR. Member of the CPSU since 1953.

Shabad graduated from the First Leningrad Medical Institute in 1924. From 1938 to 1941 he was head of the subdepartment of pathological anatomy of the Second Leningrad Medical Institute. Beginning in 1935 he was head of the laboratories of experimental oncology of the All-Union Institute of Experimental Medicine and various institutes of morphology and oncology of the Academy of Medical Sciences of the USSR. In 1958 he became head of the department of carcinogenic agents of the All-Union Institute of Experimental Medicine.

Shabad has worked mainly on chemical carcinogenesis, precancers, the prevention of malignant tumors, and the history of oncology. He discovered (1937) endogenous chemical carcinogens in the human body. He was awarded the International Prize of the World Health Organization in 1962 for the best work on cancer and methods of combating cancer.

Shabad is a foreign member of the Polish Academy of Sciences and of many scientific oncological societies. He is an honorary doctor of Charles University in Prague and an honorary member of The New York Academy of Sciences. He was awarded the Order of Lenin, the Order of the Badge of Honor, and several medals.

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[29–788–1]

SHABAKA (throne name, Nefer-ka-Ra). Egyptian pharaoh of the 25th (Ethiopian) Dynasty (ruled c. 716–c. 701 B.C.). Shabaka completed the union of Egypt and Cush, which had been initiated by his brother and predecessor Piankhy.

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SHABALIN, ALEKSANDR OSIPOVICH. Born Oct. 22 (Nov. 4), 1914, in the village of Iudmozero, in what is now Onega Raion, Arkhangel'sk Oblast. Twice Hero of the Soviet Union (Feb. 22, 1944, and Nov. 5, 1944). Rear admiral (1969). Member of the CPSU since 1943.

Shabalin, the son of a peasant, joined the navy in 1936. In 1939 he passed an examination to qualify for the rank of officer. He graduated from the Caspian Higher Naval School in 1951 and the academic courses of the Naval Academy in 1955. He fought in the Soviet-Finnish War of 1939–40 as commander of a motor torpedo boat.

During the Great Patriotic War (1941–45), Shabalin commanded a motor torpedo boat and a unit and detachment of motor torpedo boats in the Northern and Baltic fleets. He personally sank seven enemy ships, four supply ships, and one motor boat. After he assumed command of the detachment in February 1944, 25 enemy ships were sunk. Since 1957, Shabalin has held leadership posts in higher naval educational institutions.

Shabalin, the recipient of two Orders of Lenin, has been awarded three Orders of the Red Banner, the Order of the Patriotic War Second Class, the Order of the Red Star, and the Order for Serving the Homeland in the Armed Forces of the USSR Third Class. He has also received numerous medals. A bust of Shabalin was placed in the city of Onega, Arkhangel'sk Oblast.

[29–789–2]

SHABBI, ABU AL-QASIM AL-. Born 1909 in the village of al-Shabbiya, near Tozeur; died 1934 in Tunis. Tunisian poet. One of the first romanticists in Arabic poetry; a classic author of modern Tunisian literature.

Al-Shabbi was the son of a Muslim judge who instilled in him the beliefs of M. Abdo and other Islamic reformers. In the early 1920's he studied at the Zaytunah higher Muslim religious school in Tunis. He graduated from the Tunis School of Law in 1930. He first published his works in 1926.

Al-Shabbi had a perfect command of the classical traditions of Arabic poetry but contrasted it with the poetry of sentiment in the spirit of French romanticism, familiar to him from Arabic adaptations of the works of A. de Musset, A. de Lamartine, and T. Gautier. The romanticist rift between the ideal and the real was manifested in al-Shabbi's works as the tragic contradiction between contemporary Tunisian society ("a dead world . . . of ancient tombs") and the yearning for a spiritual rebirth and personal freedom (the collection *Songs of Life*, published 1955).

In 1929, in a public lecture entitled "Poetic Imagination Among the Arabs" (published 1929), Shabbi criticized the Arabic classical heritage and spoke out harshly against the prevailing traditionalism, to which he ascribed the self-isolation of Arabic literature from life and from other literatures of the world.

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SHABDAR, OSYP (Iosif Arkhipovich Shabdarov). Born Mar. 27 (Apr. 8), 1898; died 1943. Soviet Mari writer. Born in the village of Malaia Luzhala, in what is now Sernur Raion, Mari ASSR.

Shabdar graduated from the Pedagogical Institute in Kazan in 1932. He began to write poetry in 1918. He was the author of the collections of lyrical verse entitled *Sounds of the Gusli* (*Küsl'e jük*, 1929) and *Sounds of Steel* (*Vurs jük*, 1933). He also wrote stories, including children's stories, the novella *The End of the World* (1928), the novel *A Woman's Path* (*Üdramaš kornō*, 1929–36), and articles on literature.

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SHABEL'KOVKA, an urban-type settlement in Donetsk Oblast, Ukrainian SSR, under the jurisdiction of the Kramatorsk city soviet. Shabel'kovka is 4 km from Kramatorsk. The settlement has a vegetable and dairy sovkhoz and a sovkhoz where fruit plants are raised for transplantation. Most of the inhabitants of Shabel'kovka work in enterprises in Kramatorsk. [29–791–2]

SHABENDE (pen name of Abdulla, son of Miami). Born circa 1720; died 1800. Turkmen poet improviser. Born and lived in the region of Kunia-Urgench and Vas, in what is now Tashauz Oblast, Turkmen SSR.

Shabende studied in a madrasa in Khiva. He wrote lyric poetry and the *dastans Shabekhram, Gul' and Bul'bul* (1800), and *Khodzhamberdikhan*. The poetic style of his *dastans* is similar to that of Turkmen folklore. Many of his song poems entered the repertoire of the *bakhshi*.

Shabende's works are mainly written in Turkic meter, with lines of eight, 11, and 14 syllables. They also include quantitative verses, for example, *ghazals, rubaiyat*, and *mukhammas*.

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SHABESTARI, MAHMUD. Born circa 1287 in the village of Shabestar, near Tabriz; died there circa 1320. Azerbaijani poet and philosopher who wrote in Farsi.

Shabestari, a follower and teacher of Sufism, exerted an appreciable influence on the development of social thought in Azerbaijan and in the countries of the Middle East. He wrote *The Book of Happiness, Treasury of Truths, The Truth-seekers' Looking Glass, Book of an Eyewitness*, and other literary and philosophical works in verse.

Shabestari achieved fame for his narrative poem *Golshan-e raz* (*The Mystic Rose Garden*), one of the oldest sources setting forth the principles of Sufi symbolism. In 1835, J. von Hammer-Purgstall made a complete translation of the poem into German. The poem has been published in many countries.

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SHABLIOVSKII, EVGENII STEPANOVICH. Born Apr. 14 (27), 1906, in Kamen'-Kashirskii, in what is now Volyn' Oblast. Soviet literary scholar. Corresponding member of the Academy of Sciences of the Ukrainian SSR (1934). Member of the CPSU since 1928.

Shabliovskii graduated from the department of history and philology of the Kiev Institute of Public Education in 1930. He has written studies on the history and theory of Ukrainian literature, monographs on the work of T. G. Shevchenko, and studies of such writers as L. Ukrainka, I. Ia. Franko, V. S. Stefanik, and N. I. Kostomarov. He received the Lenin Prize in 1964 for his book *T. G. Shevchenko and the Russian Revolutionary Democrats, 1858–1861* (1962). Shabliovskii's works have been translated into foreign languages and languages of the USSR.

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SHABLYKINO, an urban-type settlement and the administrative center of Shablykino Raion, Orel Oblast, RSFSR. Shablykino is 68 km from Orel and 40 km from the Karachev railroad station on the Orel-Briansk line. The settlement has a hemp-processing plant, a starch factory, a creamery, and a brickyard. [29–792–2]

SHABROVSKII, an urban-type settlement in Sverdlovsk Oblast, RSFSR, under the jurisdiction of the Chkalovskii raion soviet of the city of Sverdlovsk. Shabrovskii is 25 km south of Sverdlovsk. A talc combine is located in the settlement, and marble is quarried nearby. [29–793–3]

SHABULIN, MIKHAIL NIKOLAEVICH. Born Nov. 6, 1887, in the village of Mikhalkovo, in what is now Novoderevenskii Raion, Riazan' Oblast; died Sept. 6, 1925, in Yalta. Participant in the revolutionary movement in Russia. Member of the Communist Party from 1904.

Shabulin was the son of a peasant. He graduated from the Riazan' Teachers' Seminary in 1906 and taught in Riazan' Province. He conducted party work among the peasants and was arrested several times. In 1913 he began teaching at the Moscow Teachers' Institute. In 1916, Shabulin was called into the army; after graduating from the Aleksei Military School, he was sent to the front. After the February Revolution of 1917 he served on a regimental committee and the executive committees of the Lutsk soviet and of the soviet of the Special Army of the Southwestern Front. In May 1917, Shabulin became a member of the united army committee of the RSDLP, and from June to September he was deputy chairman of the committee. In December he served on the revolutionary military committee of the Special Army.

In 1918, Shabulin returned to Riazan', where he became deputy provincial commissar of education. He served as deputy chairman of the provincial executive committee and, in 1919 and 1920, as chairman of the committee. From August to November 1919 he was a member of the revolutionary military committee of Riazan' Province. In 1920 he undertook party work on the Sovetskii Kavkaz and Oktiabr'skaia Revoliutsiia, two agitational trains of the All-Russian Central Executive Committee; the trains operated in the Northern Caucasus and Siberia. In 1921, Shabulin began conducting party and Soviet work in Yalta.

Shabulin was a member of the All-Russian Central Executive Committee, and he served as a delegate to the Ninth Congress of the RCP(B) in 1920. [29–793–5]

SHACKLETON, ERNEST HENRY. Born Feb. 15, 1874, in Kilkee; died Jan. 5, 1922, on South Georgia Island. British antarctic explorer.

From 1901 to 1903, Shackleton was a member of R. F. Scott's expedition. In 1908–09 he headed an expedition aboard the *Nimrod*. The expedition split up into three groups, one of which, led by Shackleton, set off for the south pole. The group never reached the pole, traveling as far as 88°23′ S lat.; en route it discovered the Beardmore Glacier. In the period 1914–17, Shackleton organized and led a transantarctic expedition. The expedition succeeded in exploring only part of the coast of Coats Land (called Caird Coast by Shackleton) because its ship, the *Endurance*, was trapped in the ice and crushed. In 1921, Shackleton once again set off for antarctic shores, aboard the *Quest*, but he died en route.

A coast, an ice shelf, and a strait in Antarctica and three mountains (Antarctica, Canada, and eastern Greenland) have been named after Shackleton.

WORKS

In Russian translation:

V Serdtse Antarktiki. Moscow, 1957. [29–1089–3]

SHACKLETON COAST, the northeastern slope of the Transantarctic Mountains in Antarctica, bordering on the Ross Ice Shelf between 80°30′ and 83°31′ S lat. Shackleton coast, which measures about 350 km in length, is an almost continuous chain of mountain ranges separated by outlet glaciers. The summits rise to more than 3,000 m. The slopes of the mountains are separated from the Ross Ice Shelf by steep ice precipices and broad crevasses. Discovered in 1902 by R. F. Scott's expedition, the coast is named in honor of E. Shackleton. [29–1090–1]

SHACKLETON ICE SHELF, an ice shelf in Eastern Antarctica, on the coast of Queen Mary Land (or Queen Mary Coast) and Wilkes Land, between 95° and 105° E long. The Shackleton Ice Shelf measures 440 km from west to east and 170 km from south to north. It has an area of 37,400 sq km and is 180–200 m thick. The thick Scott and Denman outlet glaciers feed into the middle parts of the shelf. Individual ice domes rise 250–300 m above the ice surface. The Shackleton Ice Shelf separates the Bunger Oasis from the Mawson Sea; the oasis' lagoons are connected with the ocean beneath the ice. The shelf was discovered in 1840 by the American expedition of C. Wilkes and was named in honor of E. Shackleton by D. Mawson's Australian antarctic expedition (1911–14). The first detailed study of the ice shelf was made by the Soviet antarctic expedition of 1956–58. [29–1090–2]

SHAD (*Alosa sapidissima*), a fish of the family Clupeidae (herrings). The largest of the anadromous herrings, the shad is up to 75 cm long and weighs up to 6.4 kg. It is found along the Atlantic coast of North America, from the Gulf of St. Lawrence to Florida. It has been acclimatized in the Pacific Ocean, where it is found from Alaska to San Diego and near Kamchatka. The fish ascend rivers to spawn in the spring. The eggs are deposited in batches. Fecundity is up to 150,000 eggs. The diet consists of plankton (usually the larger forms) and, sometimes, fry. The shad is a valuable commercial fish. In recent years, the catch has decreased considerably because of pollution and the regulation of rivers.

REFERENCE
Zhizn' zhivotnykh, vol. 4, part 1. Moscow, 1971. [29–1561–4]

SHADAEV, APOLLON INNOKENT'EVICH. Born Dec. 2 (15), 1902, in the *ulus* of Khurdut, in what is now the Ust'-Orda Buriat Autonomous Okrug, Irkutsk Oblast; died June 15, 1969, in Ulan-Ude. Soviet Buriat writer. Member of the CPSU from 1941.

Shadaev is best known for his comedy *Mergen* (1938), which is about the establishment of kolkhozes in Buriatia. He is the author of the plays *Limbe* (1935), *Bair* (in collaboration with G. Tsydynzhapov; staged 1938), *Two Untruths* (1945), *Spring Joy* (1947), *The Winged Fish* (1956), and *The Mistake of Erkhete the Blacksmith* (1965). A scholar and collector of Buriat folk tales, he published the collections *Budamshu* (1949), *The Magic Stone* (1958), and *The Little Golden Egg* (1967). Shadaev's works have been translated into the languages of the peoples of the USSR. He was awarded the order of the Badge of Honor.

WORKS
Altan undegen. Ulan-Ude, 1967.
In Russian translation:
Buriat-mongol'skie narodnye skazki. Ulan-Ude, 1956.
REFERENCES
Istoriia buriatskoi sovetskoi literatury. Ulan-Ude, 1967. [29–805–4]

SHADDADID, a feudal dynasty of Kurdish descent in Aran and Armenia from approximately 951 to 1199. The founder of the dynasty was Muhammad ibn-Shaddad, who established his rule in the city of Dvin. In Gandzha (now Kirovabad) the main branch of the Shaddadids ruled from the 970's until the Seljuk conquest of 1075. Manuchihr ibn-Shavur II founded the Ani branch of the Shaddadids in about 1072. After the incorporation of the city of Ani into Georgia in 1199, the Shaddadid dynasty came to an end.

REFERENCE
Istoriia Azerbaidzhana, vol. 1. Baku, 1958. [29–1078–2]

SHADED-POLE MOTOR, a squirrel-cage induction motor in which a rotating magnetic field is created by the field winding (FW) and a short-circuited winding (SW) that encircles a part of each stator pole (Figure 1). The pulsating magnetic flux produced by FW induces currents in SW that, according to Lentz's law, cause the pulsating magnetic flux through SW to be delayed compared with the other portion. This is the shading effect of SW. The rotor turns under the influence of the magnetic field that is created by the magnetic fluxes from the shaded and unshaded parts of the stator poles as a result of the displacement of the flux axes by angle θ and of the pulsation of the fluxes with the time lag.

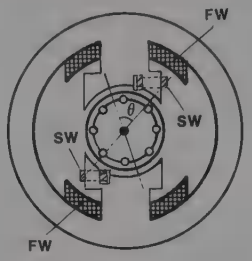

Figure 1. Cross section of a shaded-pole motor: (FW) field winding, (SW) short-circuited winding, (θ) angle between the axes of the magnetic fluxes from the shaded and unshaded parts of the stator poles

Shaded-pole motors are used to drive tape recorders, record players, table fans, and other equipment for which a power of 20–300 watts is sufficient.

REFERENCE
Vol'dek, A. I. *Elektricheskie mashiny*, 2nd ed. [Leningrad] 1974. [29–1888–1]

SHADR, IVAN DMITRIEVICH (real surname, Ivanov). Born Jan. 30 (Feb. 11), 1887, in Shadrinsk, in what is now Kurgan Oblast, RSFSR; died Apr. 3, 1941, in Moscow. Soviet sculptor.

Shadr studied under T. Zal'kaln at a commercial art school in Ekaterinburg from 1903 to 1907 and at the drawing school of the Society for the Promotion of the Arts in St. Petersburg in the years 1907 and 1908. In 1910 and 1911 he studied in Paris, where he profited from the advice of E. A. Bourdelle and A. Rodin, and in 1911 and 1912 he was in Rome. In 1926 he became a member of the Society of Russian Sculptors.

Shadr's early works, for example, his design for the unrealized *Monument to World Suffering* (1915), reveal the influence of *art nouveau*. Shadr helped carry out Lenin's plan of monument propaganda. The revolution had a considerable impact on his work; his romantic, generalized depictions took on a more concrete meaning, expressing zeal for social transformation. Shadr's mastery of plastic form aided him in his expressive and true-to-life series *The Red Army Soldier, The Worker, The Sower*, and *The Peasant*, which was intended for reproduction on postage stamps, bank notes, and bonds (all in plaster, 1922, Museum of the Revolution of the USSR, Moscow; cast in bronze, 1951, Tret'iakov Gallery).

Shadr's sculpture *The Cobblestone—Weapon of the Proletariat* dynamically portrays a young worker ripping a cobblestone from the pavement. The work has become symbolic of the rising revolutionary force of the popular masses.

Beginning in 1924, Shadr devoted a good deal of time to depicting V. I. Lenin. His monument to Lenin on the dam of the Zemo-Avchaly Hydroelectric Power Plant in the Georgian SSR is one of the best of Soviet monuments. The sculpture renders the leader's great historical importance with lifelike veracity. It fits organically into the surrounding mountainous landscape, with the power plant and dam. The culmination of Shadr's accomplishments in monumental sculpture was his design for the monument to M. Gorky in Moscow (bronze, 1939, Tret'iakov Gallery), which was executed by V. I. Mukhina together with N. G. Zelenskaia and Z. G. Ivanova (bronze and granite, 1951).

Shadr tended toward symbolic generalization in his portraits, for example, *The Mother* (plaster, 1922, collection of T. V. Shadr-Ivanova, Moscow; bronze, Tret'iakov Gallery) and *Maksim Gorky: The Stormy Petrel* (bronze, 1939, Tret'iakov Gallery). This tendency is also evident in his gravestones, for exam-

ple, that of E. N. Nemirovich-Danchenko (marble and labradorite, 1939, Novodevich'e Cemetery, Moscow).

Shadr's works are pervaded with revolutionary romanticism. They were important in establishing socialist realism in Soviet sculpture.

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I. D. Shadr [1887–1941]—Iubileinaia vystavka k 75-letiiu so dnia rozhdeniia: Katalog. Moscow, 1962.
Voronova, O. P. *Shadr*. Moscow, 1969. [29–806–1]

SHADRINSK, a city under oblast jurisdiction and administrative center of Shadrinsk Raion, Kurgan Oblast, RSFSR. Situated on the left bank of the Iset' River (Ob' River basin). Railroad station on the Sverdlovsk-Kurgan line, 146 km northwest of Kurgan. Population, 82,000 (1977).

Shadrinsk produces units for motor vehicles, printing machinery, metal structural units, and reinforced-concrete and keramzit products. The city also has a plant for the repair of metallurgical equipment, a brickyard, a tannery, a brewery, a distillery, and factories for the production of clothing, felt footwear, and leather clothing accessories and footwear. Other enterprises include a meat- and poultry-packing plant, a food-processing combine, and shops servicing the railroad industry.

Shadrinsk has a pedagogical institute and technicums of auto repair, financial studies, industrial pedagogical training, cooperative agriculture, and physical culture. It also has a medical school. The city has a drama theater and a museum of local lore. [29–807–1]

SHADRINSK GOOSE (also Ural goose), a breed developed in the 17th century in the southern Urals through the selection and breeding of the best specimens of tamed wild greylag geese. The body is short, deep, and broad. The plumage is white, gray, or of motley colors. The male weighs 5–7 kg, and the female, 4–5 kg. The egg-laying capacity is 30–40 eggs, each egg weighing 160 g. The Shadrinsk goose is bred in Kurgan, Sverdlovsk, Tiumen', and other oblasts. [29–807–2]

SHAFAREVICH, IGOR' ROSTISLAVOVICH. Born June 3, 1923, in Zhitomir. Soviet mathematician. Corresponding member of the Academy of Sciences of the USSR (1958).

Shafarevich graduated from Moscow University in 1940; he joined the university's teaching staff in 1944 and was appointed a professor in 1953. In 1943 he became associated with the Institute of Mathematics of the Academy of Sciences of the USSR. Shafarevich's principal works deal with algebra and the theory of algebraic numbers. Shafarevich received the Lenin Prize in 1959.

WORKS

Teoriia chisel, 2nd ed. Moscow, 1972. (With Z. I. Borevich.)
Osnovy algebraicheskoi geometrii. Moscow, 1972. [29–886–4]

SHAFFER, GORDON. Born Oct. 1, 1905. Public and political figure of Great Britain. A journalist by profession.

From 1937 to 1953, Shaffer contributed to the newspaper *Reynold's News*. He then became an editor of the *Journalist*, a magazine published by the National League of Journalists. Until 1972 he was president of the British Committee for the Defense of Peace, and in 1971 he became president of the British Committee for European Security and Cooperation. In 1972, Shaffer became the vice-president of the National Peace Council. He is a member of the World Peace Council.

In 1964, Shaffer received the International Lenin Prize for Strengthening Peace Among Nations. [29–890–1]

SHAFI AHMED AL-SHEIK, AL-. Born May 2, 1924; died July 26, 1971. Figure in the Sudanese and international working-class movement.

After graduating from a technical school in the city of Atbarah, al-Sheik worked in railroad workshops and took part in the communist and working-class movement. He was a member of the Politburo of the Sudanese Communist Party, and in 1950 he became general secretary of the Sudan Workers Trade Union Federation. He was subjected to repression by the reactionary authorities several times. In 1957, al-Sheik became vice-president of the World Federation of Trade Unions. In 1965 he became a member of the World Peace Council. In 1971 the Sudanese authorities accused al-Sheik of taking part in an attempted coup d'etat, and he was executed by order of a military tribunal.

In 1970, al-Sheik received the Lenin Prize for Strengthening Peace Among Nations. [29–887–3]

SHAFIROV, PETR PAVLOVICH. Born 1669; died Mar. 1 (12), 1739, in St. Petersburg. Russian state figure and diplomat; baron (from 1710).

Shafirov came from a Jewish family. In 1691 he took up his father's profession and began serving as an interpreter and translator in the Posol'skii Prikaz (Foreign Office). In 1697 and 1698 he took part in the Great Embassy in Western Europe; during this time, Peter I brought Shafirov into his own service. In 1703, Shafirov became a privy secretary to Chancellor F. A. Golovin, and in 1709 he became vice-chancellor and director of the postal service. Shafirov concluded the Prut Peace Treaty of 1711 with Turkey, and he signed the alliance agreements with Poland and Denmark in 1715 and with Prussia and France in 1717. In 1717 he became vice-president of the Collegium of Foreign Affairs. He helped with preparations for the conclusion of the Treaty of Nystadt with Sweden, which was signed in 1721.

In 1723, as a result of a struggle among groups at the court, Shafirov was accused of embezzlement of public funds and was sentenced to death; the sentence was commuted to exile for life. Shafirov was sent to Nizhny Novgorod to serve his sentence, but in 1725 he was pardoned by Catherine I and was made president of the Commerce Collegium. During the reign of Emperor Peter II (1727–30), Shafirov was in retirement. From 1730 to 1732 he served as Russian ambassador in Tehran, and in 1732 he concluded the Treaty of Resht with Iran. In 1733, Shafirov again became president of the Commerce Collegium.

WORKS

Rassuzhdenie, kakie zakonnye prichiny e. v. Petr Velikii . . . k nachatiiu voiny protiv korolia Karla XII Shvedskogo v 1700 godu imel, 3rd ed. St. Petersburg, 1722. [29–888–1]

SHAFONSKII, AFANASII FILIMONOVICH. Born Dec. 13 (24), 1740, in the village of Sosnitsy, in what is now Chernigov Oblast; died Mar. 27 (Apr. 8), 1811, in the village of Iaklichi (Gapovka), in what is now Chernigov Oblast. Ukrainian economist, ethnographer, and physician.

Shafonskii was the son of a *sotnik* (cossack lieutenant). From 1756 to 1763 he studied at the universities of Halle, Leiden, and Strasbourg. In 1769 he became a senior physician at Moscow General Hospital, where he took part in the struggle against a plague epidemic. His book *A Description of the Plague in the Capital City of Moscow From 1770 to 1772* (parts 1–2, 1775) was translated into many foreign languages. In 1782, Shafonskii served in the criminal court of Chernigov Vicegerency; between 1784 and 1786 he compiled *A Topographical Description of Chernigov Vicegerency* (parts 1–2, 1851), which contains valuable material on the history, ethnography, and economy of the Left-bank Ukraine. [29–888–2]

SHAFRAN, DANIIL BORISOVICH. Born Feb. 13, 1923, in Leningrad. Soviet cellist. People's Artist of the USSR (1977).

In 1950, Shafran graduated from the Leningrad Conservatory, where he had studied cello with A. Ia. Shtrimer. He maintains a busy performance schedule in the USSR and abroad. Shafran won recognition for his profound interpretations of the classical cello repertoire and the works of Soviet composers. His playing is distinguished by a subtle poetic quality, a high level of artistry, and brilliant virtuosity. He took first prize in the All-Union Competition of Violinists and Cellists in Moscow in 1937 and the H. Wihan International Cello Competition in Prague in 1950. Shafran received the State Prize of the USSR in 1952.

REFERENCE

Iampol'skii, I. *D. Shafran*. Moscow, 1974. [29–888–3]

SHAFRANOVO, an urban-type settlement in Al'sheevskii Raion, Bashkir ASSR. Shafranovo is situated on the right bank of the Kursak River (a left tributary of the Dema River), 137 km southwest of Ufa. It has a railroad station on the Ufa-Kuibyshev line. The settlement has a factory that makes tapestries and carpets. Limestone is mined in the area.

Shafranovo is a climatic health resort that provides koumiss treatment. Summers are warm (average July temperature, 19°C), and winters are moderately cold (average January temperature, −15°C). Annual precipitation is 415 mm. Shafranovo has a tuberculosis sanatorium. [29–889–1]

SHAFRANOVSKII, ILARION ILARIONOVICH. Born Mar. 11 (24), 1907, in St. Petersburg. Soviet crystallographer. Doctor of geological and mineralogical sciences (1943); professor (1945). Honored Scientist of the RSFSR (1973).

Shafranovskii graduated from Leningrad University in 1930. In 1931 he began working at the Leningrad Institute of Mines, where he became head of the subdepartment of crystallography in 1946. He also taught at Leningrad University from 1934 to 1948.

Shafranovskii's main works deal with crystal morphology, mineralogical crystallography, and the history of mineralogy and crystallography. Shafranovskii linked the morphology of crystals with the conditions of crystal formation and the effects of environmental symmetry. He worked out the theory of distorted crystal forms and devised the goniometric technique of describing rough diamonds.

Shafranovskii has been awarded the Order of the Red Banner of Labor and various medals.

WORKS

Kristally mineralov, parts 1–2. Leningrad-Moscow, 1957–61.
Istoriia kristallografii v Rossii. Moscow-Leningrad, 1962.
Kristallografiia, 5th ed. Moscow, 1972. (With G. M. Popov.)
Ocherki po mineralogicheskoi kristallografii. Leningrad, 1974.

REFERENCE

"Ilarion Ilarionovich Shafranovskii (k 70-letiiu so dnia rozhdeniia)." *Kristallografiia*, 1977, vol. 22, issue 3. [29–889–2]

SHAFTESBURY, THIRD EARL OF (Anthony Ashley Cooper). Born Feb. 26, 1671, in London; died Feb. 15, 1713, in Naples. English moral philosopher, aesthetician; deist.

A student of J. Locke, Shaftesbury expressed ideas characteristic of the early Enlightenment. A supporter of freethinking and an opponent of church religiosity and fanaticism, he saw reason as the single criterion of truth. Shaftesbury's philosophy was the expression of an extremely optimistic view of the world and history. Using Neoplatonic images borrowed particularly from the Cambridge Platonists, he drew a sweeping picture of a universe at the same time eternally created and in the process of being created, with a single origin of the true, the good, and the beautiful. Shaftesbury's image of the universe was the expression of man's striving for the ideal of harmonious naturalness as the reasonable order of human existence. Morality, according to him, is rooted in an innate human "moral sense"; its essence lies in the harmonious combination of individual and social inclinations. Shaftesbury's characteristic aesthetization of the world was linked with an assertion of the aesthetic nature of moral perfection, the indissoluble unity of beauty and morality (the dialogue *The Moralists: A Philosophical Rhapsody*, 1709). He analyzed the principles of classicist realism, elaborated the problem of character, which was crucial to Enlightenment art, and developed the doctrine of intrinsic form.

Shaftesbury's aesthetic ideas were systematized by British philosophy of the 18th century (F. Hutcheson and D. Hume) and were developed in English poetry and moralistic prose, beginning with A. Pope, J. Addison, and R. Steele. Shaftesbury strongly influenced aesthetic ideas in France (D. Diderot) and especially Germany (C. M. Wieland, J. G. Hamann, J. G. Herder, J. W. von Goethe, F. von Schiller, and the Jena romantics).

WORKS

Characteristicks of Men, Manners, Opinions, Times, vols. 1–3. London, 1711.
The Life, Unpublished Letters and Philosophical Regimen. London, 1900.
Second Characteristicks, or the Language of Form. Cambridge, 1914.
In Russian translation:
Esteticheskie opyty. Moscow, 1975.

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Walzel, O. *Das Prometheussymbol von Shaftesbury zu Goethe*, 2nd ed. Munich, 1932.
Wolff, E. *Shaftesbury und seine Bedeutung*. Tübingen, 1960.

AL. V. MIKHAILOV [29–1167–2]

SHAFT FURNACE, a furnace that has an upright working chamber of circular, elliptical, or rectangular cross section and is used to smelt or roast lumped materials. The heat required for the smelting or roasting process is produced by the combustion of a fuel either directly in the furnace or in an external firebox from which hot combustion products are supplied to the furnace.

Moderate velocities of the gaseous combustion products are characteristic of shaft furnaces. At such velocities, the bulk of the lumped materials (the charge) is not entrained by the ascending gas stream and, in contrast to the case of a fluidized-bed furnace, maintains aerodynamic stability. The countercurrent motion of the charge (from the top to the bottom) and of the gases forced through the charge (from the bottom to the top) and the direct contact between the charge and the hot gases result in good heat exchange and the generation of low-temperature exhaust gases. Consequently, shaft furnaces are characterized by a high thermal efficiency and a relatively high output. Such furnaces are widely used to smelt iron ores (*see* BLAST-FURNACE PRODUCTION), pig iron (*see* FURNACE, CUPOLA), and the raw materials employed in nonferrous metallurgy, as well as to roast, for example, iron ore (in the direct reduction of iron ore) and limestone.

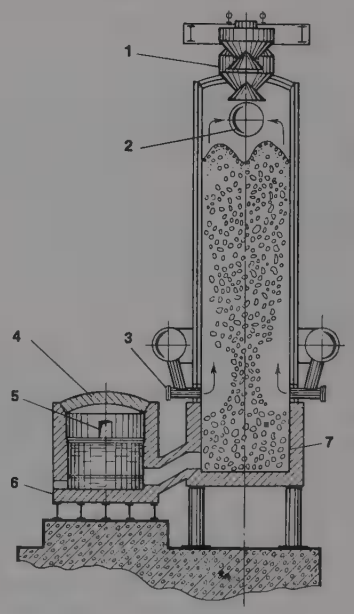

Figure 1. A shaft furnace: (1) charging device, (2) gas outlet, (3) tuyere, (4) outside crucible, (5) slag notch, (6) matte hole, (7) inside crucible

The shaft furnaces used in nonferrous metallurgy (Figure 1) are designed for continuous operation. They are low (<8 m high) because of the need to carry out smelting without the reduction of substantial amounts of iron oxides and are narrow (<2 m wide in the plane of the tuyeres); the length of the furnaces is 8–15 m. The main components of such a furnace are as follows: a top, through which the charge is loaded and the gaseous combustion products are discharged; a shaft equipped with tuyeres, through which either a blast for fuel combustion or hot gases are supplied; and an inside crucible with a refractory lining, where the molten products collect. The smelts are tapped through an outside crucible or directly from the inside crucible to a forehearth for the

stripping of the slags. The forehearth is often equipped for electric heating.

Formerly, shaft furnaces were constructed from metal jackets, through which water for cooling circulated (hence the obsolete name for shaft furnaces used in nonferrous metallurgy: the water-jacket furnace). Later, evaporative cooling came to be used instead of water cooling. The shaft is constructed of thick-walled tubing welded into units. Shaft furnaces are usually not lined since iron slags in nonferrous metallurgy readily dissolve refractory materials.

REFERENCES
See references under BLAST FURNACE SMELTING.

I. D. REZNIK [29–909–1]

SHAFT FURNACE, a firebox for the laminar combustion of moist solid fuel, such as lump peat or firewood. A shaft furnace has a tall loading shaft in which the fuel is dried and heated and volatile substances are partially released owing to the heat of the burning fuel bed below. As combustion progresses, the prepared beds in the upper part of the shaft move down to the combustion zone on the furnace grate. Shaft furnaces are used mainly to fire small boilers, that is, boilers with a steam output of up to 6.5 tons/hr. [29–911–1]

SHAGAN (also Chagan), a river in Semipalatinsk Oblast, Kazakh SSR; a left tributary of the Irtysh. The Shagan is 295 km long and drains an area of 25,400 sq km. It flows within the Kazakh Melkosopochnik. Fed primarily by snow, the river has a mean flow rate of approximately 1.02 cu m per sec. The upper course of the Shagan is dried up most of the year; it flows only during May and June. The lower course flows intermittently and sometimes divides into separate reaches. The Shagan freezes over in November, and the ice breaks up in early April. The Ashchisu is a right tributary of the Shagan. [29–800–1]

SHAGINIAN, GRANT AMAZASPOVICH. Born July 30, 1923, in the village of Giulasarak, Stepanavan Raion, Armenian SSR. Soviet gymnast. Honored Master of Sport (1951). Member of the CPSU since 1951.

Shaginian was Olympic champion in 1952, world champion in 1954, and Soviet champion six times between 1948 and 1955, taking part in individual competitions of combined events. He was all-around champion of the USSR in 1952.

Shaginian has been awarded two orders. [29–802–2]

SHAGINIAN, MARIETTA SERGEEVNA. Born Mar. 21 (Apr. 2), 1888, in Moscow. Soviet Russian writer. Hero of Socialist Labor (1976); doctor of philological sciences (1946); corresponding member of the Academy of Sciences of the Armenian SSR (1950). Member of the CPSU from 1942.

Shaginian, the daughter of an Armenian scholar and physician, graduated from the history and philosophy department of the Ger'e Advanced Courses for Women in 1912. From 1906 to 1912 she contributed to the Moscow press and later to the newspapers *Priazovskii krai* (The Azov Region), *Kavkazskoe slovo* (The Caucasian Word), and *Baku* (Baku). She published the books of poetry *First Encounters* (1909) and *Orientalia* (1913) and the short-story collections *Narrow Gates* (1914) and *Seven Conversations* (1915). In her novel *One's Destiny* (published in full in 1923), she appealed to the intelligentsia to reconsider their own destiny from the point of view of the people's destiny.

The October Revolution of 1917, which Shaginian enthusiastically welcomed, provided new themes for her writing, for example, the novella *The Change* (1923). Under the pen name Jim Dollar she published the series of agitation-adventure novellas *Mess-Mend* (1924–25), consisting of *A Yankee in Petrograd, Lori Len, Metalworker*, and *The Road to Baghdad*, which were published throughout the world by the working-class press and enjoyed enormous success; the series was adapted for the screen in 1926.

Shaginian's novel *Hydrocentral* (1930–31) deals with socialist construction and new human relationships. The novel reflects the years the author spent at the construction site of hydroelectric power plants in Armenia. It reveals her gift for exploring a literary theme, developing a plot, and providing an abundance of technical information. These qualities make *Hydrocentral* one of the best examples of the Soviet industrial novel.

In her numerous essays, including "Journey Through Soviet Armenia" (1950; State Prize of the USSR, 1951), Shaginian examines important phenomena of modern life against the scrupulously depicted panorama of Armenian culture and history. The book of sketches *Letters From Abroad* (1964) depicts postwar Europe's complex ideological struggle in the face of the growing forces of the socialist camp. Shaginian, a master of the literary portrait, wrote sketches of G. B. Iakulov, V. F. Khodasevich, S. V. Rachmaninoff, and W. Blake, as well as full-length biographical works, including *T. Shevchenko* (1941), *I. A. Krylov* (1944), *Studies on Nizami* (1955) and *Resurrection*, which is devoted to the Czech composer J. Mysliveček. Shaginian was also the author of various studies, essays, and articles, including several about Goethe, for example, *Journey to Weimar* (1914, published 1923) and *Goethe* (1950).

Themes drawn from Lenin's life occupy a special place in Shaginian's works. The historical and philosophical interpretation of various problems determined her success as a writer. Her chronicle novels *The Ul'ianov Family* (1938, rev. ed. 1957) and *The First All-Russian Exhibition* (1965) were awarded the Lenin Prize in 1972, along with several of her sketches. In the two novels, Shaginian details the history of Russia in the 1870's, shows the profound validity of Leninism as a historical phenomenon, and creates a vital image of Lenin as a man and thinker.

Shaginian's works have been translated into many languages of the peoples of the USSR, as well as foreign languages. She has been awarded two Orders of Lenin, the Order of the October Revolution, seven other orders, and several medals.

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M. S. GORIACHKINA [29–802–3]

SHAGLYTENIZ, a closed freshwater lake on the boundary of Kokchetav and Severnyi Kazakhstan oblasts in the Kazakh SSR. The lake has a variable surface area, ordinarily 240 sq km but sometimes as much as 380. It is no more than 2 m deep. The lake is situated at an elevation of 135 m. It is fed primarily by melted snow and dries up periodically. The Chaglinka River flows into Lake Shaglyteniz. [29–803–1]

SHAGONAR, a city and administrative center of Ulug-Khem Raion, Tuva ASSR. Located on the left bank of the Enisei (Ulug-Khem) River, 124 km west of Kyzyl on the Kyzyl-Chadan highway. As a result of the construction of the Saian-Shushenskaia Hydroelectric Power Plant, Shagonar was situated in the flooding zone. Construction of a new Shagonar was undertaken in 1978, 7 km from the old town in the direction of Kyzyl.

[29–805–3]

SHAGOV, NIKOLAI ROMANOVICH. Born Mar. 4 (16), 1882, in the village of Klintsovo, Nerekhta District, Kostroma Province; died June 9, 1918, in Kostroma. Participant in the revolutionary movement in Russia. Member of the Communist Party from 1905.

The son of a weaver, Shagov was a worker. He took part in the Revolution of 1905–07 in Ivanovo-Voznesensk. From 1912 to

1914 he served as a deputy to the Fourth State Duma as a representative of the workers' curia of Kostroma Province. In 1913 he became a member of the Bolshevik fraction of the Fourth State Duma. Shagov contributed to *Pravda*, and in 1913 he took part in the Kraków and Poronin meetings of the Central Committee of the RSDLP with party workers.

Shagov was arrested in 1914 and exiled to Turukhansk Krai in 1915; after the February Revolution of 1917, seriously ill, he returned to Petrograd.

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Badaev, A. E. *Bol'sheviki v Gosudarstvennoi dume: Vospominaniia*, 8th ed. Moscow, 1954. [29–803–2]

SHAGZHIN, TSYREN (also Tsyrenzhap Shagzhin). Born 1918 in the *ulus* of Kharashibir', in what is now Zaigraevo Raion, Buriat ASSR. Soviet Buriat playwright, actor, and stage director. People's Artist of the Buriat ASSR (1953). Member of the CPSU from 1943.

Shagzhin graduated from the School of Music and Theater in Ulan-Ude in 1938. His plays include *Cunning Budamshu* (1956), which is based on Buriat folklore; *The First Year* (1956) and *Conscience* (1961), which deal with life in a Buriat kolkhoz; *Song of Spring* (1957); *Flaming Hearts* (Russian translation, 1967); *The Oath* (1969); and the comedy *Devil in a Trunk* (1963). He also wrote short stories. Some of Shagzhin's works have been translated into languages of the peoples of the USSR.

Shagzhin has been awarded the Order of the Badge of Honor and several medals.

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Literatura Sovetskoi Buriatii: Tvorcheskie portrety sovremennykh pisatelei. Ulan-Ude, 1973. [29–802–1]

SHAH, the title of the monarch in several countries of the Middle East and in the Sultanate of Delhi in India. It was first used in the Sassanid state. [29–890–3]

SHAHBANDAR, ABDUL RAHMAN. Born 1886; died July 7, 1940. Syrian political figure; a physician by education and profession.

Shahbandar took part in the national liberation movement of the Arabs in the Ottoman Empire from 1908 to 1914. In 1925 and 1926 he was head of the People's Party (Hizb as-Shaab; founded 1925), and he took an active part in the Syrian National Uprising of 1925–27; in 1926 he commanded a partisan detachment in the Ghuta region. From December 1926 until 1937, he was in exile in Egypt. Shahbandar was killed by Muslim fanatics. [29–890–6]

SHAH-FAZYL (also Safid-Bulend), a monument of Asian architecture. Shah-Fazyl is a domed brick mausoleum with a concentric plan, located in the settlement of Safid-Bulend, Osh Oblast, Kirghiz SSR. It was probably built in the 11th or 12th century. The interior is richly ornamented with carved *ganch* (a mixture of burned gypsum and clay), some of which is tinted. [29–917–1]

SHAHI, a city in northern Iran, in the *ostan* (province) of Mazanderan; situated in the northern foothills of the Elburz Mountains. Population, 42,000 (1975). Shahi is a highway junction, and it has a station on the Bandar-e Shah–Tehran railroad line. The city is a center of the textile industry; the production of cotton fabric and sacking is of particular importance. Other industrial activity includes food processing. [29–892–2]

SHAHIN TANIYUS. Born 1815; died 1895. Leader of a peasant uprising in Kisrawan, northern Lebanon, in 1859 and 1860.

Shahin Taniyus was a blacksmith by trade. In January 1859 he instigated an uprising, during which the feudal lords of Kisrawan were driven out and the peasants assumed power. Shahin Taniyus remained in power until mid-1860, when the uprising was suppressed.

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SHAH-I-ZINDAH, a unique monument of medieval Middle Asian architecture in Samarkand. Shah-i-Zindah is an ensemble of mausoleums of the Samarkand nobility. The first structures were built in the 11th and 12th centuries on the eastern slope of the fortified settlement of Afrasiab; excavations have revealed remains of mausoleums, a wooden portico, and a minaret. Most of the remains, however, date from the 14th and 15th centuries.

The ensemble consists of a narrow lane with groups of religious and memorial structures featuring bright polychromatic ornamentation of carved glazed terra-cotta, painted ceramic tiles, and compositions of mosaics. They include the mausoleum of Kusama ibn Abbasa (1334), with ornamental wall paintings and tiles, and several mausoleums of the Samarkand nobility with domes and portals, including Shadi-Mulk (1372, Bukhara architects Shamseddin, Bareddin Bukhari, and Zainuddin Bukhari) and Shirin-bek-aka (1385). The Tuman-aka complex, begun in the 15th century, consists of a chartak, a memorial mosque, and a mausoleum with a carved wooden door. Also of interest are the mausoleum of Kazi Zadeh al-Rumi (first third of the 15th century) and memorial mosques dating from the mid-15th century.

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SHAH JAHAN. Born Jan. 5, 1592, in Lahore; died Jan. 22, 1666, in Agra. Ruler of the Mogul Empire (1627–58).

Shah Jahan's given name was Khurram; he received the titular name of Shah Jahan (literally, "ruler of the world") in 1616 for his victories in the Deccan. Between 1622 and 1625 he led a rebellion against his father, Jahangir, but he was defeated and forgiven. After becoming the Great Mogul in 1627, he killed his brothers and other relatives in order to be rid of pretenders to the throne. During Shah Jahan's reign magnificent structures were erected, including the Taj Mahal in Agra and the Red Fort and Jumma Masjid in Delhi; these structures are among the finest examples of Mogul architecture.

Despite its outward splendor, however, the Mogul Empire declined under Shah Jahan. Evidence of the decline may be seen in the terrible famine that struck the southern part of the country in 1630 and in the failure of numerous attempts to recover Kandahar, which had been captured by Iran. The spread of European trading companies in India intensified during Shah Jahan's reign.

A rumor of the emperor's death in 1658 led to internecine warfare among his sons, as a result of which the eldest, Aurangzeb, seized the throne. Thereafter, Shah Jahan was imprisoned in his chambers until he died in 1666. [29–891–6]

SHAHJAHANPUR, a city in northern India, in the state of Uttar Pradesh. Population, 144,000 (1971). Shahjahanpur is a trading and transportation center. The city's industries include the production of chemicals. Various branches of the food-processing industry are also represented in Shahjahanpur, including the refining of sugar. Carpet weaving is among the city's cottage industries. [29–892–1]

SHAHN, BEN. Born Sept. 12, 1898, in Kaunas, Lithuania; died Mar. 14, 1969, in New York City. American painter and graphic artist.

In 1906, Shahn was brought by his family to the USA. He studied at New York University, the College of the City of New York, and the National Academy of Design. Shahn's work dealt

with acute social problems, such as the injustice of the bourgeois world, the loneliness of urban man, and the strivings of simple people for peace. He expressed these themes in subjective, dramatic images closely related to the style of expressionism (*The Passion of Sacco and Vanzetti*, 1931–32, Whitney Museum of American Art, New York). Shahn was a master of fresco work (mural in the Bronx County Post Office, New York, 1938–39) and poster art.

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Brysen, B. *Ben Shahn*. New York, 1972. [29–832–1]

SHAH-NAMEH (Book of Kings), the title of prose and verse collections of myths, epic legends, and historical chronicles of the Persian peoples. The most significant was the epic by Ferdowsi. Other collections have survived only in excerpts recounted by various authors. Originally the collections were entitled *Khvatay-namak*, and the title *Shah-nameh* appeared later.

The collections were first compiled during the rule of the Sassanids (third to sixth centuries) in Middle Persian, and in the eighth and ninth centuries they were translated into Arabic. None of these collections survives today in the original or in Arabic. In the tenth century, works entitled *Shah-nameh* were compiled in Farsi, based on the *Khvatay-namak* and other Middle Persian works, as well as on their Arabic translations.

The poet Masudi Marwazi wrote a verse *Shah-nameh*, which evidently incorporated the mythology, epos, and court chronicle of the Sassanids. The poet Abul Muayyad Balkhi wrote a prose *Shah-nameh*, which included *dastans* and episodes not found in Ferdowsi's work. In 957 the Abu Mansur prose collection was completed; the work was named for a Samanid military commander who financed its writing. Ferdowsi's version was begun by the poet Daqiqi, who managed to write no more than 1,000 *beyts* (couplets). The first version dates to 994, but it was not a complete version of the poem. The definitive version was written in 1010–11.

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M.-N. OSMANOV [29–901–2]

SHA HO, a river in the northeastern part of China, in the basin of the Liao Ho. From Sept. 22 (Oct. 5), to Oct. 4 (17), 1904, the Sha Ho was the scene of a major battle of the Russo-Japanese War of 1904–05.

After the Russian defeat in the battle of Liaoyang of 1904, the Russian Manchurian Army, under the command of General A. N. Kuropatkin, retreated to the vicinity of Mukden (Shenyang) and to the south. The Japanese First, Second, and Fourth armies (up to 150,000 men, 648 field guns, and 18 machine guns), under the command of Field Marshal I. Oyama, came to a halt north of the T'aitzu Ho. Kuropatkin, after receiving reinforcements, which increased the fighting capacity of the Russian Army to 195,000 infantry (in reality 150,000, since the Sixth Siberian Corps arrived only at the end of the battle), more than 19,000 cavalry, 758 field guns, and 32 machine guns, passed to the offensive in accordance with the tsar's orders to aid besieged Port Arthur and effect a turning point in the war. The operation was poorly organized: preparations were not kept secret and the choice of the area of the main thrust (in mountainous terrain) and the distribution of forces were unfortunate; moreover, the Russians had no maps of the terrain. The Japanese command, learning of the Russian plan, decided to meet the Russian forces in a prepared position, sap their strength, and then pass to the counteroffensive.

On September 22 (October 5), the Russian Army launched its offensive with the immediate objective of occupying the north bank of the T'aitzu Ho. The left wing, General A. Shtakel'berg's Eastern Detachment, which constituted one-third of all the forces, delivered the main thrust over mountainous terrain against Penhsihu with the goal of enveloping the enemy's right flank. The right wing, General A. A. Bil'derling's Western Detachment, which constituted one-fourth of all the forces, delivered an auxiliary strike at Liaoyang. Significant forces were held in reserve (one-fourth) and to protect the areas in the rear (one-sixth). The Russian troops advanced slowly, and it was only on the morning of September 23 (October 6) that the right wing reached the Sha Ho and the left wing approached the enemy forward position. Stubborn attacks by the Eastern Detachment against the Japanese First Army in the passes resulted in significant losses and failure. On September 27 (October 10), the Japanese Second and Fourth armies passed to the counteroffensive and on September 29 (October 12) succeeded in pushing the Western Detachment beyond the Sha Ho. On September 30 (October 13), the Eastern Detachment also began to withdraw. In early October, the Japanese forces attempted to develop the offensive on their left wing, but they were repulsed by Russian troops. Weakened by extensive losses (up to 40,000 Russians and, according to Japanese figures, 20,000 Japanese), both sides passed to the defensive. A stationary front 60 km long formed south of Mukden. [29–917–2]

SHAHR-ASHUB (also *shahrangiz*; literally, [verses] troubling a city), the general term for poems of the classical period of Persian-Tadzhik literature that aroused a stormy reaction among the residents of a medieval city. Some works written in the *shahr-ashub* genre exposed the misdeeds of city officials and noblemen, while others were associated with "artisan" poetry, which glorified handsome youths who worked in the town's shops, with specific references to their love affairs. The *shahr-ashub* consisted of distichs or quatrains written in the meter of *rubaiyat*, *ghazals*, or *qitahs*.

The first *shahr-ashub* were written as early as the tenth and 11th centuries by Rudaki, Kassai, Labibi, and Maghsadi. However, the genre became most popular in late-medieval cities. Safai Bukhari (died c. 1504) wrote a series of 48 "artisan" *ghazals*, Darvish Dikhaki (died 1531 or 1532) and Sayido Nasafi (died c. 1710) wrote 212 "dedications" to young artisans, and the Turkish poet Isa Masihi (1470–1512) wrote a cycle of *shahrangiz* consisting of 47 "portraits" of youths in Adrianople.

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A. N. BOLDYREV [29–904–2]

SHAHRASTANI, MUHAMMAD IBN ABD AL-KARIM AL-. Born 1086 in Shahrestan, in eastern Iran; died 1153. Muslim theologian and philosopher who wrote in Arabic.

Al-Shahrastani was the author of a collection of biographies of philosophers and scholars. His most significant work, *Religious Communities and Sects*, provides information about Islam and other religious and philosophical doctrines and about sects of antiquity and the Middle Ages, including schools of Greek philosophy, the Gnostics, the pagan beliefs of Iran and Central Asia, Judaic and Christian sects, and Indian religious and philosophical systems. [29–904–1]

SHAHREZA, a city in central Iran, in the *ostan* (province) of Isfahan, on the Bushehr-Tehran highway. Population, 36,000 (1975). Shahreza has a textile industry. [29–1169–1]

SHAHR-I SOKHTA, a multilevel Neolithic and Bronze Age settlement, located 40 km from the city of Zabol, in Iran. Shahr-i Sokhta was excavated by British (1916) and Italian (1967–71) ex-

peditions. Its development has been traced from a settlement of early farmers of the late fourth and early third millennia B.C., characterized by hand-modeled painted pottery, to an urban center of the second half of the third millennium B.C., with developed industry and monumental architecture. By the beginning of the second millennium B.C., Shahr-i Sokhta was no longer inhabited.

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SHAHRISTAN, the territory of an early feudal city in Middle Asia. A *shahristan* usually had a rectangular layout with a more or less regular network of streets and was protected by a fortress wall with towers and gates. Sometimes a citadel was built inside the *shahristan*, for example, at the site of the ancient fortified city of Kafyr-Kala near Kolkhozabad in the Tadzhik SSR. The compactly built residential districts included meeting places, workshops, and small markets. Temples occupied a prominent place in the urban layout. Caravansaries were located outside the walls of the *shahristan*, as were suburban estates, a cemetery, and sometimes a citadel, as in Pendzhikent. With the development of feudalism, the *shahristan* developed an artisans' suburb, called a *rabad*.

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SHAHRUD, a city in northern Iran, in the chief governorate of Semnan; situated in the southeastern foothills of the Elburz Mountains, on the highway and railroad linking Meshed and Tehran. Population, 32,000 (1975). Sugar is refined in Shahrud, which is the center of a viticultural and fruit-growing region. Chromite and coal are mined in the area. [29–905–5]

SHAH RUKH. Born 1377; died 1447. Ruler of Herat (Khorasan). Successor and youngest son of Tamerlane (Timur); father of Ulug Beg.

After several years of internecine warfare, Shah Rukh nominally attained supreme authority over all the areas conquered by Tamerlane. Under the rule of Shah Rukh, feudal relations underwent further development, and the system of landed estates was expanded by the granting of military feudal estates (*see* SOYURGHAL). Herat replaced Samarkand as the capital of the state.

The death of Shah Rukh was followed by a fierce power struggle among his successors, and the state of the Timurids disintegrated.

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Istoriia Uzbekskoi SSR, vol. 1. Tashkent, 1967. [29–905–6]

SHAIGINO, an urban-type settlement in Tonshaevo Raion, Gorky Oblast, RSFSR. Shaigino has a railroad station (Tonshaevo) on the Gorky-Kotel'nich line. A wood-products plant is located in the settlement. [29–809–1]

SHAIK, ABDULLA MUSTAFA OGLY (real surname, Talybzade). Born Feb. 12 (24), 1881, in Tiflis; died July 24, 1959, in Baku. Soviet Azerbaijani writer and teacher. Honored Art Worker of the Azerbaijan SSR (1941).

From 1898 to 1900, Shaik studied in Mashhad, Iran. In 1901 he took up residence in Baku and became a teacher. After the establishment of Soviet power in Azerbaijan he worked to build a socialist culture. In his prerevolutionary works, Shaik combined elements of realism and romanticism. He wrote powerful prose filled with criticism of social injustice and oppression. Outstanding examples include the novel *Heroes of Our Age* (1909), the novella *The Unhappy Family* (1912), and the story "The Letter Did Not Arrive" (1908), which describes the life of petroleum workers.

Shaik's poetry of the Soviet period is pervaded with patriotism and revolutionary optimism, for example, "It's All Ours" and "Rise Up!" His stories are devoted to the new life and expose vestiges of the past. Shaik's most significant prose work is the historical revolutionary novel *Araz* (1938), which is about the Baku proletariat and its struggle for freedom.

Shaik is the author of folktales in verse and the first Azerbaijani plays for children; he also produced a series of textbooks, teaching aids, and essays on literary criticism. He translated the works of Nizami, Ferdowsi, Shakespeare, A. S. Pushkin, I. A. Krylov, J. Swift, D. Defoe, and other authors into Azerbaijani. Shaik's works have been translated into numerous languages of the peoples of the USSR.

Shaik was a deputy to the second and fourth convocations of the Supreme Soviet of the USSR. He was awarded the Order of Lenin, the Order of the Red Banner of Labor, and several medals.

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A. MIRAKHMEDOV [29–807–4]

SHAIKH AL-ISLAM. (1) In Islamic countries since the 11th century, a title of respect for ulama, or prominent theologians.

(2) In the Ottoman Empire from the mid-16th century to 1924, the mufti of Istanbul—that is, the head of the Muslim clergy, appointed by the sultan.

(3) In Iran during the reign of the Safavids, one of the chief judges among the ecclesiastical judges appointed by the shah. [29–1088–2]

SHAIKHET, ARKADII SAMOILOVICH. Born Aug. 28 (Sept. 9), 1898, in Nikolaev; died Nov. 18, 1959, in Moscow. Soviet photographer; one of the founders of Soviet photojournalism.

From 1922 to 1924, Shaikhet worked as a retoucher in a private photographer's studio in Moscow. Beginning in 1924 he contributed to the magazines *Ogonek*, *SSSR na stroike*, and *Nashi dostizheniia*. An important series of his photographs constitutes a chronicle of the first five-year plans. During the Great Patriotic War of 1941–45, Shaikhet took many pictures at the front.

Shaikhet was awarded two orders and various medals.

REFERENCE

Aleksandrov, A. I., and A. A. Shaikhet. *Arkadii Shaikhet*. [Moscow, 1973.] [29–811–5]

SHAIN, GRIGORII ABRAMOVICH. Born Apr. 7 (19), 1892, in Odessa; died Aug. 4, 1956, in Moscow; buried in the village of Goluboi Zaliv, in the Crimea. Soviet astrophysicist. Academician of the Academy of Sciences of the USSR (1939).

Shain graduated from the University of Iur'ev (Dorpat) in 1919. From 1921 to 1925 he worked at the Pulkovo Observatory, where he conducted research in celestial mechanics, the motion of meteors, and the application of relativity theory to variable and binary stars and carried out statistical studies of binary stars in relation to the problem of the evolution of their components. Beginning in 1925, he worked at the Simeiz branch of the Pulkovo Observatory, where he supervised the mounting of what was then the largest reflector in the country, with a mirror diameter of 102 cm. From 1945 to 1952 he was director of the Crimean Astrophysical Observatory. Shain initiated the creation of the Soviet 2.6-m reflector that now bears his name.

Shain's main works dealt with stellar spectroscopy and the physics of gaseous nebulas. With V. A. Al'bitskii (Albitzky), Shain determined the radial velocities of about 800 stars and discovered and calculated the orbits of new spectral binaries. In 1928, Shain, simultaneously and in part jointly with O. Struve, discovered the rapid rotation of a number of stars of the early spectral classes on the basis of the study of the form of the spectral lines. Shain conducted spectrophotometric studies of stars, especially cold stars and in particular long-period variables, such as Mira Ceti, in which he ascertained the coexistence of the high-

temperature emission and absorption lines of cold stars; these studies enabled him to notice the similarity to phenomena of solar activity—chromospheric flares, which cause the ejection of hot matter from the interior and the appearance of emission lines in the spectra of these stars. In the spectra of carbon stars, Shain discovered a high content of the isotope C^{13}. A number of Shain's studies dealt with planetary nebulas, the integral spectrum of various parts of the Milky Way, and the spectrum of the rings of Saturn. His series of studies on the nature of gaseous nebulas and of their relation to the problem of the existence of interstellar magnetic fields is widely known. Shain discovered systematic deviations of the average direction of the interstellar polarization of the light of stars from the galactic equator, which indicated that the plane of the magnetic field was inclined 18°–20° to the plane of the galactic equator. With V. F. Gaze, Shain discovered more than 150 diffuse nebulas.

Shain was a member of the London Royal Astronomical Society, an honorary doctor of the University of Copenhagen, and an honorary member of the American Academy of Arts and Sciences. Shain received the State Prize of the USSR in 1950. He was awarded two Orders of Lenin and various medals.

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P. G. KULIKOVSKII [29–809–4]

SHAIN'S COMET, a comet of the 11th stellar magnitude, discovered in 1925 by G. A. Shain at the Simeiz Observatory. Shain's comet is distinguished by its extremely large perihelion—4.18 astronomical units. Its orbit is near-parabolic. [29–810–1]

SHA'IR (also *shair, shakhir*; in Turkmen, *shakhir*; in Tatar and Kazakh, *shagïyr*), a poet-scribe among many peoples of the Near East. Among the peoples of Middle Asia, *sha'irs* continue to perform folktales, improvised poetry, and national heroic and romantic *dastans*. Unlike the *bakhshi*, who performs a memorized text, the *sha'ir* often changes or adds to the story, creating his own versions and sometimes even composing new *dastans*, for example, *Khasan-kol* by the Uzbek poet Pulkan-Shair (1874–1941). The *sha'ir* usually accompanies himself on a musical instrument, such as the *dutar* or *saz*.

Celebrated Uzbek *sha'irs* have included Ergash Dzhumanbulbul-ogly (1868–1937) and Fazyl Iuldash-ogly (1872–1955). Kermolla (1872–1934) and Durdy Klych (1886–1950) are among the renowned Turkmen *sha'irs*. [29–808–1]

SHAIRI, one of the basic meters of Georgian poetry, the classic examples of which are found in Sh. Rustaveli's narrative poem *The Man in the Panther's Skin*. In Old Georgian literature the term *shairi* had the broader meaning of "verse" or "poetry." Early examples of *shairi* were preserved in mythological and ritual folk poetry.

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SHAKA (also Chaka). Born circa 1787; died September 1828. Zulu inkosi, or ruler.

Shaka united a number of related tribes in what is now Natal Province, Republic of South Africa. He later extended his authority to parts of what are now the Transvaal, Cape of Good Hope Province, and the Orange Free State. Shaka created a disciplined army and laid the groundwork for a Zulu state. In the last years of his life his power was unlimited, and he became a despot. Shaka was murdered by a group of conspirators.

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SHAKE, a modern ballroom dance of British origin. Improvised, with characteristic movements of the shoulders and body, the dance is in 4/4 time, with a tempo ranging from moderate to moderately fast. [29–1083–2]

SHAKESPEARE, WILLIAM. Born Apr. 23, 1564, in Stratford-on-Avon; died there Apr. 23, 1616. English playwright and poet.

Shakespeare's father was John Shakespeare, an artisan and merchant. As a grammar school student, Shakespeare learned Latin and the fundamentals of ancient Greek. Beginning in the late 1580's, he worked in London as an actor (until approximately 1603) and as a playwright. In 1594 he became a shareholder in the theatrical troupe called the Lord Chamberlain's Company, which in 1603 was renamed The King's Men. In approximately 1612, Shakespeare returned to Stratford.

Because of the scarcity of biographical information, Shakespeare's works have been attributed to others, including F. Bacon, the earls of Rutland and Oxford, and the playwright C. Marlowe. But careful study of the cultural life of the period and of Shakespeare's work shows these hypotheses to be scientifically unfounded.

As a poet, Shakespeare gained renown with his narrative poems *Venus and Adonis* (1593) and *Lucrece* (1594), which were in the tradition of the philosophical poetry of the Renaissance. Between 1592 and 1600 he wrote 154 sonnets, which were published in 1609. They are apparently autobiographical in content, expressing the poet's feelings toward a friend (sonnets 1–126) and toward his beloved (sonnets 127–152). The sonnets' themes and motifs are typical of Renaissance poetry, but their more complex perception of life and man foreshadows Shakespeare's dramatic work.

The Shakespearean canon includes 37 plays, 18 of which were published in Shakespeare's lifetime; 36 of the plays were in the first edition of his collected works, published in 1623 (only *Pericles* being excluded). Attempts to establish the chronology of Shakespeare's works began in the second half of the 18th century. The following list of his plays indicates the year in which they were written and classifies them by period and genre according to the accepted practice in Shakespearean scholarship.

First period (1590–94). Early chronicle plays: *Henry VI*, Part 2 (1590), *Henry VI*, Part 3 (1591), *Henry VI*, Part 1 (1592), and *Richard III* (1593). Early comedies: *The Comedy of Errors* (1592) and *The Taming of the Shrew* (1593). Early tragedy: *Titus Andronicus* (1594).

Second period (1595–1600). Chronicle plays in the tragic vein: *Richard II* (1595) and *King John* (1596). Romantic comedies: *The Two Gentlemen of Verona* (1594), *Love's Labour's Lost* (1594), *A Midsummer Night's Dream* (1596), and *The Merchant of Venice* (1596). First mature tragedy: *Romeo and Juliet* (1595). Chronicle plays in the comic vein: *Henry IV*, Part 1 (1597), *Henry IV*, Part 2 (1598), and *Henry V* (1598). Comedies (representing Shakespeare's mastery of the comic genre): *Much Ado About Nothing* (1598), *The Merry Wives of Windsor* (1598), *As You Like It* (1599), and *Twelfth Night* (1600).

Third period (1600–08). Tragedies (representing a turning point in Shakespeare's work): *Julius Caesar* (1599) and *Hamlet* (1601). "Bitter comedies," or "problem plays": *Troilus and Cressida* (1602), *All's Well That Ends Well* (1603), and *Measure for Measure* (1604). Shakespeare's tragic masterpieces: *Othello* (1604), *King Lear* (1605), and *Macbeth* (1606). Tragedies based on ancient history: *Antony and Cleopatra* (1607), *Coriolanus* (1607), and *Timon of Athens* (1608).

Fourth period (1609–13). Romantic tragicomedies: *Pericles* (1609), *Cymbeline* (1610), *The Winter's Tale* (1611), and *The Tempest* (1612). Late chronicle play: *Henry VIII* (1613), possibly written in collaboration with J. Fletcher.

The following plays are not considered part of the Shakespearean canon: *Edward III* (1594–95), whose authorship is uncertain; *Thomas More* (1594–95; one scene); and *The Two Noble Kinsmen* (1613), written with J. Fletcher. Some Shakespearean scholars, including A. A. Smirnov of the Soviet Union, divide Shakespeare's work into three periods, combining the first and second periods (1590–1600).

Shakespeare's work incorporated all the major influences in the age of the Renaissance—both aesthetically, by synthesizing the traditions and motifs of popular romantic genres, Renaissance poetry and prose, folklore, and humanist and popular theater, and ideologically, by reflecting the entire edifice of contemporary thought, including traditional notions about the world order, defense of the patriarchal feudal system and of political centralization, Christian ethics, Renaissance Neoplatonism and Stoicism, sensualism, and Machiavellianism. This eclecticism, ranging over the full spectrum of life and human nature, was responsible for the all-encompassing vitality of Shakespeare's work. His reality, however, was presented under different facets and in different lights at various stages of his creative development.

The ideology of humanism, combined with popular ideals and aspirations, always remained the basis of Shakespeare's plays. It is no coincidence that Shakespeare's genius found its fullest expression in the theater, which by its very essence can convey life's drama more successfully than other forms of art. The socioeconomic processes that brought about the cultural upheaval known as the Renaissance began later and developed more rapidly in England than they did on the Continent. The contradictions and contrasts that marked this period were sharper and more pressing in England; the signposts marking the development of humanist thought—the belief, followed by disbelief, in the imminent triumph of humanist ideals; the hope, followed by disillusion—were separated by centuries in Italy, for example, whereas in England they were part of the experience of a single generation. Shakespeare, better than anyone else, was able to grasp and expose the contradictions of his time; hence the dynamic and dramatic character of his works, filled with struggle and conflict. His profound understanding of contemporary trends was also a factor in his dynamic view of reality; this, together with his growing craftsmanship, defines the evolution of his work.

The works of his first period show that even at this early stage Shakespeare was acutely sensitive to the comic and tragic absurdities of life, although he depicted them in a largely traditional manner, presenting the tragic as dreadful and the comic as farcical—the one being isolated from the other. Shakespeare was still learning, attempting to master both the national tradition of Marlowe's "bloody tragedy" and the European tradition in general; his work was based on ancient models—on Plautus in the case of *The Comedy of Errors*, on Seneca in *Titus Andronicus*, and on Italian humanist comedy in *The Taming of the Shrew*. Shakespeare's humanist position, too, was still to assume definite form. The positive heroes of the chronicle plays gravitate toward antiquity, and the comedies are clearly influenced by patriarchal morality.

The dramatic nature of life remains the basis of Shakespeare's work during his second creative period. The general tone and the endings of his plays testify to his faith in the harmonious resolution of life's contradictions. The ambience of these works is defined by characters who uphold harmony in government and in social and personal relationships, such as Romeo and Juliet, Viola, and Henry V. The bearers of evil, such as Tybalt, Shylock, and Malvolio, are solitary figures. The plays of this period are characterized by the organic merging of comedy and tragedy, the unconditional triumph of the principles of humanism, the ability to present ideas by means of situations and complex images, and the effort to create full-fledged characters as embodiments of ideals. All these qualities attest to Shakespeare's mature and independent mastery of his craft.

Shakespeare's writings in the 1590's consisted primarily of the chronicle plays and comedies. Eight of the chronicle plays, forming two cycles, cover the history of England from 1397 to 1485. The earlier cycle (made up of the three parts of *Henry VI* and *Richard III*) depicts the Wars of the Roses and the fall of the House of Lancaster and shows the breakup of the state owing to feudal rapaciousness. The second cycle (consisting of *Richard II*, the two parts of *Henry IV*, and *Henry V*) is devoted to the preceding period; it includes the rise of the Lancasters and England's victories in the Hundred Years' War, representing the progression from anarchy to the unified state. *King John* and *Henry VIII*, which stand apart, portray the country's internal conflicts engendered by the struggle between the English monarchy and the Roman Catholic Church.

The state, considered from the point of view of its historical destiny, constitutes the main subject of the chronicle plays. The principal conflict is the clash between the interests of the state and of the individual; this theme is developed in the struggle of entire social groups as represented by individual characters—the latter appearing as relatively sketchy figures in the early chronicle plays, while coming to life as individuals (such as Hotspur and Falstaff) in the later ones. Reflecting humanist ideology, the chronicle plays focus on the rightful victory of centralized authority (that is, absolutism) over willful anarchy. In conjunction with popular notions about good and bad rulers, such humanist views are also reflected in the portrayal of the ideal king, Henry V, and of his opposite, Richard III. In fact, the personalities of most of the monarchs in the chronicle plays show that Shakespeare recognized how far actual rulers were from the ideal and how illusory was the ideal of absolute monarchy as a general concept.

If the chronicle plays deal with man and the state, the comedies that Shakespeare wrote in the 1590's are concerned with man and nature—nature being considered in the universal and optimistic sense ascribed to it by the humanists, who saw it as an all-beneficent and omnipotent force encompassing man and society. In Shakespeare's comedies the ideal, which is identified with the natural, is dominant; hence the kinship between the comedies and romantic literature. As in the latter, the subjects are steeped in folklore, adventure, and pastoral motifs; the major themes are love and friendship, and the heroes and heroines are basically poetic and romantic figures.

The unique source of the comic in Shakespeare is life in motion, interpreted as the movement of unfettered nature in all its fullness and abundance; this explains why his comedy, in contrast to all subsequent European comedy, is not noticeably satirical in nature. The duels of wits, the jesters' pranks, the drollness of the simpletons (who make up the comedies' secondary group of characters), and the elements of festiveness, recalling ancient rites and carnivals—all this freewheeling natural playfulness contributes to the cheerful and optimistic atmosphere of Shakespeare's comedies. The world appears as a harmonious whole, life is seen as a joyous holiday, and people are represented as essentially noble and good.

Shakespeare's comedies contain dramatic complications as well—for example, Proteus' treachery in *The Two Gentlemen of Verona* and Shylock's intrigues in *The Merchant of Venice*—but whatever is inimical to genuine humanity is easily overcome and, as a rule, is not attributed to social factors. In the comedies of the 1590's, Shakespeare has no interest in actual social relationships; the comedies of the 1600's, on the other hand, present a different picture. Here Shakespeare raises important social and moral questions, such as the problem of social inequality in *All's Well That Ends Well* and questions of law and morality in *Measure for Measure*. The elements of satire and the grotesque are more noticeable; the action approaches tragedy, the happy endings are purely formal, and the tone no longer expresses the joy of living.

The gloominess of the "problem comedies" reflects Shakespeare's frame of mind during his third period, when tragedy became his predominant genre. The contradictions of bourgeois progress and of the entire transitional stage of social development between feudalism and capitalism are now interpreted as the tragically unresolvable conflicts of life in general; they are seen to represent the divergence of humanist ideals from mankind's entire past, present, and immediate future. Shakespeare's social base is nowhere so evident as it is in *Timon of Athens* (which deals with the essential nature of money) or in *Coriolanus* (which shows the people in opposition to the ruling clique). So-

cial conflict is usually presented as moral or family conflict (as in *Hamlet* and *King Lear*), as personal conflict (*Othello*), or as the struggle of conflicting ambitions (*Macbeth* and *Antony and Cleopatra*).

The basic theme of Shakespeare's tragedies—man and society—is developed primarily in the clash of individual personalities. Nevertheless, the conflict encompasses the entire chain of being; it assumes a universal or even cosmic character, and at the same time it is projected into the hero's consciousness. In *King Lear, Coriolanus*, and *Timon of Athens*, the emphasis is on the former; in *Othello, Macbeth*, and *Antony and Cleopatra*, on the latter; and in *Hamlet* the two aspects of the conflict are given equal weight.

Independently of the theme of conflict, the essence of Shakespeare's tragic humanism is revealed most fully in the figure of the main hero. The heroes of the tragedies are titanic heroes, both in strength of character and in the ability to perceive the social and universal aspect of personal misfortune. In giving his heroes the capacity for spiritual growth, Shakespeare was the first in world literature to offer a profoundly perceptive portrayal of character *development*; such development takes place in the course of the hero's gradual understanding of the nature of society—and of his own nature. Some heroes (such as Richard III, Romeo, Juliet, and Coriolanus) retain the integrity of their own nature during this process. Others (such as Brutus, Hamlet, Macbeth, and Antony) realize their own duality and the dual nature of man in general. For all of them, however, comprehension of reality and self-knowledge give rise to tragic suffering (often intensified by the realization of their own fateful mistakes, as in the case of Antony, Macbeth, and especially Othello and Lear) and lead to spiritual change, or at times to complete transformation of the personality (as in Lear). The very greatness of their merits—the qualities of mind in Brutus and Hamlet, the intensity of feeling in Romeo and Othello, the strength of character in Macbeth—is what leads the heroes to their downfall.

In spite of the significant role played by chance in leading to a tragic denouement (thus adding a hint of the mysterious to the tragic), the hero's downfall follows inevitably from the incompatibility of the hero and his world; it confirms—as does the play's entire action—the greatness of the individual, leaving no aftertaste of hopelessness. The denouement of Shakespeare's tragedies always entails a return to some sort of originally existing equilibrium. In thus uniquely structuring his tragedies, Shakespeare the humanist reveals his belief in a certain standard without which life would be impossible.

Shakespeare's fourth period reflects a new and more complex view of the world, associated with the deepening crisis of humanism and expressed in the genre of romantic tragicomedy, which is the characteristic genre of mannerism and of the baroque. The plays' tragic conflicts and happenings reflect the same clear perception of the tragic aspect of life, while faith in the humanist ideals is now primarily expressed in the happy endings—which, incidentally, are clearly utopian in character. The abundance of folklore and fantasy, the improbable and intricate plots, the simplification of character, and the markedly conventional mode of representation (especially in the denouements) all contribute to the romantically unreal atmosphere of Shakespeare's last plays.

Despite the differences between the various periods in Shakespeare's creative development, one senses the unity of artistic method in all his plays. Goethe noted that "truth and life itself are the great foundation of [Shakespeare's] works" (*Sobr. soch.*, vol. 10, Moscow, 1937, p. 585). Shakespeare's fidelity to life, however, differs from that of late realism; it is based on the playwright's poetic view of the world, which is evident even in his choice of subjects. With the exception of *Love's Labour's Lost, A Midsummer Night's Dream*, and *The Merry Wives of Windsor*—the only three plays by Shakespeare whose plots are based on unknown sources—the subjects of all his plays were taken directly from history (for example, from R. Holinshed's chronicles) or drawn from legends, tales, and narrative poems. Because the subjects are traditional, the plots acquired an epic quality by presenting some important turning points in the development of the state and in the political history of mankind and by capturing the most essential aspects of life. Furthermore, the traditional character of the subjects added authenticity to the fictional situations and made it unnecessary to adhere to verisimilitude of detail or to justify certain events or actions—for example, to explain Lear's renunciation of power. Finally, Shakespeare's use of traditional subjects allowed him to introduce fairy-tale motifs, accompanied by the characteristic mode of reasoning of folk poetry.

Shakespeare's approach to reality, which he represents by means of poetic imagery, is manifested in his abundant use of anachronisms (such as the presence of a duke in ancient Athens or of billiards in ancient Egypt), in the arbitrary location of the action (places being sometimes precisely defined and sometimes not indicated at all), in the arbitrary treatment of time (as exemplified by the use of dramatic characters from different time periods, sometimes called double time), in other "inaccuracies" (which may also be attributed to the demands of the stage, where the primary consideration is the effect produced in performance), in the use of the fantastic and the supernatural, in the blend of dramatic convention and naturalism, and in the general reconciliation of contrasts.

Another indication of Shakespeare's poetic view of the world is the presence of two or more plot lines in a single play. Parallel stories (such as those of Lear and Gloucester or of Hamlet and Laertes) convey an image of life governed by certain objective laws; in the absence of such parallelism (as in the portrayal of British and Roman relations in *Cymbeline*), the play as a whole turns into a poetic model of the world.

Shakespeare's poetic method is also evident in his representation of history in the chronicle plays and in the tragedies. He boldly transforms historical material, making it the foundation of his overall picture of life and blending the distinctive features of the past with contemporary understanding of human relations. Dramatizing history, Shakespeare portrays it through the conflict of individuals. Man is the focus of Shakespeare's dramatic art; the peak of the playwright's artistic achievement is the portrayal of the human personality in all its diversity, in its grandeur and significance, and in the complexity and dynamics of its spiritual development.

The changeable and many-faceted nature of the human personality, as presented by Shakespeare, is dramatic in its essence, since personality changes are associated above all with changes in the hero's actual situation—his role in life, his environment—and take place in spurts. In showing the many-sided nature of man's character, Shakespeare often sacrifices logic for the sake of dramatic intensity. Furthermore, his heroes' thoughts and feelings are clothed in poetic metaphors; indeed, many speeches are poems in their own right. Shakespeare makes the fullest use of poetic imagery. His series of images correspond to the evolution of the Shakespearean hero's character; for example, the images by which Othello expresses lofty ideals at the beginning of the play are later interlaid with meanspirited images that recall Iago's speech, and Othello's "purification" is accompanied by a similar purification of his language. Shakespeare's images serve as leitmotifs that correspond to the overall tone of the plays. The expressiveness and variety of his poetic and dramatic devices have placed his work among the world's supreme artistic achievements.

Among his contemporaries, too, Shakespeare was held in high esteem (for example, by F. Meres and B. Jonson). In the age of classicism and during the Enlightenment, although credited with the ability to be "true to nature," Shakespeare was criticized for his ignorance of "the rules." Voltaire called him a "barbarian of genius." English Enlightenment critics praised Shakespeare for being true to life. In Germany, J. Herder and Goethe raised him to the loftiest heights (Goethe, *Shakespeare und kein Ende*, 1813–16). During the romantic period, various writers contributed to a better understanding of Shakespeare's work—specifically, A. W. von Schlegel, G. Hegel, S. T. Coleridge, Stendhal, and V. Hugo.

The question of Shakespeare's evolution as an artist was first raised in the mid-19th century by G. Gervinus of Germany. The cultural-history school of Shakespearean studies includes works by H. Taine, E. Dowden, M. Koch, and G. Brandes. G. Rümelin and, to some extent, G. B. Shaw were among the positivist critics who opposed the "canonization" of Shakespeare the artist. In the 20th century, the works of E. K. Chambers represent a very im-

portant contribution to factual knowledge of Shakespeare and his work.

In Russia, Shakespeare was first mentioned by A. P. Sumarokov in 1748, but he was still relatively unknown there even in the second half of the 18th century. It was only in the first half of the 19th century that Shakespeare was given a place in Russian culture; references to Shakespeare are found in various writers of that period, including W. K. Küchelbecker, K. F. Ryleev, A. S. Griboedov, and A. A. Bestuzhev, who were all associated with the Decembrist movement, and A. S. Pushkin, for whom Shakespeare's chief virtues were his objectivity, truthful portrayal of character, and faithful representation of his time. The Shakespearean tradition was developed by Pushkin in his own tragedy *Boris Godunov*.

Another writer who turned to Shakespeare in the struggle for realism in Russian literature was V. G. Belinskii. Shakespeare became increasingly important in Russia from the 1830's through the 1850's. A. I. Herzen and I. A. Goncharov were among those who, projecting Shakespeare's images onto contemporary events, promoted a more profound understanding of the tragic nature of their age. A notable event was the staging of *Hamlet* in 1837 in N. A. Polevoi's translation, with P. S. Mochalov playing the title role in Moscow and V. A. Karatygin in St. Petersburg. V. G. Belinskii and other progressive people of the time saw Hamlet's tragedy as a reflection of the tragedy of their own generation. Hamlet's attraction was also felt by I. S. Turgenev and F. M. Dostoevsky. Turgenev drew a parallel between Hamlet's image and certain distinctive traits of the "superfluous people" (see Turgenev's article "Hamlet and Don Quixote," 1860). In the acute social struggle of the 1860's, attitudes toward Shakespeare became, on the one hand, more academic (as in the works of N. I. Storozhenko, founder of the Russian school of Shakespearean scholarship) and, on the other, more critical (for example, in L. N. Tolstoy's *Shakespeare and the Drama*, 1903–04, published 1906).

The growing body of interpretation of Shakespeare's work in Russia was paralleled by increasing knowledge of and familiarity with the works themselves. In the 18th and early 19th centuries translators of Shakespeare into Russian worked primarily from French adaptations of his works. In the first half of the 19th century, translations of Shakespeare were either too literal (for example, M. Vronchenko's translation of *Hamlet*, 1828) or too free (Polevoi's translation of *Hamlet*). Various translations published between 1840 and 1860, including those of A. V. Druzhinin, A. A. Grigor'ev, and P. I. Veinberg, reveal a scientifically oriented approach to the problem of literary translation—for example, by applying the principle of linguistic adequacy. The first *Complete Collection of Shakespeare's Dramatic Works Translated by Russian Writers*, edited by N. V. Gerbel', was published in 1865–68. The second complete collection to be published in prerevolutionary Russia, edited by S. A. Vengerov, appeared in 1902–04.

Based on the profound generalizations of K. Marx and F. Engels, the Soviet school of Shakespearean scholarship carried on and developed the traditions of progressive Russian thought. A. V. Lunacharskii lectured on Shakespeare in the early 1920's. The primary focus of Shakespearean studies (for example, by V. K. Miuller and I. A. Aksenov) is on the artistic aspects of his work. Published works include historicoliterary monographs (such as A. A. Smirnov's) and studies dealing with specific problems (such as M. M. Morozov's). The works of A. A. Anikst and N. Ia. Berkovskii, as well as a monograph by L. E. Pinskii, represent major contributions to modern Shakespearean scholarship. The motion-picture directors G. M. Kozintsev and S. I. Iutkevich have presented their own original interpretations of works by Shakespeare.

Shakespeare's work has been translated into 28 of the languages of the USSR. In addition to separate editions of the plays and selected works, complete collections of Shakespeare's works were published in Russian in 1936–50 and 1957–60. A particular school of Soviet translators, including M. L. Lozinskii, B. L. Pasternak, V. V. Levik, T. G. Gnedich, and S. Ia. Marshak, has specialized in the close reading and interpretation of works by Shakespeare.

Shakespeare has occupied an important place in the Russian theater repertoire since the mid-1830's. Two Russian actors who gained renown for their Shakespearean roles were P. S. Mochalov (for his Richard III, Othello, Lear, and Hamlet) and V. A. Karatygin (for his Hamlet and Lear). In the second half of the 19th and in the early 20th century, the Malyi Theater of Moscow created its own school of Shakespearean interpretation, combining stage realism with elements of romanticism; among its outstanding Shakespearean interpreters were G. Fedotova, A. Lenskii, A. Iuzhin, and M. Ermolova. Beginning in the early 20th century, Shakespeare was included in the repertoire of the Moscow Art Academic Theater, or MKhAT (which presented *Julius Caesar* in 1903, directed by V. I. Nemirovich-Danchenko in collaboration with K. S. Stanislavsky, and *Hamlet* in 1911, directed by H. Craig, with V. I. Kachalov in the respective title roles).

Early Soviet productions of Shakespeare's plays were experimental and sometimes formalist in nature, as in the case of A. Tairov's production of *Romeo and Juliet* at the Kamernyi Teatr in 1921; they also included, however, such important productions as the second MKhAT's *Hamlet* (1924), with M. Chekhov in the title role.

The year 1935 was marked by three memorable productions that sought to convey the wide-ranging sociohistorical and philosophical significance of Shakespeare's tragedies by means of heroic images—namely, *Othello* (directed by S. Radlov at Moscow's Malyi Theater, with A. Ostuzhev in the title role), *King Lear* (directed by Radlov at the Moscow Jewish Theater, with S. Mikhoels playing Lear), and *Romeo and Juliet* (directed by A. D. Popov at the Theater of the Revolution, with M. Astangov playing Romeo and M. Babanova in the part of Juliet). These were followed by a series of successful Shakespearean interpretations, presented throughout the country in the various national languages (for example, by A. Khorava, A. Vasadze, V. Vagarshian, and V. Tkhapsaev). Productions that were particularly successful were those in which colorful staging and a festive spirit were combined with lofty humanism and psychological subtlety; such were the productions of *Twelfth Night* (directed by S. Giatsintova at the second MKhAT, 1933), *Much Ado About Nothing* (by S. Rapoport, Vakhtangov Theater, 1936), and *The Taming of the Shrew* (by A. D. Popov, Central Theater of the Red Army, 1937).

A new era in Soviet Shakespearean theater was opened in 1954 with two productions of *Hamlet*—by the Leningrad Academic Drama Theater (directed by G. Kozintsev) and by the Moscow Mayakovsky Theater (directed by N. Okhlopkov)—which had broad public reverberations. The new era was marked by productions that plumbed the depths of Shakespeare's tragic motifs, by rejection of the romanticized approach to Shakespeare (particularly in the productions of the 1960's and 1970's), by the primary role often assumed by the director in shaping the stage action, and by the increasing number of Shakespearean plays actually performed. Every Shakespearean play staged in the USSR is an outstanding event in the theatrical life of the country.

Film versions of Shakespeare's plays (including Soviet ones) have been produced in a steady flow that began with *The Taming of the Shrew*, filmed in 1929 and starring M. Pickford and D. Fairbanks.

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I. A. RATSKII [29–1090–5]

SHAKHAN, an urban-type settlement in Karaganda Oblast, Kazakh SSR, under the jurisdiction of the Shakhta city soviet. Shakhan is situated 39 km northwest of the Karabas railroad station on the Karaganda-Mointy line, 12 km west of Karaganda. Coal is mined in the area. The settlement has a plant for the production of reinforced-concrete items. [29–890–5]

SHAKHAZIZ, SMBAT SIMONOVICH. Born Sept. 5 (17), 1841, in the village of Ashtarak, near Yerevan; died Dec. 24, 1907 (Jan. 6, 1908), in Moscow. Armenian poet and teacher.

In 1860, Shakhaziz graduated from the Moscow Lazarev Institute, where he then taught Armenian for 30 years. His verse collection *Leisure Hours* (1860) is typified by romantic longing. Shakhaziz maintained close ties with editors of the journal *Iusisapail* (Northern Lights) and was influenced by S. Nazarian and M. Nalbandian. It was natural therefore that he turned toward patriotic themes, for example, in the collection of verse *The Sorrow of Levon and Other Poems* (1865). Shakhaziz's lyric poem "The Dream" became a folk song. In the narrative poem *The Sorrow of Levon* he describes a teacher-hero.

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SHAKHBERDYEVA, MAIIA (Medeniet Shakhberdyeva). Born Feb. 23, 1930, in the city of Kerki, Turkmen SSR. Soviet Turkmen singer (coloratura soprano). People's Artist of the USSR (1975).

In 1956, Shakhberdyeva graduated from the Moscow Conservatory, where she studied voice under V. F. Rozhdestvenskaia. Beginning in 1962 she studied under M. E. Donets-Tesseir in Kiev. In 1956, Shakhberdyeva became a soloist in the Turkmen Theater of Opera and Ballet.

Shakhberdyeva possesses an expressive voice of equal quality in all registers. Her roles have included the Snow Maiden and Marfa in Rimsky-Korsakov's *The Snow Maiden* and *The Tsar's Bride*, Rosina in Rossini's *The Barber of Seville*, Violetta in Verdi's *La Traviata*, the title role in Delibes' *Lakmé*, Ailar in V. Mukhatov's *The Bloody Watershed*, Aknabat in Agadzhikov's *Night of Alarm*, and Shasenem in Ovezov and Shaposhnikov's *Shasenem and Garib*.

Shakhberdyeva also performs in concert. She has toured in the German Democratic Republic, Poland, India, and Canada. In 1975 she began teaching at the Ashkhabad Institute of the Arts. Shakhberdyeva was a deputy to the sixth and seventh convocations of the Supreme Soviet of the Turkmen SSR. [29–890–7]

SHAKHBUZ, an urban-type settlement and the administrative center of Shakhbuz Raion, Nakhichevan ASSR. Shakhbuz is situated on the river Nakhichevanchai, a tributary of the Araks; it is located 30 km northeast of the Nakhichevan railroad station, on the highway linking Evlakh, Goris, and Nakhichevan. Industry is represented by a motor vehicle repair plant, a winery, and the Badamly Mineral Water Plant. [29–891–1]

SHAKHDAG, a peak in the eastern part of the Greater Caucasus, in the system of the Bokovoi Range, in the Azerbaijan SSR. The summit is 4,243 m above sea level. The peak is composed of limestones and dolomites. There are high mountain meadows and small glaciers on Shakhdag. [29–891–2]

SHAKHDAG (also Sevan), a mountain range in the system of the Lesser Caucasus. The range extends along the northeastern shore of Lake Sevan, along the border between the Azerbaijan SSR and the Armenian SSR. It measures approximately 70 km in length and rises to a maximum elevation of 3,367 m. It is composed mainly of volcanogenic rocks and sandstones. Broad-leaved forests grow on the northern slope, primarily mountain steppes on the southern slope, and high-mountain meadows are found along the ridge. [29–891–3]

SHAKHDARA (also Iuzhnaia Shakhdara, Dzhaushangoz), a river in Gorno-Badakhshan Autonomous Oblast, Tadzhik SSR; a left tributary of the Gunt River of the Amu Darya basin. The Shakhdara is 142 km long and drains an area of 4,180 sq km. Fed by glaciers and snow, the river has a mean flow rate of 35.2 cu m per sec. High water occurs in July. The Shakhdara is used for irrigation. [29–891–4]

SHAKHDARA, a mountain range in the southern part of the Western Pamir, in the Tadzhik SSR. The range is the watershed for the Shakhdara and Piandzh rivers. Its western part, the meridional Ishkashim Range, measures 95 km in length, rising to a maximum elevation of 6,096 m at Mt. Mayakovsky. The sublatitudinal Shakhdara Range proper, which constitutes the middle and eastern parts, measures 105 km long and rises to a maximum elevation of 6,726 m at Karl Marx Peak. High-mountain steppe and meadow steppe are found on the slopes. There are also glaciers; total glaciated area is approximately 433 sq km. [29–891–5]

SHAKHIMARDAN, a climatic health resort in the Uzbek SSR, 52 km from Fergana. Shakhimardan is situated at an elevation of 1,540–1,570 m. Summers are hot and dry (average July temperature, 22°C), and the winters are mild (average January temperature, −3°C); annual precipitation is approximately 350 mm. Sanatoriums treat patients suffering from tuberculosis. [29–892–4]

SHAKHLICHA (also *shakhlycha, shakhlich*), a Chuvash folk wind instrument, a type of vertical flute. The *shakhlicha* appears in end-blown and fipple versions, the former resembling the Moldavian *fluer*. It is made of maple wood, linden bark, and thin tin. The end-blown version has five or six finger holes, and the fipple version two, four, or seven. Only men, primarily young men, play the *shakhlicha*, which is used to perform improvised lyric melodies or dance tunes. The instrument produces a gentle, soft tone.

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SHAKHLIN, BORIS ANFIIANOVICH. Born Jan. 27, 1932, in Ishim, Tiumen' Oblast. Soviet gymnast and coach. Honored Master of Sport (1955). International-class official (1968). Member of the CPSU since 1964.

Shakhlin was overall champion of the Olympic Games (1960), of the world (1958), of Europe (1955), and of the USSR (six times from 1954 to 1963). He was Olympic champion six times (1956, 1960, 1964), world champion three times (1958), European champion five times (1955–63), and USSR champion 13 times (1957–63) in various competitions of combined events.

Shakhlin has been awarded the Order of Lenin, two other orders, and medals.

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SHAKHMATOV, ALEKSEI ALEKSANDROVICH. Born June 5 (17), 1864, in Narva; died Aug. 16, 1920, in Petrograd. Russian linguist; specialist in Russian chronicles. Academician of the St. Petersburg Academy of Sciences (1894).

Shakhmatov graduated from Moscow University in 1887 and became a privatdocent there in 1890. He became a professor at the University of St. Petersburg in 1910 and was chairman of the Division of Russian Language and Literature of the Academy of Sciences from 1906 to 1920. Shakhmatov was the founder of the historical study of the Russian literary language. He brought to light ancient koines—languages used for communication within a group speaking related languages or dialects—that differed from the individual dialects normally spoken. He studied the formation of the Russian nationality, Slavic ethnogeny, and questions of the original Slavic homeland and of Proto-Slavic.

Shakhmatov traced the history of Russian chronicle writing from the 11th to 16th centuries. He was the first to apply the comparative historical method to the study of chronicles, and he laid the foundations of the textual criticism of chronicles and of textual criticism as a science. Making extensive use of dialectal data in the interpretation of written sources, Shakhmatov gave consideration to ancient orthographic systems that hindered the reflection in writing of the special characteristics of the spoken language.

Shakhmatov studied the modern Olonets, Kaluga, and Riazan' dialects, set up projects for the investigation of dialects, and analyzed and published the large amount of information acquired in these projects. In addition to research in Slavic accentology and the comparative phonetics and grammar of the Slavic languages, he carried out studies on ancient and modern Indo-European languages and the Finnish and Mordovian languages. He made an important contribution to the historical morphology of Russian. In theoretical linguistics, he did valuable work on grammatical forms, parts of speech, word groups, types of sentences, and the relationship of morphology and syntax.

Shakhmatov edited several parts of the academy's *Dictionary of the Russian Language* (1891–1916). Under his leadership the academy's Division of Russian Language and Literature became the center of philological studies in Russia. It organized the study of many ancient literary works and modern dialects. The division undertook the compilation of dictionaries and the preparation of the multivolume *Encyclopedia of Slavic Philology*; it resumed publication of the *Complete Collection of Russian Chronicles*. Shakhmatov organized the publication of a series of texts in the Old Church Slavonic and Russian languages and works of world literature, and he played a large role in reforming Russian orthography.

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L. P. ZHUKOVSKAIA [29–895–2]

SHAKHMURZAEV, SAID OSMANOVICH. Born Feb. 26 (Mar. 10), 1886, in the village of Eltiubi, in what is now Chegem Raion, Kabarda-Balkar ASSR; died Nov. 30, 1975, in Nal'chik. Soviet Balkar poet.

Shakhmurzaev graduated from the Crimean Pedagogical Technicum in 1929. From 1924 to 1958 he engaged in pedagogical work, serving as deputy people's commissar of education of the Kabarda-Balkar ASSR from 1939 to 1941. He was first published in 1916.

The agitational and publicist verse that Shakhmurzaev wrote in the 1930's dealt with the building of a new life. His collections of verse include *Zurna* (1957), *Know the Plants* (1960), *To Friends* (1966), and *The Wind of Time* (1967). His novella *At Daybreak*, (published 1965) deals with S. Kalabekov, a Balkar associate of S. M. Kirov. Shakhmurzaev compiled a Balkar primer in 1929 and, together with D. Kokov, published *Balkar Toponymic Dictionary* in 1970.

Shakhmurzaev was awarded the Order of Lenin, the Order of the Red Banner of Labor, and various medals.

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SHAKHOV, FELIKS NIKOLAEVICH. Born Oct. 12 (24), 1894, in the village of Beloiarskoe, in what is now Altai Krai; died Oct. 30, 1971, in Novosibirsk. Soviet geologist. Corresponding member of the Academy of Sciences of the USSR (1958).

After graduating from the Tomsk Technological Institute in 1922, Shakhov remained to work there. In 1935 he became a professor and head of a subdepartment at the institute (now the Tomsk Polytechnic Institute). In 1957 he was appointed head of a laboratory and head of the division of geochemistry of the Institute of Geology and Geophysics of the Siberian Division of the Academy of Sciences of the USSR in Novosibirsk. Shakhov's main works dealt with the geology and origin of ore deposits and with rare and radioactive elements, problems of metallogeny, and the methodology of prospecting and geological exploration.

Shakhov was awarded the Order of Lenin and two other orders.

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SHAKHOVSKAIA, an urban-type settlement and the administrative center of Shakhovskaia Raion, Moscow Oblast, RSFSR. Shakhovskaia has a railroad station on the Moscow-Rzhev line, 154 km from Moscow. The settlement has a milk plant, a logging and timber distribution establishment, a wood-products plant, and a shop of the Volokolamsk Textile Mill. [29–902–2]

SHAKHOVSKOI, ALEKSANDR ALEKSANDROVICH. Born Apr. 24 (May 5), 1777, on the *pomest'e* (estate) of Bezzaboty, Smolensk Province; died Jan. 22 (Feb. 3), 1846, in Moscow. Prince. Russian writer and theatrical figure. Academician of the Russian Academy (1810).

Shakhovskoi graduated in 1792 from the Boarding School for the Nobility at Moscow University. From 1802 to 1826, he headed a St. Petersburg dramatic troupe. He belonged to the Society of the Lovers of the Russian Word from 1811 to 1815.

Shakhovskoi wrote more than 100 plays, including vaudevilles, historical dramas, and adaptations of works by European authors. Among his most important works are the prose play *The New Stern* (staged 1805), which attacks sentimentalism, and the comedy of manners *A Lesson to Coquettes, or the Lipetsk Spa* (1815). Shakhovskoi's plays are distinguished by their diverting plots and their use of popular language. Shakhovskoi's apt and aphoristic verse written in iambic lines of varying lengths foreshadowed the style of A. S. Griboedov's verse in *Woe From Wit*.

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SHAKHOVSKOI, DMITRII IVANOVICH. Born 1861 in Moscow; died Apr. 15, 1939. Russian state and public figure. Prince. Grandson of the Decembrist F. P. Shakhovskoi.

D. I. Shakhovskoi graduated from the University of St. Petersburg in 1885. He served in the district *zemstvo* (assembly) of the city of Ves'egonsk. A contributor to the journal *Osvobozhdenie*, which he had helped found, Shakhovskoi was a member of the council of the Union of Liberation. He took part in the *zemstvo* congresses of 1904 and 1905.

Shakhovskoi joined the Constitutional Democratic (Cadet) Party in 1905. In the following year he was a deputy to the State Duma and secretary of both the Duma and the Cadet faction. After the February Revolution of 1917, Shakhovskoi became minister of welfare in the bourgeois Provisional Government. In August 1917 he joined a committee of the Council of Public Figures, and in 1918 he helped establish the counterrevolutionary Union for the Rebirth of Russia.

During the 1920's, Shakhovskoi engaged in literary activity and published material pertaining to P. Ia. Chaadaev (*Literaturnoe nasledstvo*, vols. 22–24, 1935). [29–903–2]

SHAKHOVSKOI, FEDOR PETROVICH. Born Mar. 12 (23), 1796, in Moscow; died May 24 (June 5), 1829, in Suzdal'. Prince. Decembrist; retired major of the Semenovskii Life Guards Regiment.

Shakhovskoi helped found the Union of Salvation in 1816 and the Union of Welfare in 1818. He supported the plans proposed for assassinating the tsar, but took no part in subsequent Decembrist organizations.

Shakhovskoi displayed great courage during the investigation that followed the Decembrist Uprising. He was sentenced to exile for life, but the term was subsequently commuted to 20 years. He was sent to Turukhansk in 1826 and was transferred to Eniseisk in 1827. In exile, he engaged in botanical research and, after a crop failure, gave considerable amounts of money to the people of Turukhansk. In 1829, Shakhovskoi was moved to the Spaso-Efimiev Monastery in Suzdal', where he died.

REFERENCE

Shchegolev, P. E. "Dekabrist kn. F. P. Shakhovskoi." In his book *Dekabristy*. Moscow-Leningrad, 1926. [29–903–3]

SHAKHOVSKOI, GRIGORII PETROVICH. Date of birth unknown; died after 1612. Prince, boyar. Political and military figure in Russia of the early 17th century.

The first mention of Shakhovskoi dates from 1596. During the late 16th and early 17th centuries he was appointed to minor posts in a number of southern fortresses. His career was aided when his father, Petr Mikhailovich, went over to the side of the First False Dmitrii. During the reign of Vasilii IV Shuiskii, Shakhovskoi was sent to Putivl' as *voevoda* (military governor). He joined in the peasant uprising led by I. I. Bolotnikov, and he apparently became a boyar during the rebellion. In early 1607, Shakhovskoi moved with the army of Ileika Muromets from Putivl' to Tula. After Tula was captured by the tsarist forces, he was exiled to the Spaso-Kamennyi Monastery. He became a leading member of the Boyar Duma of the Second False Dmitrii in late 1608, and he later fled with the pretender to Kaluga. Shakhovskoi took part in the First Volunteer Corps of 1611. [29–903–1]

SHAKHOVSKOI, IAKOV PETROVICH. Born Oct. 8 (19), 1705; died July 23 (Aug. 3), 1777, in Moscow. Prince. Russian state figure and memoirist.

Shakhovskoi began his military career as a soldier in the Semenovskii Life Guards Regiment in 1719, and he served in the Russo-Turkish War of 1735–39. He became a senator in 1741 and was chief procurator of the Synod from 1742 to 1753. Named procurator-general of the Senate in 1760, he retired in 1761. Shakhovskoi's memoirs describe the social life of 18th-century Russia and provide a characterization of the leaders of the St. Petersburg administration.

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Pekarskii, P. P. "Russkie memuary XVIII v." *Sovremennik*, 1855, vol. 52. [29–903–4]

SHAKHRIKHAN (until Nov. 13, 1970, the settlement of Moskóvskii), a city under oblast jurisdiction and administrative center of Moskovskii Raion, Andizhan Oblast, Uzbek SSR. Shakhrikhan has a railroad station 32 km southwest of Andizhan. Enterprises include a cotton-ginning plant, a silk factory, and a branch of the Andizhan Clothing Factory. The city has a museum of local lore. [29–905–4]

SHAKHRISABZ, a city under oblast jurisdiction and administrative center of Shakhrisabz Raion, Kashkadar'ia Oblast, Uzbek SSR. Situated in the Kitab-Shakhrisabz Oasis, on the Great Uzbek Highway (Tashkent-Termez), 5 km from the Kitab railroad station, the terminal stop on a branchline of the Karshi-Termez line. Population, 30,000 (1974).

Shakhrisabz has a cotton-ginning plant, a cannery, a winery, a creamery, a gravel plant, and an asphalt plant. Other enterprises include the Khudzhum Factory, which manufactures articles of Uzbek national arts and crafts, a silk factory, a furniture factory, and a meat-packing plant. The city also has an agricultural technicum, a pedagogical school, and a medical school.

Shakhrisabz was settled in the 13th century or later. The name of the city of Kesh, which belonged to Sogdiana, was also applied for a long time to Shakhrisabz, as well as to the historical region in the Kashkadar'ia Valley on another trade route between Samarkand and Balkh. Between the 14th and 16th centuries, Shakhrisabz was a major city in Middle Asia. Under the Sheibanids and the Ashtarkhanids it was a separate domain. In the 18th century the ruler (*bek*) of Shakhrisabz proclaimed his independence. After being occupied by Russian troops in 1868, Shakhrisabz and the surrounding area ruled by the *bek* were annexed by Bukhara.

Architectural remains include ruins of the enormous gates of the palace of Timur Ak-Sarai (1380–1404), with their rich tile ornamentation. Part of a Timurid mausoleum, the Dorus-Siadat (14th century), has also been preserved. It consists of the tall Khazrat-Imam, with its tent-shaped dome, hall, and vault. Nearby is the vault of Dzhekhangir, faced with carved marble. An ensemble of memorial structures for worship includes remains of the mausoleum of Sheikh Kulial (c. 1370) and that of the descendants of Ulug Beg, the Gumbezi-Seiidan (1437–38), which has carved marble epitaphs. Also of note are the portal and dome of the Kok-Gumbez mosque (1435–36), which once had arched galleries.

Shakhrisabz has long been a center of artistic folk embroidery and ceramics.

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Pugachenkova, G. A. *Termez, Shakhrisiabz, Khiva*. Moscow, 1976.

G. A. PUGACHENKOVA [29–904–3]

SHAKHRISTAN, a pass through the Turkestan Range. It is at an elevation of 3,378 m. Through the pass runs the highway that links the cities of Leninabad and Dushanbe, both of which are in the Tadzhik SSR. [29–905–2]

SHAKHSENEM, the site of an ancient fortified settlement of Khwarazm, located 90 km southwest of the city of Kunia-Urgench, Tashauz Oblast, Turkmen SSR. The city existed from the fourth century B.C. through the 13th century A.D., although for certain periods it was uninhabited. The cultural layers form a hill surrounded by the remains of fortress walls. The height of the walls in the tenth to 12th centuries was 15 m. In the center of the settlement there are ruins of a mosque and of a four-pillared building, probably a pre-Islamic temple. Pavilions and a small wall from a medieval park have been preserved southwest of the settlement.

Excavations have uncovered carved alabaster ornamentation from the mosque, ceramics, coins, a richly decorated bronze vessel from the 12th century, and an early medieval clay idol.

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SHAKHSEVENY, an ethnographic group of Azerbaijanis living in northwestern Iran and parts of the southern Azerbaijan SSR. The formation of the Shakhseveny was initiated in the 16th century by Shah Abbas I, who, in an attempt to weaken the influence of the Kizilbash tribal leaders, organized a special guard recruited from members of the Kizilbash tribal confederation (*see* KIZILBASH). The guard was named Shakhseveny, from the Azerbaijani *shakhsevan* (literally, "shah-lovers"). Abbas I granted the Shakhseveny extensive holdings in the regions of Ardebil, Mugan, Saveh, and Qazvin. Most of the Shakhseveny adopted a settled way of life in the late 19th century. [29–906–1]

SHAKHTA, an urban-type settlement in Perm' Oblast, RSFSR, under the jurisdiction of the Kizel city soviet. Situated on the highway linking Solikamsk and Gremiachinsk, Shakhta is 6 km north of the Kizel railroad station on the Solikamsk-Chusovskaia line. The city has a furniture factory. Hard coal is mined nearby. [29–907–2]

SHAKHTERSK (until 1953, the settlement of Katyk), a city under oblast jurisdiction and the administrative center of Shakhtersk Raion, Donetsk Oblast, Ukrainian SSR. Railroad station (Postnikovo) on the Chernukhino-Ilovaisk line. Population, 73,000 (1977).

Coal is mined near Shakhtersk, which has three coal-preparation plants. The city also has a machinery and repair plant, a knitwear factory, a bread-baking combine, and a brewery. Educational institutions include a trade technicum, a film-making technicum, and a pedagogical school. [29–907–4]

SHAKHTERSK, a city in Uglegorsk Raion, Sakhalin Oblast, RSFSR; located on the western coast of Sakhalin Island, on the Tatar Strait of the Sea of Japan, 17 km north of Uglegorsk. Coal is mined near Shakhtersk. The city has a coal-preparation plant, a building materials combine, a brickyard, and an electric power plant. [29–907–3]

SHAKHTERSKII, an urban-type settlement in Anadyr' Raion, Chukchi Autonomous Okrug (formerly Chukchi National Okrug), Magadan Oblast, RSFSR. Shakhterskii is situated on the shore of Anadyr' Gulf of the Bering Sea. Industry is represented by the Anadyr' Fish-processing Plant. [29–907–6]

SHAKHTERSKII, an urban-type settlement in Tula Oblast, RSFSR, under the jurisdiction of the Donskoi city soviet. Shakhterskii is situated 9.5 km from the city of Donskoi. The settlement has a footwear factory. [29–907–5]

SHAKHTINSK, a city under oblast jurisdiction in Karaganda Oblast, Kazakh SSR. Situated on the Sherubai-Nura River, 28 km west of the Karabas railroad station on the Karaganda-Mointy line and 23 km southwest of Karaganda. Population, 52,000 (1977). Shakhtinsk is a coal-mining center of the Karaganda Coal Basin. The city has a garment factory, a detergent factory, two plants for the manufacture of reinforced concrete products, and a plant for the production of nonstandard equipment and devices for small-scale mechanization. Shakhtinsk also has a technological technicum. [29–907–7]

SHAKHTNOE, an urban-type settlement in Donetsk Oblast, Ukrainian SSR, under the jurisdiction of the Khartsyzsk city soviet. Shakhtnoe is situated 3 km from the Skosyrskaia railroad station on the Chernukhino-Ilovaisk line. A stone quarry is located near the settlement, and coal is mined in the vicinity. [29–912–1]

SHAKHTNOE STROITEL'STVO (Underground Mine Construction), a monthly scientific and technical and production journal published jointly by the State Committee for Construction, the Ministry of the Coal Industry of the USSR, the Ministry of Construction for Heavy Industrial Enterprises of the USSR, and the Scientific and Technical Society of Mining. The journal was founded in Moscow in 1957.

Shakhtnoe stroitel'stvo carries articles that deal with the design, construction, and modernization of mining enterprises. It also publishes articles on the development of shaft-sinking techniques, the construction of various types of underground structures, accident prevention, the exchange of information relating to advanced technology, and socialist competition in branches of industry. Circulation, 5,000 (1978). [29–914–1]

SHAKHTNYI, an urban-type settlement in Perm' Oblast, RSFSR, under the jurisdiction of the Gubakha city soviet. Shakhtnyi is situated on the Solikamsk-Perm' highway and is 4 km from the Polovinka railroad station on the Solikamsk-Chusovskaia line. Hard coal is mined near Shakhtnyi, which has a shop of a plant for the repair of mining equipment; the main plant is located in the city of Kizel. [29–914–2]

SHAKHTY (until 1920, Aleksandrovsk-Grushevskii), a city under oblast jurisdiction in Rostov Oblast, RSFSR. Railroad station 75 km northeast of Rostov-on-Don; highway junction. Population, 223,000 (1977; 135,000 in 1939, 196,000 in 1959, 205,000 in 1970). Shakhty consists of three raions.

Shakhty's economy is dominated by light industry, with a cotton textile combine, two footwear factories, a flax mill, a garment factory, and a ceramics combine. The coal mined in the area is processed at two enrichment plants. The Gidroprivod Plant is located in Shakhty, which also has a machine-building plant. Food-processing enterprises include a meat-packing plant, a brewery, and a milk plant. The building-materials industry in the city comprises a building-materials combine and two plants producing reinforced-concrete structural components. The city has a research and development institute of coal mining, a technological institute of consumer services, a branch of the Novocherkassk Polytechnic Institute, a mining technicum, an energy technicum, a medical school, and a music school. A drama theater and a museum of local lore are also located in Shakhty.

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Zemlia donskaia. Rostov-on-Don, 1975. [29–916–2]

SHAKHTY TRIAL OF 1928, a trial of anti-Soviet-minded specialists who attempted to wreck the hard coal industry of the Donbas.

The case was initiated by organs of the Unified State Political Directorate (OGPU) in early 1928 and was heard in Moscow between May 18 and July 6 of the same year. Appearing before the Special Presence of the Supreme Court of the USSR were 53 defendants, primarily engineers and technicians. The trial demonstrated that among the old specialists employed by the coal indus-

try were persons associated with the former owners of the mines. The Shakhtintsy, as these persons were called, were guilty of subversive activities, for which they had received remuneration from the former bosses, who had fled abroad.

When the New Economic Policy had been introduced, the former mine owners had assigned their agents the task of regaining what they called "their" enterprises through denationalization or concessions. As the socialist structure of the economy grew stronger, however, these hopes were dashed; the former owners then became the instigators of an active, organized wrecking campaign.

The activities of the Shakhtintsy were directed by the Association of Former Mining Industrialists of Southern Russia, which was headed by B. N. Sokolov in Paris, and the Polish Association of Former Directors and Owners of Mining Enterprises in the Donets Basin, which was headed by Dwórzanczyk. These associations were linked with the governments and intelligence services of capitalist countries, and they established wrecking groups in the Donbas, Kharkov (1923–24), and Moscow (1926). The Shakhtintsy sought to weaken the defenses and economic strength of the USSR and to create favorable conditions for intervention by the imperialist states. Their acts of sabotage included dynamiting and flooding mines and setting fire to power plants.

On July 6, 1928, the Supreme Court of the USSR sentenced five persons—N. N. Gorletskii, N. K. Krzhizhanovskii, V. Ia. Iusevich, S. Z. Budnyi, and N. A. Boiarinov—to be shot; 40 persons were sentenced to imprisonment for one to ten years. Four others received suspended sentences, and four were acquitted.

The Central Committee of the Communist Party and the Soviet government took measures to increase the vigilance of the Soviet people and to create cadres of Soviet specialists devoted to the cause of socialism. (The Central Committee reached its decisions at a united plenum with the Central Control Commission of the ACP[B] that was held in Moscow between Apr. 6 and Apr. 11, 1928, and at a plenum held in Moscow from July 4 to 12.) As a result, the effects of the wrecking were remedied at the enterprises.

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D. L. GOLINKOV [29–907–8]

SHAKHUN'IA, a city (since 1943) and the administrative center of Shakhun'ia Raion, Gorky Oblast, RSFSR. Railroad station on the Gorky-Kirov line. Population, 20,000 (1974). Shakhun'ia has a logging and timber distribution establishment, a sawmill, a wood-products plant, a drawn-thread embroidery workshop, a dry-milk combine, and enterprises serving railroad transportation. [29–916–3]

SHAKHURIN, ALEKSEI IVANOVICH. Born Feb. 25, 1904, in the village of Mikhailovskoe, in what is now Moscow Oblast; died July 3, 1975, in Moscow. Soviet state figure. Hero of Socialist Labor (1941). Lieutenant general of the engineers (1944). Member of the CPSU from 1925.

The son of a peasant, Shakhurin became a worker in 1921. After graduating from the Moscow Institute of Engineering and Economics, he worked in the aircraft industry and at the N. E. Zhukovskii Air Force Academy. In 1938 he became first secretary of the party's Yaroslavl oblast committee and then of the Gorky oblast committee.

Shakhurin was made people's commissar of the aviation industry of the USSR in 1940. During the Great Patriotic War of 1941–45, he helped evacuate enterprises of the aviation industry to the eastern part of the country and facilitated the production of matériel for the air force. After the war he served as deputy minister of the aviation industry of the USSR and vice-chairman of the State Committee on Foreign Economic Relations of the Council of Ministers of the USSR. He became a personal pensioner in 1959.

Shakhurin was a delegate to the Eighteenth Congress of the ACP(B) in 1939 and was elected a member of the party's Central Committee. Shakhurin was awarded two Orders of Lenin, three other orders, and various medals. [29–916–4]

SHAKLOVITYI, FEDOR LEONT'EVICH. Date of birth unknown; died Oct. 11 (21), 1689, in Moscow. Russian state figure and diplomat.

The son of a petty nobleman, Shaklovityi became a *pod'iachii* (minor official) of the Prikaz Tainykh Del (Bureau of Secret Affairs) in 1673 and a *dumnyi d'iak* (administrative clerk of the Boyar Duma) in 1682. After the Moscow Uprising of 1682, he headed the Streletskii Prikaz (central office for the administration of the *strel'tsy*, or semiprofessional musketeers).

A supporter of Sof'ia Alekseevna in her struggle against Peter I, Shaklovityi, together with his followers, was arrested when Peter came to power. Shaklovityi was interrogated under torture and executed.

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SHAKSHA, an urban-type settlement in Ufa Raion, Bashkir ASSR. Shaksha is situated on the Ufa River, a right tributary of the Belaia River, 10 km east of Ufa. It has a railroad station on the Ufa-Cheliabinsk line. Industry is represented by a brickyard and a shop of the Bashkir Ceramic Plant; building materials are also produced in the settlement. [29–812–4]

SHAKVA (also Shakovka), a river in Perm' Oblast, RSFSR; a right tributary of the Sylva River of the Kama River basin. The Shakva is 167 km long and drains an area of 1,580 sq km. It rises in the spurs of the Central Urals and is fed primarily by snow. The city of Kungur is located near the confluence of the Shakva and the Sylva. [29–812–1]

SHALAKUSHA, an urban-type settlement in Niandoma Raion, Arkhangel'sk Oblast, RSFSR. Shalakusha is situated on the Mosha River, a tributary of the Onega. The settlement is served by a railroad station on the Konosha-Obozerskaia line. It has a sawmill and a logging and timber distribution establishment. [29–813–4]

SHALAUROV, NIKITA PAVLOVICH. Date of birth unknown; died 1764. Russian trader.

From 1760 to 1762, Shalaurov and I. Bakhov journeyed down the Lena River and sailed along the seacoast, stopping for the winters, to Chaun Bay, which Shalaurov became the first to explore. He charted the coast from the Kolyma River to Chaun Bay. In 1764, Shalaurov, traveling alone, rounded Cape Shelagskii. He perished near the mouth of the Verkun' River. The following have been named in honor of Shalaurov: islands in Chaun Bay and the mouth of the Kolyma, a cape on the Novosibirskie Islands, Cape Shalaurova Izba, and a mountain east of Chaun Bay.

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[29–813–6]

SHALIA, an urban-type settlement and the administrative center of Shalia Raion, Sverdlovsk Oblast, RSFSR. Shalia is situated on the Central Urals. It has a railroad station on the Sverdlovsk-Perm' line, 146 km northwest of Sverdlovsk. Industry is represented by a logging and timber distribution establishment, a milk plant, and a workshop of a furniture factory that is based in the city of Krasnoufimsk. [29–817–3]

SHALIKOV, PETR IVANOVICH. Born 1767; died Feb. 16 (28), 1852, in Serpukhov District, Moscow Province. Prince. Russian writer and journalist.

Shalikov's collections of verse *The Fruit of Free Feelings* (parts 1–3, 1798–1801) and *The Flowers of the Graces* (1802) and his prose works *Journey to Little Russia* (1803–04) and *Journey to Kronstadt* (1805) evince a sentimentalism similar to that of Karamzin. As publisher of the magazines *Moskovskii zritel'* (1806), *Aglaia* (1808–12), and *Damskii zhurnal* (1823–33), Shalikov took a reactionary stance. Shalikov edited the newspaper *Moskovskie vedomosti* for 25 years.

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SHALKAR (also Chelkar), a salt lake in Ural'sk Oblast, Kazakh SSR. The lake has an area of 200 sq km, an average depth of 5.1 m, and a maximum depth of 13 m. Salt bottoms are adjacent to the lake on the north. Fed by snow and underground springs, the lake has its highest water level in May; the level varies by 1.8 m. Lake Shalkar freezes over in November, and the ice breaks up in May. The Esenankaty River empties into the lake, and the Solianka River of the Ural River basin flows out of it. The lake is fished commercially. [29–814–1]

SHALKARTENIZ (also Chelkartengiz), a salt bottom northeast of the Aral Sea, in the Kazakh SSR. It has an area of approximately 1,800 sq km. In the spring, waters of the Turgai and Irgiz rivers flow into Shalkarteniz, which becomes a bitter lake with depths of 2–3 m. [29–814–2]

SHAL'NIKOV, ALEKSANDR IOSIFOVICH. Born Apr. 27 (May 10), 1905, in St. Petersburg. Soviet physicist. Corresponding member of the Academy of Sciences of the USSR (1946).

Shal'nikov graduated from the Leningrad Polytechnic Institute in 1928. In 1935 he began working at the Institute of Physical Problems of the Academy of Sciences of the USSR, and in 1938 he became a professor at Moscow State University. His main works are devoted to various aspects of experimental physics, for example, low-temperature physics and the study of properties of thin metal films and colloids.

Shal'nikov received the State Prize of the USSR in 1948, 1949, and 1953. He has been awarded the Order of Lenin and various medals.

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SHALOM ALEICHEM (also Sholem or Sholom Aleichem; pen name of Sholom Nokhumovich Rabinovich). Born Feb. 18 (Mar. 2), 1859, in Pereiaslav, Ukraine; died May 13, 1916, in New York. Jewish writer.

Shalom Aleichem wrote in Hebrew, Yiddish, and Russian. He studied at a heder and at the Russian district school in Pereiaslav. His first published work, in 1879, was in Hebrew. The novella *Two Stones* and the short story "The Elections," both published in 1883, were the first of his works to appear in Yiddish. His writing conformed to the democratic and enlightenment traditions of Jewish and Russian literature. In the pamphlet *The Trial of Shomer* (1888) and in the series of articles "The Theme of Poverty in Jewish Literature," Shalom Aleichem fought against the "trash" literature and idyllic romance, advocating a realistic folk literature. He also founded a literary annual, *The Popular Jewish Library* (1888–89), which brought together the work of many democratic writers and played a notable role in the history of modern Jewish literature.

In his satirical novel *Sender Blank and His Household* (1887), Shalom Aleichem criticized the bourgeoisie. He followed this with romantic portrayals of gifted common people in the novels *Stempenyu* (1888) and *Yosele Solovey* (1889). In 1892 the first chapters of *Menakhem-Mendl* were published; this was a novella about a *luftmentsh*, or impractical dreamer—a petit bourgeois who tries unsuccessfully to climb up the capitalist ladder. Another "little man," but of a completely different stamp than Menakhem-Mendl, was portrayed in the novella *Tevye the Dairyman*, some chapters of which appeared in 1894. Tevye is a toiler and a pure spirit; he is a wise, unselfish, and good man who is full of compassion for another's misfortune. These stories demonstrate Shalom Aleichem's masterful use of humor, as do his short-story cycles, which he began in the 1890's and on which he continued to work throughout his writing life—*Kasrilevke, Railroad Stories, The Undaunted, Stories for Children*, and *Monologues*.

The Revolution of 1905–07 was a significant landmark in Shalom Aleichem's development as a writer. In the early 1900's he established contacts with L. N. Tolstoy, A. P. Chekhov, M. Gorky, and V. G. Korolenko, gave readings from his works at illegal and semilegal gatherings of the intelligentsia and young workers in Poland, Lithuania, and Latvia, issued satirical pamphlets against autocracy (*Uncle Pinye and Aunt Reyzl, Sleep, Alesha*, and *The Newly Born*—all published in 1905), and wrote about revolutionaries in the short stories "Yosif" and "Shmulik" (1905). In the novel *The Deluge* (1906) he sought to draw a broad picture of the age, including figures of revolutionaries and common people. The novel, albeit full of sympathy for the people and the revolution, is nevertheless characterized by an abstract humanism that testifies to the author's inadequate understanding of the social significance of events.

With the reestablishment of reactionary rule, having survived the pogrom in Kiev, Shalom Aleichem left for America, and subsequently he moved to Switzerland. The anticapitalist tendencies in his writings, made more pronounced by his observations on the "American way of life," were reflected in the novel *Wandering Stars* (1909–11), in various short stories, and especially in the novella *Motl, the Son of the Cantor Peyse* (part 1, 1907); here, as well as in *Menakhem-Mendl* and *Tevye the Dairyman*, the author poses the question of the fate of the masses under capitalism. *Motl* was highly praised by M. Gorky in 1910.

Shalom Aleichem returned to Russia in 1908; in October of that year he was widely acclaimed on the 25th anniversary of the start of his literary activity, and in 1909 his works were published in Russian. In the last years of his life he published the novel *The Bloody Jest* (1912), written in response to the Beilis case; he also worked on the play *The Grand Prize* (1915) and on the unfinished autobiographical novel *Back From the Fair*.

World War I found Shalom Aleichem in Germany, where he was undergoing medical treatment; he was interned and sent to Berlin, then to Denmark, and in December 1914 he arrived in New York. The imperialist war evoked his anger, which he expressed in the short-story cycle *Tales of a Thousand and One Nights* (1914). He experienced loneliness and depression in a country that was alien to him, and these feelings aggravated the illness that led to his death.

Shalom Aleichem's realistic writing gained worldwide recognition, and his works have been translated into many languages. Modern Jewish literature continues in the best of Shalom Aleichem's traditions.

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G. A. REMENIK [29–1338–1]

SHAL'SKII, an urban-type settlement in Pudozh Raion, Karelian ASSR. Shal'skii has a port—Shala—on the eastern shore of Lake Onega, at the mouth of the Vodla River. Industry is represented by the Pudozh Sawmill, the Steklianskii Timber-rafting Enterprise, and a fish-processing station of the Petrozavodsk Fish-processing Combine. [29–817–1]

SHALYGINO, an urban-type settlement in Glukhov Raion, Sumy Oblast, Ukrainian SSR. Shalygino is 126 km northwest of the city of Sumy and 12 km from the Krupets railroad station on the Khutor-Mikhailovskii–Vorozhba line. Shalygino has a sugar factory. [29–816–1]

SHAMALDY-SAI, an urban-type settlement in Osh Oblast, Kirghiz SSR, under the jurisdiction of the Tash-Kumyr city soviet. Shamaldy-Sai is situated on the Naryn River. It has a railroad station on the Uchkurgan—Tash-Kumyr branch line. The Uchkurgan Hydroelectric Power Plant is located in the settlement. Shamaldy-Sai has a milk plant and a metal structural components plant. [29–819–1]

SHAMAN, a priest in the cult of shamanism. The shaman has the ability to enter into *kamlanie*, a state of ritual ecstasy, during which, his followers believe, he communicates with spirits. With the spirits' aid, he can, for example, heal the sick or predict the future. [29–819–2]

SHAMANISM, an early form of religion among most peoples.

Originating in the period of the primitive communal system, shamanism was based on faith in the shaman's communication with spirits, which occurred when the shaman was in a state of *kamlanie* (ritual ecstasy). The forms of *kamlanie*, the concept of the spirits, and the shaman's degree of specialization differed among different peoples. Some peoples retained vestiges of shamanism even under the conditions of class society.

Shamanism acquired complex forms among such Siberian peoples as the Tuvinians, Evenki, and Yakuts. The Siberian shamans dressed in special costumes, and their *kamlanie*, which involved the playing of tambourines, included frenzied dances and the use of hypnosis, ventriloquy, and various tricks. In *kamlanie* the shaman enacted a trip to the world of the spirits (sometimes on a "horse" or "deer," represented by the tambourine) and a struggle against the spirits. Professional shamans were nervous, easily excited people who were able to put themselves into a state of ecstasy or hallucination that became a self-regulated hysterical fit.

Among some peoples of Asia, Africa, Central America, and Polynesia, shamanism coexisted with other forms of religion. Vestiges of shamanism are retained in many later religious systems; examples include the *radenie* (prayer accompanied by dance) of the Khlysty and the *dhikr* ritual of the dervishes in Islam. Among the peoples of the USSR, shamanism has almost completely disappeared.

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S. I. VAINSHTEIN [29–820–1]

SHAMANOVA, MARIIA GAVRILOVNA. Born Apr. 14, 1908, in Moscow. Soviet athlete. Honored Master of Sport (1935).

Shamanova was the first Soviet athlete to win victories in international track-and-field competitions. She was USSR champion 14 times from 1927 to 1943 in running and broad jump.

Shamanova has been awarded the Order of the Badge of Honor.

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SHAMARY, an urban-type settlement in Shalia Raion, Sverdlovsk Oblast, RSFSR. Shamary, situated on the Sylva River at its confluence with the Vogulka River, has a railroad station on the Sverdlovsk-Perm' line, 185 km northwest of Sverdlovsk. The Shamarales Logging Production Association is located in the settlement. [29–820–2]

SHAMASH, in Babylonian-Assyrian religion and mythology, the god of the sun, justice, and oracles. [29–820–3]

SHAMASH-SHUM-UKIN (Greek, Sammugen or Saosduchinos). King of Babylon (667–648 B.C.). Son of Esarhaddon.

Circa 653 B.C., Shamash-shum-ukin raised a rebellion against his brother Ashurbanipal, king of Assyria, who had supreme authority over Babylon. The rebellion was supported by most of the peoples subjugated by the Assyrians—the Arab tribes and the citizens of the Chaldean and Syrian principalities, Elam, Media, Judea, Lydia, and Egypt. Shamash-shum-ukin committed suicide after the defeat of his army and the capture of Babylon in 648 by Ashurbanipal's forces.

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SHAMBALA (also, Washambala, Sambara), a people living in Tanzania. According to a 1975 estimate, the Shambala, together with the related Zigua (Zigula), Bondei, Kwere, and Doe peoples, number more than 650,000. Their language belongs to the eastern group of Bantu languages. The Shambala practice ancestor and nature worship; Christianity and Islam are also widespread. The Shambala engage chiefly in land cultivation, growing sisal, maize, coffee, and yams and other vegetables; many have left their farms to seek work in economically more developed areas. [29–821–1]

SHAMIAKIN, IVAN PETROVICH. Born Jan. 30, 1921, in the village of Korma, Dobrush Raion, Gomel' Oblast. Soviet Byelorussian writer and state figure. People's Writer of the Byelorussian SSR (1972). Member of the CPSU since 1943.

The son of a peasant, Shamiakin took part in the Great Patriotic War of 1941–45. He graduated from the Party School of the Central Committee of the Communist Party of Byelorussia in 1950, and in 1971 he became chairman of the Supreme Soviet of the Byelorussian SSR.

Shamiakin's first work appeared in print in 1941. The themes of military duty and of heroic deeds at the front and rear were long characteristic of his works. For example, the novel *Deep Current* (1949; State Prize of the USSR, 1951) deals with the selfless battle of Byelorussian partisans against the fascist German aggressors. Postwar life in the village is depicted in his novels *Good Luck!* (1953; Russian translation, 1955) and *The Wells* (1957; Russian translation, 1959); the second novel exposes in telling fashion bureaucratic red tape and apathy. Between 1956 and 1966, Shamiakin published a series of five topical novellas that constitute the book *Troublous Happiness* (1966; Ia. Kolas State Prize of the Byelorussian SSR, 1967); this work is a lyric and epic narrative about love, fidelity, and the inner beauty of the Soviet man.

One of Shamiakin's best novels, *Heart on Your Sleeve* (1964;

Ia. Kolas State Prize of the Byelorussian SSR, 1965), treats of moral and ethical problems; although a story about present-day events, it includes some scenes of wartime life. The novel *Snowy Winters* (1970) is constructed on the same compositional principle. Lenin appears in the novellas *Bread* (1969), *The First General* (1970), and *The "Comrade Lenin" Armored Train* (1970), as well as the short story "The Sailor From the *Oleg*" (1970). The life and work of the Soviet intelligentsia are the subject of the novel *Atlanta and the Caryatids* (1974; Russian translation, 1974). Shamiakin has also written children's stories. He is the author of the plays *Don't Trust the Silence* (1958), *The Banishment of the Lascivious Women* (1961), and *And the Birds Fell Silent* (1977) and of the book of essays of literary criticism entitled *A Conversation With the Reader* (1973). Shamiakin makes use of timely themes and dynamic plots. Many of his works have been translated into languages of the USSR and other countries of the socialist community.

Shamiakin was a deputy to the sixth through ninth convocations of the Supreme Soviet of the Byelorussian SSR; he is a member of the Central Committee of the Communist Party of Byelorussia. He became the deputy chairman of the administrative board of the Writers' Union of the Byelorussian SSR in 1954 and the board's secretary in 1976. Shamiakin has been awarded five orders and various medals.

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F. I. KULESHOV [29–831–2]

SHAMIL (also Shamyl). Born 1797 in the *aul* (village) of Gimry, in Dagestan; died March 1871 in Medina, in what is now Saudi Arabia. Head of a Muslim military and theocratic state in Dagestan who led the struggle of the Dagestan and Chechen mountaineers against the tsarist colonialists (*see* CAUCASIAN WAR OF 1817–64).

The son of an Avar peasant, Shamil was raised among Muslim clergy. In the 1820's he became an associate of Gazi-Magomed's and later of Gamzat-Bek's; in 1834 he was elected imam. Through his organizational abilities and force of will he succeeded in uniting the mountaineers and in subjugating the local Dagestani feudal lords. His personal bravery and remarkable eloquence made Shamil an extremely popular figure. In 1848 his rule was declared hereditary. Supported by the free peasants and the clergy, he established an imamate, that is, a military theocracy in which secular and religious power was invested in him (*see* IMAMATE).

Shamil, who proved to be a skilled military commander, successfully warred against the tsarist forces and achieved several major victories in the 1840's. In the 1850's, however, his movement declined, owing to the superior numbers of the tsarist troops, growing internal social contradictions, the ruin and exhaustion of the people, a food crisis, and the treachery of his vicegerents.

On Aug. 25, 1859, Shamil, with 400 Murids (*see* MURIDISM), was besieged in the *aul* of Gunib, and on August 26 he surrendered under honorable conditions. He and his family were resettled in Kaluga, and in 1870 he was permitted to make a pilgrimage to Mecca. Dagestan and Chechnia were annexed by force, a method typical of tsarist policy. At the same time, the incorporation of these peoples into the Russian Empire contributed to their economic, political, and cultural development.

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Dvizhenie gortsev Severo-Vostochnogo Kavkaza v 20–50-kh gg. XIX v.: Sb. dokumentov. Makhachkala, 1959. [29–821–4]

SHAMKHAL, an urban-type settlement in Kizil''iurt Raion, Dagestan ASSR. Shamkhal is situated on the Shuraozen' River, which flows into the Caspian Sea. It has a railroad station on the Gudermes-Baku line, and a 40-km branch line runs from the settlement to Buinaksk. Shamkhal has a poultry farm, a flour combine, a feedlot sovkhoz, and a sovkhoz for the production of dairy products and vegetables. [29–830–4]

SHAMKHAL, the title borne by the rulers of various peoples of Dagestan, including the Kumyks, Laks, and Darghins, from the late 12th century until 1867. The title was conferred at a meeting of the feudal aristocracy in Kazi-Kumukh; at the same time the *krym-shamkhal*, or future *shamkhal*, was also designated. In the 17th century the authority of the *shamkhal* became essentially hereditary, and only Kumyk rulers bore the title. The residence of the *shamkhal* was located in the settlements of Kazi-Kumukh, Buinak, and Tarki (*see* TARKI SHAMKHALATE). [29–830–3]

SHAMKHOR (also Shamkur, Shamkir), a city and the administrative center of Shamkhor Raion, Azerbaijan SSR. Located on the Tbilisi-Evlakh highway, 4 km from the Dolliar railroad station. Population, 21,000 (1974).

An ancient city, Shamkhor was captured in the seventh century by the Arabs. It later fell under the sway of the emirs of Gandzha (now Kirovabad), who belonged to the Shaddadid dynasty. The Mongol Tatars destroyed Shamkhor in 1235. The Kizilbash rulers controlled the city during the 16th and 17th centuries. The city became part of Russia in 1803.

Shamkhor has a brandy distillery, a winery, and a combine of local industry; a museum of local lore is located in the city.

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SHAMKHORCHAI, a river in the Azerbaijan SSR; a right tributary of the Kura River. The Shamkhorchai is 95 km long and drains an area of 1,170 sq km. It rises in the Shakhdag Mountains and in its lower course divides into branches. It is fed primarily by underground waters. The mean flow rate 49 km from the mouth is 8.58 cu m per sec. A reservoir is located on the river. The *Shamkhorchai* is used for irrigation. [29–830–6]

SHAMLUG, an urban-type settlement in Tumanian Raion, Armenian SSR. Shamlug is situated 24 km from the city of Alaverdi and 8 km from the Akhtala railroad station. Copper ore is mined in the vicinity. Shamlug has a branch of the Alaverdi Garment Factory. [29–822–2]

SHAMOTA, NIKOLAI ZAKHAROVICH. Born Dec. 4 (17), 1916, in Poltava. Soviet literary scholar, critic, and public figure. Academician of the Academy of Sciences of the Ukrainian SSR (1967); member of the academy's presidium and academician-

secretary of the division of literature, language, and art (1966–71). Member of the CPSU since 1945.

Shamota took part in the Great Patriotic War of 1941–45. He graduated from the Nezhin Pedagogical Institute in 1939 and from the Academy of Social Sciences of the Central Committee of the CPSU in 1953. From 1961 to 1978 he served as director of the T. G. Shevchenko Institute of Literature of the Academy of Sciences of the Ukrainian SSR. Shamota's first published works appeared in 1946. His most important works deal with the theory of socialist realism, the contemporary literary process, and Soviet Ukrainian writers. His books have been translated into many languages, both in the USSR and abroad.

Shamota became a member of the Central Committee of the Communist Party of the Ukraine in 1976. He was a deputy to the eighth and ninth convocations of the Supreme Soviet of the USSR. Shamota has been awarded the Order of Lenin, four other orders, and various medals.

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S. D. ZUBKOV [29–824–3]

SHAMOV, AFZAL SHIGABUTDINOVICH. Born Feb. 19 (Mar. 4), 1901, in the village of Tatarskoe-Tanaevo, in what is now Zelenodol'sk Raion. Soviet Tatar writer. Member of the CPSU since 1943.

A veteran of the Civil War of 1918–20, Shamov studied in the literature department of Moscow State University from 1926 to 1930. He took part in the Great Patriotic War of 1941–45. In 1949 and 1950, Shamov was editor of the journal *Sovet ädebiyäti* (Soviet Literature).

Shamov was first published in 1919. His main theme—the spiritual growth and political development of Soviet man—appears in such works as the novellas *Raufa* (1926) and *The Story of a Love* (1933) and the short-story collections *In Petroleum City* (1955) and *On One of the Days* (1959). Shamov's lyric works were published in the collection *On a Rainy Evening* (1965). He has translated into Tatar works by such writers as L. N. Tolstoy, N. V. Gogol, F. V. Gladkov, and N. A. Ostrovskii.

Shamov was a member of the Presidium of the Supreme Soviet of the Tatar ASSR from 1959 to 1963. From 1958 to 1961 he was chairman of the administrative board of the Writers' Union of the Tatar ASSR. Shamov has been awarded the Order of the October Revolution, two other orders, and various medals.

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[29–823–2]

SHAMOV, VLADIMIR NIKOLAEVICH. Born May 22 (June 3), 1882, in Menzelinsk, in what is now the Tatar ASSR; died Mar. 30, 1962, in Leningrad. Soviet surgeon. Academician of the Academy of Medical Sciences of the USSR (1945); lieutenant general in the military medical service (1943). Member of the CPSU since 1942.

Shamov graduated from the Military Medical Academy in 1908. Between 1923 and 1939 he was head of the subdepartment of faculty surgery at the Kharkov Medical Institute, chief of the surgical clinic of the Ukrainian Institute of Experimental Medicine, and director of the Ukrainian Institute of Hematology and Blood Transfusion. Between 1939 and 1958 he was chairman of the department of hospital surgery at the Military Medical Academy and director of the Institute of Neurosurgery in Moscow, Institute of Neurosurgery in Leningrad, and the Leningrad Institute of Blood Transfusion. During World War II, he served as deputy chief surgeon of the Soviet Army.

Shamov was the first physician in the USSR (1919) to transfuse blood based on the blood group of the donor and recipient and to transfuse cadaver blood (1928) under experimental conditions. He was one of the pioneers in organ and tissue transplantation in the USSR. He also worked out problems connected with the organization of the specialized medical care of the wounded. Shamov conducted research in neurosurgery, urology, and pulmonary and abdominal surgery. He developed (1926) a method of completely isolating an intestinal loop from all of its nerve connections and was thus able to conduct physiological observations of the functioning of an isolated segment of the intestine.

Shamov received the Lenin Prize (1962). He was awarded two orders of Lenin, four other orders, and various medals.

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M. B. MIRSKII [29–823–3]

SHAMS AL-DIN ILDIGUZ (also Shams al-Din Eldiguz). Date of birth unknown; died 1174. Founder of the Turkic Ildiguzid feudal dynasty in Azerbaijan and northwestern Iran.

A Kipchak slave by birth, Shams al-Din Ildiguz was in the service of the Seljuk vizier Simirumi and later of Sultan Masud ibn Muhammad, who appointed him governor of northern and southern Azerbaijan in 1136. Having become an independent ruler of lands in Azerbaijan and head of the Iraqi-Seljuk sultanate after Masud's death, he united under his rule various territories, including southern Azerbaijan, northern Azerbaijan as far as Shirvan and Georgia, and all western Iran.

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[29–829–1]

SHAMSHURENKOV, LEONTII LUK'IANOVICH. Born 1687 in the village of Bol'shepol'skaya, Iaransk District, Kazan Province; died there 1758. Russian inventor; *dvortsovyi krest'ianin* (court peasant).

In 1736, Shamshurenkov designed the original models of the hoisting mechanisms to be used in lifting the Tsar Bell. (Damaged by fire, the bell was never hoisted into place.) In 1752 he built a four-wheeled carriage that was powered by two men. Shamshurenkov also proposed designs for self-propelled sleighs and a mechanical verstmeter (a device that records the mileage covered by a vehicle).

REFERENCE

Gagarin, E. I. *Leontii Luk'ianovich Shamshurenkov*. Moscow, 1963.

[29–831–1]

SHAMURATOVA, AIMKHAN. Born June 10, 1917, in the city of Kungrad. Soviet Kara-Kalpak actress. People's Artist of the USSR (1968). Member of the CPSU since 1957.

Since 1932, Shamuratova has spent practically her entire career

as an actress with the Stanislavsky Kara-Kalpak Theater of Drama and Comedy. She also studied at the Moscow Conservatory and gave concerts of songs of the peoples of the USSR. Her roles have included Aisara in Iashen's *Giul'sar*, Gul'parshin in Davkaraev's *Alpamys*, the title role in *Raushan* by Aimurzaev and Allanazarov, Parshagul' and Aibike in Khodzhaniiazov's *Love Can't Be Won by Force* and *Taluas*, Tolgonai in Aitmatov's *Maternal Field*, and Anna Ivanovna in A. N. Ostrovskii's *Poverty Is No Crime*.

Shamuratova was a deputy to the fourth and seventh convocations of the Supreme Soviet of the Kara-Kalpak ASSR. She has been awarded two orders and several medals. [29–830–1]

SHAMURIN, EVGENII IVANOVICH. Born Oct. 16 (28), 1889, in Yerevan; died Dec. 1, 1962, in Moscow. Soviet specialist in book science. Doctor of pedagogical sciences; professor at the Moscow Library Institute beginning in 1944.

Shamurin graduated from the law faculty of the University of Kazan in 1912. From 1921 to 1937 he worked in Moscow at the Russian Central Book Chamber, known as the All-Union Book Chamber from 1936. He became the editor of *Knizhnaia letopis'* (Book Chronicle) in 1923 and the deputy director of the Book Chamber in 1932.

Shamurin made a great contribution to the development of bibliography and library science. His chief works are *Cataloging* (1925), *Methods of Bibliographical Work* (1933), *The Systematic Catalog and Its Organization* (1936), and *Essays on the History of the Library Bibliographical Classification* (vols. 1–2, 1955–59). Shamurin was the compiler of *A Dictionary of Book Science Terminology* (1958).

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Masanov, Iu. I., and I. B. Gracheva. *E. I. Shamurin (1889–1962)*. Moscow, 1970. [29–830–2]

SHAN (self-designation, *Thainyo*), a nationality in Burma, inhabiting primarily the Shan Upland. According to a 1975 estimate, the Shan number 2.1 million.

The Shan, who speak a Thai language, profess Buddhism; the folk religion is based on tiger worship. The Shan first settled in Burma at about the beginning of the Common Era; a Shan state, with its capital at Muanmau, is known to have existed as early as the seventh century. In the 14th and 15th centuries all northern and central Burma was controlled by the Shan, who in turn came under the control of the Burmese kings in the mid-16th century.

The Shan are undergoing national consolidation in their own region of Burma, the Shan State. They engage chiefly in irrigation farming, including the cultivation of rice; the plow is still the principal agricultural implement. Highly developed handicrafts include smithery, jewelry-making, the making of lacquer ware, weaving, and mat braiding.

REFERENCE

Narody Iugo-Vostochnoi Azii. Moscow, 1966. [29–841–3]

SHAN, a national state in Burma, in the Shan Upland. Area, 158,000 sq km. Population, 2,725,000 (1969), most of whom are of Shan nationality. The capital is the city of Taunggyi. The chief crops grown in the Shan state are rice, potatoes, tea, and citrus fruits. Nonagricultural economic activities include logging, the mining of lead-zinc ores (center, Baldwin), the mining of brown coal (center, Lashio), nonferrous metallurgy, and the processing of timber and agricultural raw materials. [29–832–2]

SHANFARA. Lived around the turn of the sixth century. Arab poet from southwest central Arabia.

Shanfara was numbered among the *saluqiin*, who were the ancient Arab counterparts of the *izgoi* in Kievan Rus'; specifically, the *saluqiin* were the poor who had no tribal affiliation as a result of the decay of the clan tribal system. In Shanfara's poetry motifs of self-praise (*fahr*) predominate, affirming the heroism of individuals and a lack of tolerance for social injustice. Shanfara is best known for his *lamiyah* (literally, "poem rhyming in *l*"); however, scholars now think the work was actually written by the eighth-century Iraqi philologist Halaf al-Ahmar.

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SHANGHAI, a city in China. Situated near the mouth of the Yangtze River, on its right tributary the Huangp'u Chiang, 50 km from the East China Sea. Most populous city in China and one of the largest cities in the world. Shanghai and its adjacent territory constitute an autonomous municipality administered directly by the central government. Area, 5,800 sq km. Population, approximately 11 million (1974).

Shanghai is one of China's major centers of industry, transportation, and commerce. As a seaport and river port it handles approximately 50 million tons of cargo annually, including nearly half the country's overseas cargo. It is also an important railroad and highway junction. Shanghai has more than 1 million industrial workers and accounts for more than one-seventh of the value of China's industrial production (1973–74).

Heavy industry produces more than 50 percent of the city's gross industrial output; in 1949 the figure was only 14 percent. The machine-building industry produces more than one-fourth of the country's output and manufactures equipment for the power-engineering, petroleum, mining, printing, paper, textile, and food-processing industries. Other products include electrical instruments, radio and electronic equipment, motor vehicles, ships, machine tools, motion-picture and still cameras, and watches. The city has iron and steel enterprises, which produce more than 2 million tons of steel annually; nonferrous metallurgy is represented as well. The diversified chemical industry, which is based on imported raw materials, accounts for about one-third of the nation's output; products include mineral fertilizers, toxic chemicals, acids, plastics, synthetic resins, chemical fibers, rubber goods, and pharmaceuticals. The city also has an oil refinery.

Shanghai remains one of the most important centers of the textile industry in the world. Its textile mills employ more than one-third of its industrial workers and produce about one-fifth of China's total output of fabrics, including more than half the country's wool and silk. The tobacco industry, which accounts for more than half of China's output, and the food-processing industry are also of considerable size.

Several large publishing houses are located in Shanghai. Among the city's educational institutions are Futan and T'ungchi universities, medical and pedagogical institutes, and an institute of foreign languages. Other institutions include a branch of the Academy of Sciences of the People's Republic of China, research institutions, several scholarly societies, and the Zikaiwei Observatory. Cultural institutions include the Shanghai Library (more than 3.5 million volumes in 1977), the Shanghai Municipal People's Library (more than 900,000 volumes), and museums.

The central part of the city and its principal industrial sections lie along the left bank of the Huangp'u and along its tributary the canalized river Wusung Chiang (also Suchou Ho). There are industrial enterprises and artisans' workshops south of the city's center in Nantao (Southern City), Shanghai's historical nucleus, where the principal architectural monuments are concentrated.

The old industrial districts, dominated by the textile industry, include Ch'ap'ei, P'ut'o, and Yangp'u. The new districts of Tengp'u, Minhang, and Kaoch'iao contain, for the most part, machine-building and chemical enterprises. There are wharves and cargo-handling facilities on the right bank of the Huangp'u in the Tungch'ang (P'utung) district. S. N. RAKOVSKII

Shanghai grew from the fishing settlement of Hu Tu, which had been established in antiquity, and by the 16th century was a busy center of trade and handicrafts. Under the Treaty of Nanking (1842), the city was opened to foreign trade. A British settlement was established in Shanghai in 1843, and an American settlement in 1848; the French obtained a concession in 1849 (*see* EXTRATERRITORIAL CONCESSIONS). In 1854, Great Britain, France, and the USA seized the city's customs administration, which they controlled until 1937. In 1860 and 1862 the Taiping rebels and Anglo-French interventionists clashed outside Shanghai.

In the second half of the 19th century Shanghai rapidly developed into the country's leading industrial and commercial center

and served as the principal base for the capitalist nations' aggression in China. Beginning with the patriotic May Fourth Movement in 1919, the city was an important center of the national liberation and revolutionary movement. The First Congress of the Communist Party of China was held in Shanghai in 1921, and the national Revolution of 1925–27 began in the city, which was the site of three workers' uprisings in 1926 and 1927 (*see* SHANGHAI UPRISINGS OF 1926–27). Shanghai was occupied by the Japanese from November 1937 to August 1945. The city was liberated from Kuomintang rule by the People's Liberation Army of China on May 27, 1949. V. P. ILIUSHECHKIN

The central part of Shanghai comprises business and commercial areas with broad, tree-lined streets and multistory (up to 35 floors) buildings, whose architecture is either European or a stylized version of traditional Chinese design. On the outskirts of the city narrow, winding streets are lined with one-story houses, clay-walled cottages, and bamboo huts. Architectural monuments of the 16th–19th centuries include the Former Temple of Confucius, the five-story octagonal Lung Hua Pagoda, and the Yu Fu Monastery, which contains a nephrite statue of Buddha that was brought from Burma. Shanghai's craftsmen produce basketry, wood carvings, embroidery, woven goods, and articles of bone, stone, and metal. [29–838–1]

SHANGHAI UPRISINGS OF 1926–27, three armed uprisings by the workers of Shanghai, led by the Communist Party of China. The workers hoped to liberate Shanghai from the rule of the warlords and to help the National Revolutionary Army (NRA), which was engaged in the Northern Campaign of 1926–27.

The first two uprisings, on Oct. 24, 1926, and Feb. 22 and 23, 1927, were poorly organized and ended in defeat. The Communists, having learned from their earlier setbacks, prepared the third uprising in absolute secrecy; they armed 5,000 workers, and a main headquarters was established for the uprising. On March 21, as units of the NRA approached Shanghai, the Communist Party and the Shanghai General Council of Trade Unions called a general strike, which grew into an armed workers' uprising. By the evening of March 22, the warlords in Shanghai had been overthrown. The victory of the workers of Shanghai was an important event in the Revolution of 1925–27 in China.

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Iur'ev, M. F. *Revoliutsiia 1925–27 gg. v Kitae*. Moscow, 1968. [29–840–1]

SHANG YANG. Born 390 B.C.; died 338 B.C. Ancient Chinese state figure and reformer; a founder of the Legist school (*see* FA-CHIA).

A scion of an impoverished aristocratic family, Shang Yang in 361 B.C. entered the service of the Ch'in king Hsiao Kung and rose to become his chief adviser. From 359 to 348 he carried out a series of reforms that helped to consolidate central authority and strengthen the Ch'in state. As a result of Shang Yang's reforms, the right of private ownership of land was legalized for the first time in China's history, and the purchase and sale of land were officially permitted. In other reforms, land cultivation was encouraged, freedom to engage in trade and handicrafts was restricted, and some artisans and petty merchants were made slaves of the state. The aristocracy was deprived of the right to inherit administrative posts, and its system of hereditary landholding was abolished. The territory of the state was divided into 31 prefectures, large (patriarchal) families were forcibly split up, and a system of mutual responsibility and spying was introduced in the villages.

Shang Yang's reforms aroused the displeasure of the hereditary aristocracy, at whose insistence he was put to death. Many of the changes aimed at strengthening central authority were applied throughout the country after the unification of China by the Ch'in state in 221 B.C.

REFERENCE

Kniga pravitelia oblasti Shan (Shan Tsziun' Shu). Moscow, 1968. (Translated from Chinese.) [29–846–4]

SHANHAIKUAN, a city in North China, in Hopeh Province. Port on the coast of the Gulf of Liaotung of the Yellow Sea. Situated in the Shanhaikuan Corridor, at the eastern end of the Great Wall of China. Population, more than 30,000 (1957). Shanhaikuan is served by a railroad station on the Peking-Mukden line. In addition to a plant that produces structural units for bridges, the city has enterprises of the machine-building and chemical industries. [29–846–1]

SHANHAIKUAN CORRIDOR, a narrow, low-lying strip of coastland in China, between the Yanshan Mountains and the Gulf of Liaotung of the Yellow Sea. It connects the North China Plain with Northeast China and has a length of approximately 200 km and widths of up to 25 km. The railroad and highway that link Peking with Shenyang run through it.

For many centuries, the corridor was China's main gateway to the north, and as such it held great strategic importance. In the sixth century, the Chinese began building forts in the corridor, which derives its modern name from the Shanhaikuan Fort, erected in the 14th century; the eastern end of the Great Wall of China was joined to the fort. In May 1644 a battle took place near Shanhaikuan between the rebel forces of Li Tzu-ch'eng and the combined forces of Manchu aggressors and Chinese feudal lords under the leadership of Wu San-kuei. The rebels were defeated in the battle; shortly thereafter, the Manchu forces seized Peking and proceeded to conquer all of China. [29–846–2]

SHANIAVSKII UNIVERSITY (full name, A. L. Shaniavskii Moscow City People's University), a university that existed in Moscow from 1908 to 1918. The initiative and funds for founding the university were provided by General A. L. Shaniavskii (1837–1905), a liberal figure in the field of public education. Under pressure from democratic elements of society, the Duma passed a bill in 1908 approving the establishment of the new university. Regular instruction began in the same year. Students of both sexes over the age of 16 were admitted without regard to nationality, religion, or political views. Since admission requirements did not include a secondary school diploma, the student body was quite diverse.

Shaniavskii University had two divisions—general and scholarly. The former provided a general secondary education; the latter provided a higher education in the natural, social, and philosophical sciences. Programs of study in the fields of preschool education, library science, and education outside the classroom became very well known. Many prominent scholars who had left government educational institutions because of their progressive views joined the staff of the university; among them were P. N. Lebedev, Iu. V. Got'e, A. N. Reformatskii, and P. P. Blonskii. In 1912 more than 3,600 students were enrolled in the university.

Shaniavskii University was closed in late 1918 as a result of a reorganization of the system of public education.

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Otchet Moskovskogo gorodskogo narodnogo universiteta im. A. L. Shaniavskogo, 1908–1916. Moscow [1909–16]. [29–846–3]

SHANIDAR, a Stone Age cave site in the foothills of the Zagros Mountains (northern Iraq), near Lake Urmia, where in the period 1951–61 an American archaeological expedition discovered nine Neanderthal skeletons, along with Levalloisian stone implements of the Mousterian culture. Anthropologically, the people from Shanidar, who lived 50,000 to 70,000 years ago, are related to the Neanderthals of Western Europe, but they have quite a few traits in common with modern man.

REFERENCE

Korobkov, I. I. "Novye dannye o neandertal'skikh skeletakh iz peshchery Shanidar (Irak)." *Voprosy antropologii*. 1963, no. 15. [29–832–5]

SHANIDZE, AKAKII GAVRILOVICH. Born Feb. 14 (26), 1887, in the village of Noga, in what is now the Georgian SSR. Soviet philologist. Corresponding member of the Academy of

Sciences of the USSR (1939). Academician of the Academy of Sciences of the Georgian SSR (1941).

Shanidze graduated from the University of St. Petersburg in 1913. He helped found the University of Tbilisi, where he became a professor. Shanidze's principal works deal with the history and structure of the Kartvelian languages, Georgian dialectology, the writing system of the Caucasian Albanians, and the history of Georgian literature.

Shanidze analyzed and published several Old Georgian texts, and his publication of Khevsur poetry constituted a landmark in the study of Georgian folklore. He published Svanetian poetic texts and a series of original and translated Old Georgian literary works. He reconstructed the original text of S. Rustaveli's narrative poem *The Man in the Panther's Skin*. Shanidze has been awarded three Orders of Lenin and two other orders.

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SHANNON, CLAUDE ELWOOD. Born Apr. 30, 1916, in Gaylord, Mich., USA. American scientist and engineer; one of the founders of mathematical information theory. Member of the National Academy of Sciences (1956) and of the American Academy of Arts and Sciences.

Shannon graduated from the University of Michigan in 1936. From 1941 to 1957 he was a research mathematician with Bell Telephone Laboratories. In 1941 he became a consultant for the National Defense Research Committee. Shannon became a professor of electrical engineering and mathematics at the Massachusetts Institute of Technology in 1957.

Shannon's principal works deal with the algebra of logic, the theory of relay and switching systems, the mathematical theory of communication, information theory, and cybernetics.

WORKS

In Russian translation:
Raboty po teorii informatsii i kibernetike. Moscow, 1963. [29–1129–2]

SHANNON, the longest river in Ireland. The Shannon has a length of 368 km (356 km according to some calculations) and drains an area of 15,700 sq km. The river flows through the Central Lowland and passes through a number of lakes, including loughs Allen, Ree, and Derg. Before emptying into the Atlantic Ocean, it forms an estuary with a length of approximately 100 km.

The Shannon is fed by rain. The water level rises in the autumn and winter and falls in the summer. The river never freezes over. The mean flow rate in the lower course is approximately 200 cu m per sec. The Shannon is navigable for almost its entire length, and at high tide oceangoing vessels can sail as far as the city of Limerick. The river is linked with Dublin by the Royal Canal and the Grand Canal. The Ardnacrusha Power Station is on the Shannon above Limerick. The cities of Carrick-on-Shannon, Athlone, Killaloe, and Limerick are situated on the Shannon. [29–834–4]

SHANNON'S CODING THEOREM, a basic theorem of information theory on the transmission of signals over communication channels in the presence of noise that results in distortion.

Suppose a sequence of symbols that appear with certain probabilities is to be transmitted, there being some probability that a transmitted symbol will be distorted during transmission. The simplest method of reliably restoring the original sequence from the received sequence is to repeat each transmitted symbol many (N) times. The rate of transmission, however, will thereby be slowed by a factor of N—that is, will be made close to zero. According to Shannon's theorem, there exists a positive number ν, dependent solely on the probabilities under consideration, such that, for arbitrarily small $\epsilon > 0$, methods of transmission at a rate ν' ($\nu' < \nu$) arbitrarily close to ν can be found that permit restoration of the original sequence with a probability of error of less than ϵ. If the rate of transmission ν' is greater than ν, then such methods cannot be found. The methods of transmission referred to involve the use of "noise-proof" codes. The critical rate ν is given by the equation $H\nu = C$, where H is the entropy of the source in bits per symbol and C is the capacity of the channel in bits per second. [29–1129–3]

SHANSHIASHVILI, SANDRO IL'ICH. Born July 13 (25), 1888, in the village of Dzhugaani, in what is now Signakhi Raion, Georgian SSR; died Oct. 28, 1979, in Tbilisi. Soviet Georgian writer. Honored Art Worker of the Georgian SSR (1930).

Shanshiashvili took part in the revolutionary movement and was arrested. From 1911 to 1914 he studied in Switzerland, and later he attended lectures at the universities of Berlin and Leipzig. Beginning in 1922 he contributed to the journal *Drosha* (The Banner) and helped build Soviet culture.

Shanshiashvili began writing in 1904. His early plays, notably *Anzor* (staged 1928), *The Three* (1931), and *New Roots* (published 1951), brought him popularity and literary recognition. In 1949, Shanshiashvili was awarded the State Prize of the USSR for the plays *Arsen* (staged 1936), *The Heroes of Krtsanisi* (staged 1942), and *Imeretian Nights* (1948). The drama *Arsen* depicts the struggle of the Georgian peasants against feudal tyranny and colonial policy, and *The Heroes of Krtsanisi* deals with the struggle of the Georgian people against the Iranian conquerors. The struggle of the Georgian proletariat at the barricades in the Revolution of 1905–07 is portrayed in the play *Arsen Dzhordzhiashvili* (1956). Shanshiashvili's works were important in the development of Soviet Georgian theater.

Shanshiashvili was awarded the Order of the Red Banner of Labor.

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SHANSI, a province in China, in the basin of the middle course of the Huang Ho. Area, 150,000 sq km. Population, 18 million (1975). The capital is the city of T'aiyüan.

Shansi occupies the Shansi Plateau, which constitutes the eastern part of the Loess Plateau and the western slopes of the T'aihang Shan. The province has a temperate monsoon climate, with a mean January temperature that ranges from −16°C in the north to −2°C in the south and a mean July temperature of 20°–25°C. Annual precipitation is 400–500 mm. Vegetation in the west and northwest is mostly of the semidesert type; in the east are mixed and broad-leaved forests that have survived mainly in the upper zone of the mountains.

In value of output, Shansi's economy is dominated by industry, although most of the economically active population is employed in agriculture. The coal, metallurgical, machine-building, chemical, textile, and food-processing industries are highly developed. In addition to T'aiyüan, which accounts for about half the province's total industrial output, the principal industrial centers are Tat'ung and Yangch'üan. Coal is mined at the Tat'ung, Yangch'üan (Chintungnan), Hsit'an (Chinchuang), Luan, Fenhsi, Ningwu, and Hotung coalfields. Shansi produces about one-seventh of China's coal.

The metallurgical plant in T'aiyüan makes pig iron and steel, including rolled stock. Pig iron is produced in Yangch'üan, Ch'angchi, and Linfen. The machine-building industry, which is of nationwide importance, is represented by heavy machine building in T'aiyüan, textile machine building in Yützu, and tex-

tile and agricultural machine building in T'aiyüan and Tat'ung. The chemical industry, whose principal products are soda, acids, and sulfur, is concentrated in T'aiyüan and Yünch'eng.

The textile industry is represented by cotton mills in T'aiyüan and Yützu, and the food-processing industry produces wine, butter, and flour. The province's handicrafts include silk fabrics, rugs, and metal and porcelain articles. The production of building materials is centered in T'aiyüan and Tat'ung.

Shansi is an ancient farming region. Approximately one-third of the province is under cultivation, and part of the land, mainly in the Fen Ho valley and the Hsinhsien Basin (Yünch'eng), is irrigated. Terracing is practiced on the mountain slopes. More than half the plowland is sown to grains: wheat, foxtail millet, kaoliang, maize, and oats. The major industrial crops are cotton and flax, but sesame, peanuts, rape, and sugar beets are also grown. In the central and southern areas the land is double-cropped. Cattle, donkeys, and mules are raised chiefly for use as draft animals; sheep (in the mountains) and swine are also raised.

S. N. RAKOVSKII

Traces of the Neolithic Yangshao culture and remains of the material culture of the Shang period (16th–11th centuries B.C.) have been discovered in Shansi. The region was part of the Chin state from the seventh to fifth centuries B.C., the Chou kingdom from the fifth to third centuries B.C., the Northern Wei state from the fourth to sixth centuries A.D., the province of Hotung from the seventh to ninth centuries, the Khitan state of Liao from the tenth to 12th centuries, and the Jurchen state of Chin in the 12th and 13th centuries. Shansi received its present name in the 14th century.

In the 17th century, rebel peasant detachments under Li Tzu-ch'eng were active in Shansi, which was officially formed as a province in the middle of the century. For many years after the Hsinhai Revolution of 1911–13 the province was controlled by the warlord Yen Hsi-shan. From 1937 to 1945, Shansi was occupied by the Japanese. The province was liberated from Kuomintang rule by the People's Liberation Army of China in April and May 1949.

V. P. ILIUSHECHKIN [29–844–2]

SHANT, LEVON (pen name of Levon Segbosian). Born 1869 in Constantinople; died Nov. 29, 1951, in Beirut. Armenian writer.

Shant graduated from a theological school in Üsküdar and studied at the Echmiadzin Theological Academy. From 1892 to 1899 he studied at the universities of Leipzig, Jena, and Munich, and he later returned to Armenia. His early works, the first of which were published in 1891, include the narrative poem *The Girl From the Mountains* (1893), the novella *The Strangers* (1896), and the dramas *The Egoist* (1901) and *On the Road* (1904). All of these works deal with the quest for freedom in a world of illusions.

In his later works, Shant often employed historical themes. After the defeat of the Revolution of 1905–07 he wrote the drama *Old Gods* (1909; Russian translation, 1912), and during World War I (1914–18) he wrote the drama *The Emperor* (1916). Shant subsequently became closely associated with the bourgeois nationalist party Dashnaktsutiun, and his views displayed reactionary tendencies. He emigrated in 1921 and lived in Europe, Asia, and North America, taking up residence in Beirut in 1949.

Shant wrote about the distant past of the Armenian people, for example, the tragedy *Oshinpail* (1932) and the novel *Thirsting Souls* (1941). Shant's heroes reflect the author's gradual loss of interest in social matters. Eventually symbolist perception of reality came to prevail in his works.

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SHANTAR ISLANDS, an archipelago in the southwestern part of the Sea of Okhotsk comprising 15 islands (Khabarovsk Krai, RSFSR). The total area of all the islands is approximately 2,500 sq km. The largest islands are Bol'shoi Shantar (area, 1,790 sq km), Feklistov (about 400 sq km), Malyi Shantar (about 100 sq km), and Belichii (about 70 sq km). The maximum elevation is 701 m. The islands, which are primarily mountainous, are composed of sandstones and clayey shales, with granitic and ultrabasic intrusions. The climate is harsh. The mountain slopes are covered with larch and dark coniferous forests; on the peaks there are thickets of dwarf stone pine. [29–836–2]

SHANTINGTUNG (Chinese, "upper cave"), the site of a Late Paleolithic settlement, located at the railroad station of Chouk'outien, about 45 km from Peking. The items found at Shantingtung include the bones of Neoanthropinae (the Shantingtung man) and stone and bone implements. The Shantingtung man's chief occupations were fishing, gathering, and hunting. A burial site attests to the existence of religious beliefs. The skulls found at Shantingtung are characterized by indistinct differentiation of racial features. In general they exhibit some Mongoloid characteristics, such as a tendency toward a broad nose and alveolar prognathism.

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SHANTSER, VIRGILII LEONOVICH (party pseudonym, Marat). Born Sept. 21 (Oct. 3), 1867, in Odessa; died Jan. 29 (Feb. 11), 1911, in Moscow. Figure in the Russian revolutionary movement.

Shantser was the son of an engineer. In the late 1880's, while a student at a *Gymnasium* in Nikolaev, he became associated with supporters of the People's Will. He graduated in 1899 from the University of Iur'ev (previously Dorpat, now Tartu), where he took part in Social Democratic student circles.

In 1901 he undertook party work in Moscow and was, as a result, exiled to Eastern Siberia. After the Second Congress of the RSDLP (1903), Shantser became a Bolshevik. In 1904 he was made a member of the Moscow committee of the RSDLP. In 1905 the Central Committee of the RSDLP named him its representative for the central industrial region. In the same year he became a leader of the Moscow committee of the RSDLP and an editor of the newspaper *Rabochii*. He took part in the preparations for the December Armed Uprising of 1905 in Moscow.

Exiled to Eniseisk Province in 1906, Shantser escaped in the same year and became a member of the Omsk committee of the RSDLP and, subsequently, of the St. Petersburg committee. At the Fifth (London) Congress of the RSDLP, he was elected to the Bolshevik Center. Shantser was arrested in 1907 and exiled to Siberia, where he continued his revolutionary activities. Exiled in 1908 to Turukhansk Krai, he escaped again and went abroad.

In Paris, in June 1909, Shantser took part in the conference of the enlarged editorial board of *Proletarii*. He joined the *otzovisty* (recallers) and in December became a member of the antiparty Vpered Group. Seriously ill, Shantser returned to Russia in 1910.

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SHANTSY, a term for various types of Russian field fortifications from the 17th to the 19th century. [29–841–1]

SHANTUNG, a province in East China, occupying the Shantung Peninsula and part of the North China Plain, along the lower Huang Ho. The province is washed by the Yellow Sea and the Pohai Wan. Area, 150,000 sq km. Population, 58 million (1975). The capital is the city of Tsinan.

The coast of the Shantung Peninsula, which is indented by numerous bays and inlets convenient for ships, is rocky. The coast of the North China Plain is flat and marshy. Part of the province is taken up by the T'ai Shan. Shantung has a temperate monsoon

climate. The principal rivers in the province's dense network of rivers are the Huang Ho and the Wei Ho. The lakes Tungp'ing Hu and Tushan Hu are connected by the Grand Canal system.

Shantung, an industrially developed province, is an important industrial region of the People's Republic of China; in 1971 it accounted for 5.5 percent of the country's gross industrial output. The highly developed mining industry includes the extraction of coal, petroleum, iron ore, bauxites, graphite, and salt (on the coast). The Tzupo Coalfield, in which 6–7 million tons were mined annually in the 1970's, and the Shengli oil fields, which yielded an estimated 15 million tons in 1975, produce for the entire country. The petroleum-refining industry is undergoing development.

The province produces a substantial quantity of electric power at fossil-fuel-fired steam power plants. Ferrous metallurgy is represented by plants in Tsinan and Tsingtao, and nonferrous metallurgy by an aluminum plant in Tsingtao. The diversified machine-building industry manufactures locomotives and railroad cars at the Ssufang Plant in Tsingtao, as well as internal-combustion engines, machine tools, electrical equipment, and machinery for the textile industry and agriculture. There are shipyards in Tsingtao.

The chemical industry is highly developed in Tsinan (rubber goods and mineral fertilizers), Tsingtao (plastics, mineral fertilizers, toxic chemicals, and dyes), and Poshan (Tzupo). Tsingtao ranks second in the People's Republic of China as a center of the cotton industry, with more than ten cotton mills, as well as knitwear and dye factories. The textile industry is also well developed in Tsinan, whose plants include a spinning mill, a textile mill, and a burlap plant. The porcelain and faïence industry in Poshan produces for the entire country. The highly developed food-processing industry produces vegetable oil, flour, tobacco, and wine.

Shantung, an important agricultural region, ranks second among China's provinces in the production of wheat; the other main food crops are soybeans, millet, rice, kaoliang, maize, and sweet potatotes. Shantung leads China's provinces in the production of peanuts; other industrial crops are cotton, tobacco, and hemp. There is fruit growing and viticulture. Animal husbandry, which plays an auxiliary role, is devoted to the raising of cattle, donkeys, swine, sheep, goats, and horses and to poultry farming. Other economic activities include fishing and the hunting of marine animals.

There is navigation on the Huang Ho, the Hsiaoch'ing Ho, and the Grand Canal. The province's main seaports are Tsingtao, Yant'ai, Weihai, Lungk'ou, and Shihtao. Tsingtao is a seaside resort. I. M. FEDOROV

Numerous objects from a Neolithic culture known as the Lungshan have been discovered in Shantung, and settlements from the Shang period (16th–11th centuries B.C.) are known to have existed in the province. From the eighth to third centuries B.C. most of Shantung formed part of the Ch'i and Lu kingdoms; during this period the ancient Chinese thinkers Confucius and Mencius were born in the region. Shantung received its present name in the tenth century.

Shantung was on numerous occasions the scene of major popular uprisings, notably the Red Eyebrows Rebellion in the first century, the Rebellion of the Yellow Turbans in the second century, a peasant uprising under Tou Chien-te in the seventh century, a peasant war led by Huang Ch'ao in the ninth century, and an uprising led by Sung Chiang in the 12th century. Shantung was officially formed as a province in the mid-17th century.

Detachments taking part in the northern campaign of the Taiping rebels operated in Shantung in 1854 and 1855, and detachments of Nien rebels were active in the province from 1864 to 1868. In 1898, Chiaochou Wan and the port of Tsingtao were forcibly "leased" by Germany, and the port of Weihai by Great Britain. At this time Germany declared Shantung within its sphere of influence and was granted several concessions in the province. Shantung was a center of the anti-imperialist Boxer Rebellion (1899–1901).

At the beginning of World War I, the territory leased by Germany was taken over by Japan, which returned it to China in 1922 under pressure from its imperialist competitors. From 1937 to 1945 the province was occupied by the Japanese. Shantung was liberated from Kuomintang rule by the People's Liberation Army of China in the summer of 1949. V. P. ILIUSHECHKIN [29–842–3]

SHANTUNG, a peninsula in East China, extending 350 km into the Yellow Sea. The coast is indented by numerous bays and inlets. The hills are covered with shrubs; the coastal plains and the plains that lie between the hills are densely populated. Wheat, peanuts, and tobacco are cultivated, and there are fruit orchards. The seaports of Tsingtao, Yant'ai and Weihai are situated on the Shantung Peninsula. [29–842–2]

SHANTUNG MOUNTAINS, mountains, in East China, in Shantung Province. The Shantung Mountains extend, with breaks, for more than 500 km and rise to 1,524 m. They are composed of Archean schists and granites, as well as of Lower Paleozoic sedimentary rocks. They are strongly dissected by deep tectonic valleys; normal faults have developed. The region has stands of oak forest and shrub thickets. [29–844–1]

SHAN UPLAND (also Shan Plateau), an upland region in eastern Burma that extends into China (where it is called the Yünnan Plateau), Laos, and Thailand.

In the western part of the Shan Upland, high rolling plains and flat-topped mountain masses alternate with intermontane basins. In the east, mountain ranges with elevations of 2,500–2,600 m are dissected by the deep gorges of various rivers, notably the Salween and Mekong. The Shan Upland, which is composed primarily of gneisses, schists, quartzes, and limestones, exhibits numerous karst phenomena.

The upland has a subequatorial monsoon climate, with a mean January temperature of 18°–24°C and a mean July temperature of about 30°C. Annual precipitation is 1,300–1,700 mm, with more than 2,000 mm on the windward mountain slopes. Most of the precipitation falls in the summer. The rivers, which have many rapids, are a valuable source of hydroelectric power. They are used for timber flotation and, in some cases, irrigation. The largest of the area's numerous lakes is Lake Inle.

Alpine evergreen and deciduous forests of teak, sal, magnolia, laurel, and bamboo give way to coniferous forests as elevations increase. Savannah vegetation grows in those areas of the Shan Upland that are relatively arid. L. I. KURAKOVA [29–834–6]

SHAOHSING, a city in East China, in Chekiang Province. Population, 170,000 (1953). Shaohsing has a landing on the canal that links Hangchou with Yüyao; it also has a railroad station on the Hangchou-Ningpo line. The city has tea-curing and rice-polishing plants; other industry includes the production of rice wine, silk fabrics, paper, and tinfoil. [29–847–2]

SHAOKUAN (also Ch'üchiang), a city in China, in Kwangtung Province. Population, more than 100,000 (1970). An important transportation center on the Peking-Canton railroad line, Shaokuan has a landing at the confluence of two rivers: the Wu Shui and Chen Shui. Industry includes ferrous and nonferrous metallurgy and the production of various kinds of industrial equipment. The city also has a tannery and enterprises of the cement, glass, wood-products, chemical, and textile industries. [29–847–1]

SHAOYANG (also Paoch'ing), a city in China, in Hunan Province. Population, more than 100,000 (1971). Shaoyang, a highway junction, has a landing on the Tzu Shui, a river that empties into the lake Tungt'ing Hu. In addition to cottage industries, the city has enterprises of the paper and food-processing industries. [29–847–3]

SHAPIRO, FEDOR L'VOVICH. Born Mar. 24 (Apr. 6), 1915, in Vitebsk; died Jan. 30, 1973, in Moscow. Soviet physicist. Corresponding member of the Academy of Sciences of the USSR (1968).

Shapiro graduated from Moscow State University in 1941. Beginning in 1945, he worked at the Institute of Physics of the Academy of Sciences of the USSR. In 1959 he was appointed deputy director of the Neutron Physics Laboratory of the Joint Institute for Nuclear Research in Dubna. He was also a professor at Moscow State University (from 1967).

Shapiro's main works dealt with nuclear and neutron physics. Shapiro developed and experimentally substantiated the method

of time-delay neutron spectroscopy in lead and subsequently discovered the excited state of ^{4}He using this method and generalized the law for the absorption of slow neutrons by nuclei. He also proposed a method of producing polarized neutrons by sending them through a polarized proton target and used the method to investigate the interaction of such neutrons with polarized nuclei, including deuterium nuclei. Shapiro was the first to detect experimentally ultracold neutrons and investigate their properties. He demonstrated the feasibility of measuring the magnetic moments of neutron resonances from their shift in a magnetic field.

Shapiro received the State Prize of the USSR in 1971 (with others) for a series of studies on developing and improving pulsed reactors. He was awarded two orders and various medals.

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SHAPKIN, TIMOFEI TIMOFEEVICH. Born Feb. 21 (Mar. 5), 1885, at the *khutor* (farmstead) of Semimaiachnyi, in the *stanitsa* (large cossack village) of Verkhnekondruchenskaia, in what is now Rostov Oblast; died Mar. 22, 1943, in Rostov-on-Don. Soviet military figure. Lieutenant general (1940). Member of the CPSU from 1938.

The son of a Don Cossack, Shapkin fought in World War I. He graduated from the Novocherkassk Military School in 1916. During the Civil War of 1918–20, Shapkin served in General Denikin's White Guards as commander of a *sotnia* (squadron) of the 6th Don Cossack Regiment. After joining the Red Army in March 1920, he served as commander of a cavalry troop, a regiment, and a brigade and, in 1921, assumed command of the 14th Cavalry Division. Shapkin graduated from the Advanced Academic Courses in 1922 and the M. V. Frunze Military Academy in 1935.

Shapkin commanded a cavalry division from 1922 to 1924, after which he served as a cavalry inspector in the Western Siberia Military District, commander of the 7th Separate Turkestan Brigade, and commander of the 20th Cavalry Division. In 1941 he became commander of the IV Cavalry Corps. During the Great Patriotic War of 1941–45, from September 1942, he served in that post on the Transcaucasian, Stalingrad, and Southern Fronts. Shapkin was awarded four Orders of the Red Banner for distinction in battle during the Civil War and against the Basmachi in 1930, as well as an Order of Kutuzov Second Class.

[29–848–3]

SHAPKINA (also Pil'vor''iaga), a river in Arkhangel'sk Oblast and the Komi ASSR. A right tributary of the Pechora River, the Shapkina is 499 km long and drains an area of 6,570 sq km. It flows through the Bol'shezemel'skaia Tundra and is fed chiefly by snow. Highwater occurs between May and June, and the mean flow rate 82 km from the mouth is 582 cu m per sec. [29–848–4]

SHAPLEY, HARLOW. Born Nov. 2, 1885, in Nashville, Mo.; died Oct. 20, 1972, in Boulder, Colo. American astronomer.

Shapley graduated from the University of Missouri at Columbia in 1910, and from 1912 to 1914 he worked at Princeton University. From 1914 to 1921 he was an astronomer at the Mount Wilson Observatory. From 1921 to 1952 he was director of the Harvard Observatory.

Shapley was a pioneer in a new method of investigating the structure of the Milky Way Galaxy and other stellar systems based on the study of variable stars. Between 1910 and 1912 Shapley and H. Russell developed a method of determining the orbital elements of eclipsing binaries. Shapley also worked out a method of determining distances to remote stellar systems and star clusters based on observations of the constituent variable stars known as the cepheids. From 1915 to 1917 he investigated a system of globular clusters and determined the direction to the center of the Milky Way Galaxy. Shapley's research in extragalactic stellar systems is of great importance. Shapley also studied the Magellanic Clouds and investigated the structural features and spatial distribution of other galaxies. In addition, he was instrumental in organizing the study of meteors using the photographic method.

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SHAPORIN, IURII ALEKSANDROVICH. Born Oct. 27 (Nov. 8), 1887, in the city of Glukhov, in what is now Sumy Oblast; died Dec. 9, 1966, in Moscow. Soviet composer, teacher, and figure in the music world. People's Artist of the USSR (1954).

The son of an artist, Shaporin graduated from the faculty of law at the University of St. Petersburg in 1913. In 1918 he graduated from the Petrograd Conservatory, where he had studied composition with N. A. Sokolov, orchestration with M. O. Shteinberg, and score reading with N. N. Cherepnin. An important influence on Shaporin was his meetings with A. A. Blok, to whose poetry he often turned in his own works. From 1919 to 1934, Shaporin was a music director and composer at various theaters in Leningrad.

In 1936, Shaporin took up residence in Moscow. In 1939 he began teaching at the Moscow Conservatory, where he was made a professor the following year; among his students were G. A. Zhubanova, E. F. Svetlanov, A. G. Fliarkovskii, R. K. Shchedrin, and R. M. Iakhin. Shaporin became secretary of the Composers' Union of the USSR in 1952.

In his finest compositions, Shaporin further developed the tradition of the Russian musical classics. Important historical events of the past and present are reflected in his large-scale works, which are notable for their epic scope; these include the opera *The Decembrists* (1953), the symphony-cantata *The Field of Kulikovo* (1939; libretto by Blok, with additions by M. L. Lozinskii; State Prize of the USSR, 1941), and the oratorios *Tale of the Battle for the Russian Land* (1944, words by various authors; State Prize of the USSR, 1946) and *While the Bird of Prey Circles* (1963). These works, imbued with a lofty patriotic ardor, are characterized by the use of a broad musical canvas and a realistic interpretation of literary source material. The images and themes of Shaporin's sole symphony (1932) are associated with revolutionary events. The suite *The Flea* (1926) is based on music composed for a dramatic version of N. S. Leskov's novella *The Left-handed Smith and the Steel Flea*.

Shaporin, a master of vocal music, continued the tradition of the art song established by P. I. Tchaikovsky, S. I. Taneev, and S. V. Rachmaninoff in his song cycles set to the poetry of such writers as A. S. Pushkin (1937), Blok (*Distant Youth*, 1939), and F. I. Tiutchev (*The Heart's Memory*, 1958). Particularly well known are such art songs as "The Incantation," "Under the Blue Sky," "Autumn Holiday," and "At Evening the War Became Silent" and his adaptations of the folksongs "Nothing Is Fluttering in the Field" and "The Barge Haulers' Song" (State Prize of the USSR, 1952). In addition to ballads for voice and orchestra set to words by I. A. Bunin, Blok, M. V. Isakovskii, and K. M. Simonov, Shaporin composed choral works, two piano sonatas, and incidental music for theater and motion pictures. He also wrote articles on music. Shaporin was awarded the Order of Lenin, two other orders, and various medals.

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M. M. Iakovlev [29–849–2]

SHAPOSHNIKOV, BORIS MIKHAILOVICH. Born Sept. 20 (Oct. 2), 1882, in the city of Zlatoust, in what is now Cheliabinsk Oblast; died Mar. 26, 1945, in Moscow. Soviet military figure and theorist. Marshal of the Soviet Union (May 7, 1940). Professor (1935). Member of the CPSU from 1930.

The son of a white-collar worker, Shaposhnikov joined the

army in 1901. He graduated from the Moscow Military School in 1903 and the Academy of the General Staff in 1910. During World War I he served in staff positions, becoming a regiment commander in October 1917; in December of the same year he was elected commander of the Caucasian Grenadier Division, with the rank of colonel.

Shaposhnikov volunteered for the Red Army in May 1918 and held various staff positions on the Supreme Military Council and in the People's Commissariat for Military and Naval Affairs of the Ukraine. He was appointed chief of the Intelligence Section of the Field Staff of the Revolutionary Military Council of the Republic in August 1919 and chief of the Field Staff's Operations Directorate in October 1919.

After the Civil War, Shaposhnikov served from 1921 to 1925 as first assistant to the chief of the Staff of the Workers' and Peasants' Red Army. He was commander of the Leningrad and Moscow military districts between 1925 and 1928, chief of the Staff of the Workers' and Peasants' Red Army from 1928 to 1931, and commander of the Volga Military District in 1931 and 1932. Shaposhnikov served as head and military commissar of the M. V. Frunze Military Academy from 1932 to 1935 and commander of the Leningrad Military District from 1935 to 1937. Between 1937 and 1940 he was both chief of the General Staff and deputy people's commissar of defense. From August 1940 through July 1941 he was deputy people's commissar of defense.

During the Great Patrotic War of 1941–45, Shaposhnikov served as chief of the General Staff from July 1941 to May 1942, deputy people's commissar of defense from May 1942 through June 1943, and head of the K. E. Voroshilov Higher Military Academy from 1943 to 1945.

Shaposhnikov worked extensively and successfully to strengthen and improve the Red Army, particularly its strategic and operational leadership apparatus. He summarized his combat experiences of the Civil War of 1918–20 in *Cavalry*, which he published in 1923, and in *On the Vistula*, which he published in the following year. At the same time, he did a great deal of work on the commission charged with formulating military regulations, which he imbued with the basic principles of Soviet military doctrine. In a fundamental work, *The Brain of the Army* (vols. 1–3, 1927–29), Shaposhnikov drew on the experience of World War I to outline the nature of future warfare. He characterized the leadership requirements of modern warfare and presented a clear picture of the role, functions, and structure of the General Staff as the organ of the Supreme Command for the direction of the armed forces.

Shaposhnikov's command of Marxist-Leninist methods of research, his broad erudition in the field of military history, his extensive practical experience in staff work and troop command, and his excellent memory made him one of the outstanding military theorists of his time.

Shaposhnikov was a member of the Central Executive Committee elected by the Seventh Congress of Soviets and a deputy to the first convocation of the Supreme Soviet of the USSR. He became a candidate member of the Central Committee of the ACP(B) in 1939. He was awarded three Orders of Lenin, two Orders of the Red Banner, the Order of Suvorov First Class, and two Orders of the Red Star. The Vystrel Higher Infantry and Tactical School has been named in honor of Shaposhnikov, who is buried in Red Square at the Kremlin Wall.

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Vasilevskii, A. M. "Marshal B. M. Shaposhnikov." *Voenno-istoricheskii zhurnal*, 1972, no. 9. [29–850–1]

SHAPOSHNIKOV, VLADIMIR GEORGIEVICH. Born May 25 (June 6), 1870, in Vol'sk, in what is now Saratov Oblast; died Oct. 3, 1952, in Kiev. Soviet organic chemist and chemical engineer. Member of the Academy of Sciences of the Ukrainian SSR (1922).

Shaposhnikov graduated from the St. Petersburg Institute of Technology in 1893. Beginning in 1900, he was a professor at the Kiev Polytechnic Institute. Shaposhnikov's principal works dealt with the technology of natural fibers and the chemistry of dyes. Shaposhnikov proposed a system of nomenclature for the azo dyes. He also developed a new method of obtaining azophenines.

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Issledovaniia iz oblasti azinovykh i azonievykh krasiashchikh veshchestv. Kiev, 1904.
Standarty azokrasitelei. Moscow, 1935.
Khimicheskaia tekhnologiia voloknistykh i krasiashchikh veshchestv, 3rd ed., vols. 1–2. Moscow-Leningrad, 1938–39. Vol. 2, 4th ed.: Kiev, 1955. [29–851–1]

SHAPOSHNIKOV, VLADIMIR NIKOLAEVICH. Born Feb. 12 (24), 1884, in Moscow; died there Oct. 23, 1968. Soviet microbiologist; founder of Soviet industrial microbiology. Academician of the Academy of Sciences of the USSR (1953).

Shaposhnikov graduated from Moscow University in 1910 and from 1911 to 1926 taught in the department of plant physiology, becoming a professor in 1921. From 1926 to 1967 he was a professor in the university's department of microbiology, where he was also head of a subdepartment from 1938 to 1967. In addition, he was in charge of the industrial microbiology laboratory of the Scientific Research Institute of Pharmaceutical Chemistry (1920–35), the Central Scientific Research Laboratory of the Fermentation Industry (1935–38), and the department of industrial microbiology of the Institute of Microbiology of the Academy of Sciences of the USSR (1938–63).

Shaposhnikov's main work was in the area of industrial microbiology. Shaposhnikov contributed much to the understanding of the physiology of microorganisms, mapped out the evolutionary pathways of the main types of fermentation, and discovered the two-phase nature of many microbiological processes, which made it possible, in many cases, to control them. His work laid the foundation for the industrial manufacture of lactic acid, acetone, and vinegar in the USSR.

Shaposhnikov founded a large scientific school. A recipient of the State Prize of the USSR (1950), he was awarded two Orders of Lenin, two other orders, and various medals.

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"Chestvovanie akademika V. N. Shaposhnikova." *Vestnik AN SSSR*, 1954, no. 6. IA. A. PARNES [29–851–2]

SHAPOVALOV, ALEKSANDR SIDOROVICH. Born Aug. 28 (Sept. 9), 1871, in the village of Chernaia Sloboda, Poltava Province; died Apr. 30, 1942. Participant in the Russian revolutionary movement. Member of the Communist Party from 1895.

The son of a peasant, Shapovalov became a worker in 1886. In 1894 he joined the Gruppa Narodovol'tsev (a group that supported the People's Will), and in 1895 he became a member of the St. Petersburg League of Struggle for the Emancipation of the Working Class. He was arrested in 1896 and exiled to Eastern Siberia. In 1899, Shapovalov was one of 17 exiles who endorsed Lenin's attack on economism "A Protest by Russian Social Democrats." Beginning in 1901, Shapovalov carried out party work in Batumi, Kiev, Tver' (now Kalinin), Ekaterinoslav (now Dnepropetrovsk), and Odessa. He took part in the Revolution of 1905–07 in Kharkov.

Between 1906 and 1917, Shapovalov lived abroad and carried out work for various Bolshevik organizations. He returned to Russia in June 1917. After the October Revolution he engaged in soviet and party work in Moscow. In 1924 and 1925 he was a member of the Central Control Commission of the RCP(B). Shapovalov became a personal pensioner in 1928.

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Na puti k marksizmu. Moscow, 1926.
V podpol'e, 2nd ed. Moscow-Leningrad, 1931.
V bor'be za sotsializm [2nd ed.]. Moscow, 1957.

"Vladimir Il'ich v ssylke v Sibiri." In *Ob Il'iche: Vospominaniia pitertsev*. [Leningrad, 1970.]
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Prokhvatilov, Iu. A. *A. S. Shapovalov* [1871–1942]. Leningrad, 1965.
[29–849–1]

SHAPSHAL, a mountain range in the Altai on the boundary between Gorno-Altai Autonomous Oblast and the Tuva ASSR. The Shapshal Range forms the divide between the Ob' system (the Chulyshman River) and the left sources of the Enisei (the Alash and Khemchik rivers). The range is approximately 130 km long and rises to 3,507 m. It is composed primarily of schists. In the northern part of the range, the divides have undergone planation; in the southern part, they are dissected by alpine landforms. Small glaciers occur. Mountain tundras predominate on the slopes of the Shapshal Range, and larch forests are encountered in some river valleys. [29–852–5]

SHAPSUG, part of the Adygeians; in the past one of the Adygeian tribes. The Shapsug, who inhabit the Adygei Autonomous Oblast and Tuapse and Lazarevskoe raions of Krasnodar Krai, speak the Shapsug dialect of the Adygei language. Their economy is based on land cultivation and fruit growing. [29–852–3]

SHAPUR. In the Sassanid state:

Shapur I. Died 272. King from 239 or 241.

Shapur I conquered vast territories and thus continued the efforts of his father, Ardashir I, to strengthen and expand the state. He defeated the Roman emperor Valerian near Edessa in 260 and took the emperor and most of his army captive. During Shapur I's reign, numerous irrigation and construction projects were carried out in Persia, and many cities were founded.

Shapur II. Died 379. King from 309.

Shapur II's wars with Rome resulted in a considerable expansion of the Sassanid state. The king founded a number of cities. Beginning in about 339, Shapur II's reign saw widespread persecution of the Christians, whose religion was becoming the official faith of the Roman Empire. [29–852–4]

SHARAF KHAN (also Sharaf al-Din ibn Shams al-Din Bitlisi). Born Feb. 25, 1543, in Bitlis; died 1603 or 1604. Kurdish historian and military and state figure.

Sharaf Khan's family had the hereditary right to rule the city of Bitlis in eastern Anatolia. Sharaf Khan was raised and educated at the court of the Iranian shah Tahmasp I. He later became the chief leader of the Kurdish tribes of Iran. In the late 1570's he became the ruler of the princely state of Bitlis. In 1595 and 1596, Sharaf Khan wrote *Sharaf-nameh* (in Persian)—the fundamental and earliest source on the medieval history of the Kurdish people.

WORKS
In Russian translation:
Sharaf-name, vols. 1–2. Translation, foreword, notes, and appendixes by E. I. Vasil'eva. Moscow, 1967–76.
[29–854–5]

SHARAKAN, Armenian church songs. *Sharakan* evolved from the early Middle Ages through the epoch of developed feudalism (tenth–15th centuries). A collection of *sharakan* is called a *sharaknots*. [29–863–4]

SHARALIEV, BORISLAV. Born Aug. 22, 1922, in Plovdiv. Bulgarian film director. Honored Artist of the People's Republic of Bulgaria (1971). Member of the Bulgarian Communist Party since 1944.

Sharaliev studied at a theatrical school in Sofia. In 1950 he graduated from the directing school of the All-Union State Institute of Cinematography in Moscow (M. I. Romm's studio), and in 1951 he began working in a feature-film studio in Sofia. He won fame early in his career with his first independent work, *Song of a Man* (1954), a biographical film about the revolutionary and poet N. Vaptsarov. He dealt with the resistance movement of World War II (1939–45) in *Two Victories* (1956) and *One Quiet Evening* (1960).

Sharaliev's other films include *Two Under the Sky* (1962), *Knight Without a Visor* (1966), *God Be With You, Friends* (1970; shown in the USSR as *Farewell, Friends*), *The Indispensable Sinner* (1971), and *Anticipation* (1973). In 1975 he directed the television series *Notes on Bulgarian Uprisings*, based on a book by Z. Stoianov, a participant in the partisan movement.

Sharaliev was awarded the Dimitrov Prize in 1955. [29–853–5]

SHARANGA, an urban type settlement and the administrative center of Sharanga Raion, Gorky Oblast, RSFSR. Sharanga is situated 75 km southeast of the Uren' railroad station on the Gorky-Kirov line. Industry is represented by a souvenir factory of the Khokhlomskaia Rospis' Production Association, a butter factory, a flax-processing plant, and a vegetable-drying plant. [29–854–1]

SHARAV, BALDUUGIIN (nickname, Marzan [jester]). Born 1869; died 1939. First Mongolian painter to deal with contemporary subjects.

Sharav founded a Mongolian school of art that combined the traditions of Lamaist miniature painting and Chinese painting with elements of Western European art, such as chiaroscuro. He is noted for his inexhaustible powers of observation, bold imagination, sense of humor, and satirical manner. In addition to paintings on extremely large canvases, such as *The Events of One Day* and *Holiday of Abundance* (both at the Museum of Fine Arts of the Mongolian People's Republic, Ulan Bator), his works include ethnographically accurate sketches, illustrations, and political posters. Sharav also painted portraits; of particular note is his *V. I. Lenin* (1922, Museum of Fine Arts of the Mongolian People's Republic, Ulan Bator). [29–853–2]

SHARGOROD, an urban-type settlement and the administrative center of Shargorod Raion, Vinnitsa Oblast, Ukrainian SSR. Shargorod is situated on the Murashka River of the Dnestr River basin, 25 km from the Iaroshenka railroad station on the Zhmerinka-Vapniarka line and 125 km southwest of Vinnitsa. The settlement has a wine-making combine and a butter factory. [29–855–2]

SHARGUN' (until 1973, the settlement of Takchiian), a city in Saryasiia Raion, Surkhandar'ia Oblast, Uzbek SSR. Shargun' is situated at the foot of the southwestern spur of the Gissar Range, 15 km from the Saryasiia railroad station on the Kagan-Dushanbe line. Hard coal is mined in the vicinity. Shargun' has a briquetting factory. [29–855–3]

SHAR'IA, a city (since 1938) under oblast jurisdiction and the administrative center of Shar'ia Raion, Kostroma Oblast, RSFSR. Situated on the left bank of the Vetluga River. Railroad junction. Population, 26,000 (1974). Industry is represented by the Shar'iadrev Production Association, an experimental machine shop, a milk plant, a garment factory, a furniture factory, and a plant that manufactures reinforced-concrete structural members. There are also two logging and timber distribution establishments. Educational institutions include a pedagogical school, a medical school, and a sovkhoz technicum. The city has a museum of local lore and a people's amateur theater. [29–873–1]

SHARIA (literally, "correct path," "correct way of behaving"), the body of Islamic religious, ethical, and legal precepts, based on the Koran, *sunna* (sacred tradition), and *fiqh* (Islamic jurisprudence).

The *sharia* was developed in the Arabian Caliphate between the seventh and 12th centuries. In addition to precepts on the fundamental religious obligations of Muslims, it includes the norms of Islamic state, civil, criminal, and procedural law. The *sharia* is in force in countries where Islam is the state religion, and it is applied especially in the spheres of marriage, the family, and inheritance.

After the October Revolution of 1917, the Soviet government at first restricted the jurisdiction of the *sharia* and later elimi-

nated *sharia* courts; those norms of the *sharia* that conflicted with Soviet laws were made inoperative. The norms of the *sharia* have no legal force in the USSR, and the precepts of the *sharia* are preserved only in the rituals and way of life of some Muslims.

In most foreign countries where the population professes Islam, the norms of the *sharia* have been incorporated into secular law. The *sharia* continues to be regarded as the source of Islamic law and one of the foundations of Muslim ideology. [29–857–2]

SHARIF, AZIZ ALIEVICH. Born Mar. 16 (28), 1895, in the city of Nakhichevan. Soviet literary scholar and translator. Honored Scientist of the Azerbaijan SSR (1963).

Sharif studied at the Moscow Commercial School from 1915 to 1917 and graduated from the M. Gorky Institute of Literature in 1943. His doctoral dissertation, completed in 1956, was entitled "The Life and Work of Dzh. Mamedkulizade." He became a professor at Moscow State University in 1962.

Sharif was first published in 1910. He is the author of many articles, pamphlets, critical-biographical studies, and monographs in Azerbaijani and in Russian dealing with classical and contemporary Azerbaijani literature, literary relations, and problems of translation. Sharif has translated works by M. F. Akhundov, A. Akhverdov, N. Vezirov, Dzh. Dzhabarly, S. Ragimov, and M. Ibragimov into Russian and works by N. V. Gogol, A. N. Ostrovskii, M. Gorky, and A. A. Fadeev into Azerbaijani.

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In Russian translation:
Rozhdenie Molla Nasreddina. Baku, 1968.
Vagif—pevets liubvi i krasoty. Moscow, 1968. [29–857–5]

SHARIF, in pre-Islamic Arabia, a member of a distinguished family, the leader of a tribe, or the ruler of a town. The term was later used as an honorary title for Muslims tracing their genealogy to the prophet Muhammad. Only the descendants of Hasan, a grandson of Muhammad's, had a formal right to the title, but usually all of the descendants of Muhammad were called sharifs and sayyids. In Arabia from the tenth century until 1916, the grand sharif was the ruler of the Hejaz and Mecca. [29–1140–4]

SHARIFZADE, ABBAS MIRZA (also Sharifov). Born 1892; died 1937. Soviet Azerbaijani actor and stage director. Honored Artist of the Azerbaijan SSR (1935).

Sharifzade performed in amateur productions, and in 1908 he began his professional career as the leading actor in the Gadzhibekov brothers' opera company. In 1920 he joined the Azizbekov Theater. Sharifzade was greatly influenced by the work of G. Arablinskii. He created a number of roles in the Azerbaijani repertoire, including the title role in Gusein Dzhavid's *Iblis*; Aidyn, Oktai, El'khan, and Eivaz in Dzhabarla's *Aidyn, Oktai El' ogly, Bride of Fire*, and *In the Year 1905*; and the title role in Narimanov's *Nadir-shakh*. He played lead roles in such foreign classics as Shakespeare's *Othello, Hamlet*, and *Macbeth*, Schiller's *The Robbers*, and Gutzkow's *Uriel Acosta*. Sharifzade also acted in motion pictures and was one of the first Azerbaijani film directors. His films included *In the Name of God* (1925) and *Hadji Kara* (1929). [29–858–1]

SHARJAH, a city in the United Arab Emirates; the capital of the emirate of Sharjah. Population, 19,200 (1968). Sharjah is a trading center and a port on the Persian Gulf. Fishing is the traditional occupation; other economic activities include the chasing of gold and silver articles. [29–856–1]

SHARKEY, LAWRENCE LOUIS. Born Aug. 6, 1898, near Orange, New South Wales; died May 13, 1967, in Sydney. Figure in the Australian and international working-class movement.

The son of a small farmer, Sharkey went to work at the age of 14 as an unskilled laborer. From his youth he took part in the trade union movement; he organized and led a number of strikes. Sharkey joined the Communist Party of Australia (CPA) in 1924 and became a member of the party's Central Committee in 1928. In 1930 he was chosen a member of the Politburo of the Central Committee and was named party chairman, a position he held until 1948. From 1948 to 1965 he served as general secretary of the party, and from 1965 to 1967 he was vice-chairman of the Central Committee. During the 1930's, Sharkey edited party newspapers. He took part in the work of the Seventh Congress of the Comintern (1935) and was elected a candidate member of the Executive Committee of the Comintern.

Sharkey was persecuted for his revolutionary activities. In 1949 he was sentenced to three years' imprisonment for supporting the peaceful foreign policy of the USSR. A steadfast opponent of Liquidationism, right opportunism, dogmatism, sectarianism, and revisionism, Sharkey fought for the unity of the world communist movement. [29–859–3]

SHARK IULDUZI (*Shark yulduzi*; Star of the East), a Soviet Uzbek journal of art, literature, politics, and public affairs. *Shark iulduzi*, a publication of the Communist Party of the Uzbek SSR, has been published weekly in Tashkent since 1933 under various names. Publication was curtailed during the Great Patriotic War (1941–45) but was resumed in 1946, when the current name was adopted. Editors of the journal have included the writers Aibek, A. Mukhtar, Kh. Guliam, and Mirmukhsin (1950–60 and since 1971).

The journal deals with current events in public affairs, politics, and literature. It also publishes articles on the history of Uzbek classical literature and Soviet literature and art, problems of literary criticism and theory, and works of Soviet and world literature. Circulation, 160,000 (1979). [29–859–1]

SHARK KAPYSY (*Sharq gapïsï*; Gate to the East), an Azerbaijani-language newspaper of the Nakhichevan ASSR. *Shark kapysy* has been published since 1921. It comes out in Nakhichevan six times a week. Circulation, 16,000 (1977). The newspaper has been awarded the Order of the Badge of Honor. [29–858–3]

SHARKOVSHCHINA, an urban-type settlement and the administrative center of Sharkovshchina Raion, Vitebsk Oblast, Byelorussian SSR. Sharkovshchina has a railroad station on the Druia-Voropaevo line. The settlement is situated on the Disna River, a left tributary of the Zapadnaia Dvina. Sharkovshchina has a building-materials combine, a butter factory, and a vegetable-drying plant. [29–861–2]

SHARMA, RAM SHARAN. Born Sept. 1, 1920. Indian historian. One of the founders of the Marxist school in Indian historical science.

Sharma's main works are on the socioeconomic history of antiquity and the early Middle Ages. He was head of the department of history at the University of Patna from 1953 to 1973. In 1973, Sharma became head of the department of history at the University of Delhi and chairman of the Indian Council of Historical Research.

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Sudras in Ancient India. Delhi, 1958.
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Aspects of Political Ideas and Institutions in Ancient India, 2nd ed. Delhi, 1968.
Light on Early Indian Society and Economy. Bombay, 1966.
Social Changes in Early Medieval India (c. A.D. 500–1200). Delhi, 1969. [29–862–1]

SHAROKHIN, MIKHAIL NIKOLAEVICH. Born Nov. 11 (23), 1898, in the village of Ivanovskoe, in what is now Danilov Raion, Yaroslavl Oblast; died Sept. 19, 1974, in Moscow. Soviet military leader. Colonel general (1945). Hero of the Soviet Union (Apr. 28, 1945). Member of the CPSU from 1920.

The son of a peasant, Sharokhin joined the Red Army in 1918. He fought in the Civil War of 1914–18 as a platoon commander and as a troop commander in the cavalry. He graduated from advanced cavalry courses for command personnel in 1926, the M. V. Frunze Military Academy in 1936, and the Military Academy of the General Staff in 1939.

During the Great Patriotic War of 1941–45, Sharokhin served in 1941 and 1942 as deputy chief of the Operations Directorate of

the General Staff and as deputy chief of the General Staff. In 1942 he served as chief of staff of the Third Shock Army on the Kalinin Front and chief of staff of the Northwestern Front; he was chief of staff of the Volkhov Front in 1942 and 1943. Sharokhin served on the Steppe, Second Ukrainian, and Third Ukrainian fronts as commander of the Thirty-seventh Army from August 1943 to October 1944 and the Fifty-seventh Army from October 1944 to the end of the war.

After the war, Sharokhin served in command positions and as a directorate chief in the General Staff of the Armed Forces. He was appointed deputy chief of the Main Military and Scientific Directorate of the General Staff in December 1951 and a directorate chief of the Higher Military Educational Institutions of the Ministry of Defense in April 1953. After becoming a scientific consultant to the deputy minister of defense on questions of military science in May 1957 and military consultant to the Group of Inspectors General of the Ministry of Defense in April 1958, Sharokhin retired in September 1960.

Sharokhin was awarded three Orders of Lenin, four Orders of the Red Banner, the Order of Suvorov First Class, the Order of Kutuzov Second Class, the Order of Bogdan Khmel'nitskii First Class, the Order of the Red Star, and various medals. He was also the recipient of foreign orders and medals. [29–868–4]

SHARONOV, VSEVOLOD VASIL'EVICH. Born Feb. 25 (Mar. 10), 1901, in St. Petersburg; died Nov. 27, 1964, in Leningrad. Soviet astronomer. Member of the CPSU from 1949.

Sharonov was a professor at Leningrad State University from 1944. Beginning in 1951, he was also director of the university observatory. Sharonov worked out new methods of absolute photometry and colorimetry, which have been applied to the study of the solar corona and the determination of the light solar constant. He also invented a number of devices for investigating the visibility of distant objects and fires.

WORKS

Izmerenie i raschet vidimosti dalekikh predmetov. Moscow-Leningrad, 1947.
Mars. Moscow-Leningrad, 1947.
Priroda planet. Moscow, 1958. [29–868–3]

SHARPEY'S FIBER, any one of the collagenous fibers of different thicknesses that cause the periosteum to adhere firmly to bones. Sharpey's fibers pass at different angles from the inner layer of the periosteum and at different depths to the layer of the external general lamellae of the diaphysis of tubular bones. They become branched mainly in this layer, sometimes reaching the osteon layer but never penetrating the substance of the osteon lamellae. They can be readily distinguished on histological sections of growing bones. They become partly or completely calcified and almost invisible in the bones of persons of advanced age. Sharpey's fibers were described by the British scientist W. Sharpey (1802–80). [29–870–2]

SHARQAWI, ABD AL-RAHMAN AL-. Born Nov. 10, 1921, in the province of Minufiya. Egyptian writer.

Al-Sharqawi was born into a peasant family. His first works were published while he was a student at the law school of the University of Cairo, which he attended from 1938 to 1943. Al-Sharqawi took part in the antimonarchy struggle. He founded the progressive journal *Al-Katib* (1951–53), which advocated peaceful cooperation among peoples. He was head of Egyptian delegations to various conferences on peace from 1951 to 1955.

Al-Sharqawi became widely known after the publication of his novel *The Earth* (1954), which deals with the oppressed peasantry's awakening to struggle; the book was translated into many languages. The concepts of "Arab socialism" in its leftist form are evident in the novel *Muhammad—the Messenger of Freedom* (1962). In this work the author attempted to correlate the life of the prophet to our times and social struggle. The history of Islam and its projection in contemporary times are the basic themes of al-Sharqawi's plays about Caliph Husein (1969). In the novel *Fellah* (1967), which is pervaded with themes of revolution and democracy, the author returns to the subject of village life after the enactment of land reform.

Al-Sharqawi is a member of the World Peace Council.

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In Russian translation:
Fellakh. Moscow, 1973.
In English translation:
Egyptian Earth. Translated by D. Stewart. London, 1962.

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SHARUA, in Kazakh feudal society, a category of dependent peasants who raised cattle and cultivated the land. Legally, the *sharua* were not serfs, but they were subject to the corvée and had to make payments in kind. [29–872–2]

SHARUKAN', a city of the 11th to early 13th centuries apparently located on the Severskii Donets near the cities of Chuguev and Zmiev. Sharukhan', whose name derives from that of the Polovtsian khan Sharukan, arose as an Alani settlement. The city had an ethnically mixed population and served as the winter refuge of the Polovtsy. In 1111 it was captured by troops under the command of Vladimir Vsevolodovich Monomakh and other Russian princes. During the 12th and early 13th centuries, Sharukan' was gradually abandoned.

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Pletneva, S. A. "Polovetskaia zemlia." In *Drevnerusskie kniazhestva X–XIII vv*. Moscow, 1975. [29–872–3]

SHARVIN, IURII VASIL'EVICH. Born June 24, 1919, in Moscow. Soviet physicist. Corresponding member of the Academy of Sciences of the USSR (1970).

Sharvin graduated from Moscow State University in 1941. Beginning in 1943, he worked at the Institute of Physical Problems of the Academy of Sciences of the USSR. In 1965 he became a professor at the Moscow Physicotechnical Institute. Sharvin's main works deal with the experimental investigation of the properties of pure metals at low temperatures.

Sharvin has been awarded the Order of the Red Banner of Labor and various medals.

WORKS

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"Nabliudenie fokusirovannykh puchkov elektronov v metalle." *Pis'ma v ZhETF*, 1965, vol. 1, issue 5. (With L. M. Fisher.)
"Nabliudenie dinamicheskogo promezhutochnogo sostoianiia sverkhprovodnikov s pomoshch'iu mikrokontaktov." *Ibid.*, 1965, vol. 2, issue 6.
"Poverkhnostnoe smeshannoe sostoianie sverkhprovodnikov pervogo roda." *Ibid.*, 1969, vol. 10, issue 4. (With I. L. Landau.) [29–855–1]

SHARZHENGA, a river in Vologda Oblast, RSFSR; a left tributary of the Iug River of the Severnaia Dvina basin. The Sharzhenga is 183 km long and drains an area of 1,500 sq km. The river rises in the Severnye Uvaly. It is fed primarily by snow. High water occurs in April and May, and freshets occur in the summer and fall. The mean flow rate is approximately 14 cu m per sec. The Sharzhenga freezes over in late October or in November, and the ice breaks up in late April or early May. [29–856–3]

SHASENEM AND GARIB, a Turkmen folk *dastan*. The legend of the love between Garib and Shasenem dates to the third story of the ancient Ghuz epos *Kitab-i dede Qorqut*. The events in the *dastan* take place during the Safavid era (1502–1736). Several versions of *Shasenem and Garib* have been circulated in Turkmenia. The version *Khelalay and Garib* is quite distinctive. Themati-

cally, *Shasenem and Garib* is similar to the Azerbaijani and Turkish *dastans* entitled *Ashuk Garib*, which became well known to Russian readers in M. Iu. Lermontov's *Ashik Kerib* (1837, published 1846), which is presented as a Turkish fairy tale. The plot of *Shasenem and Garib* was the basis for an opera of the same name by A. G. Shaposhnikov and D. Ovezov, staged in 1944 at the Turkmen Theater of Opera and Ballet.

TEXTS
Shasenem i Garïp: Türkmen khalk dessanï. Ashkhabad, 1959. [Introducion by B. Akhundov.]
Khelalay—Garïp. Ashkhabad, 1966. [Compiled by S. Annanurova.]
REFERENCE
Kor-Ogly, Kh. *"Shasenem i Garyp"—narodnyi dastan.* Moscow, 1955. (Dissertation.)

KH. KOROGLY [29–873–3]

SHASHIH, a city in China, in Hupeh Province. Population, more than 100,000 (1971). Shashih, a port on the left bank of the Yangtzu River, produces textiles, flour, chemicals, wood products, paper, and ceramics. [29–920–2]

SHASHKA, a Caucasian or Russian saber. Consisting of a blade and a hilt, the *shashka* is carried in a scabbard on a shoulder belt. Unlike other sabers, the *shashka* is worn with its back edge forward.

The *shashka* first appeared among the mountain peoples of the Caucasus. It was adopted by a Nizhny Novgorod dragoon regiment of the Russian regular army in 1834. By 1881, it was used throughout the army, although only with field uniform in guards units. The blade of the Caucasian *shashka* is slightly curved—its rise measures up to 30 mm—with the cutting edge on the convex side and with double edges along portions of the foible and the forte. The blade has longitudinal hollows, is 700 to 900 mm long and up to 40 mm wide, and often is engraved.

The Russian *shashki* introduced in, for example, 1834 and 1841, differed from the Caucasian *shashki* in hilt and scabbard. The Russian *shashka* of 1881 had six variants: three soldiers' versions (for dragoons, cossacks, and artillerymen), two officers' versions (for regular-army officers and cossack officers), and a version that combined the cossack saber and the dragoon scabbard. At one time standard Red Army issue, the Russian *shashka* of 1881 was replaced by the 1927 cavalry *shashka*.

A *shashka* for generals was authorized in 1940. By the mid-1950's, however, *shashki* were worn only as part of the full-dress uniform. [29–920–3]

SHASHKEVICH, MARKIAN SEMENOVICH. Born Nov. 6, 1811, in the Village of Podles'e, in what is now Zolochev Raion, L'vov Oblast; died June 7, 1843, in Novoselki, in what is now Busk Raion, L'vov Oblast. Ukrainian poet. Pioneer of the new Ukrainian literature in the Western Ukraine.

Shashkevich was a village priest. Together with I. N. Vagilevich and Ia. F. Golovatskii, he headed a literary society of progressive youth in L'vov that came to be called the Russian Trinity (Rus'ka Triitsia). He initiated the publication of the journal *The Dnestr Water Nymph* (1837), to which he also contributed.

Shashkevich's lyrical poems, ballads, and historical narrative poems are patriotic and vividly romantic.

Shashkevich, an advocate of political unity for all Ukrainian lands, urged his people to preserve and develop their native language and culture. He glorified the heroic past of the Ukrainian people.

WORKS
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REFERENCES
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Ukrains'ki pys'mennyky: Biobibliohrafichnyi slovnyk, vol. 3 Kiev, 1963.
Shalata, M. I. *Markiian Shashkevych.* Kiev, 1969.

A. V. MISHANICH [29–921–1]

SHASHKOV, SERAFIM SERAFIMOVICH. Born Nov. 5 (17), 1841, in Irkutsk; died Aug. 28 (Sept. 9), 1882, in Novgorod. Russian historian and publicist.

The son of a priest, Shashkov entered the Kazan Theological Academy in 1860. He was expelled on Sept. 16, 1861, for taking part in a requiem for the victims of the Bezdna uprising of 1861. He moved to St. Petersburg in 1861 and became a member of the "Siberian circle" of G. N. Potanin and N. M. Iadrintsev, as well as a contributor to the journals *Vek, Iskra* and *Slovo.* In 1863 he moved to Krasnoiarsk, where in 1864 and 1865 he gave public lectures on the history of Siberia. In the summer of 1865, Shashkov was arrested in Irkutsk for membership in the Society for Siberian Independence. He spent the period from 1868 to 1874 in exile in Arkhangel'sk and Voronezh provinces.

Beginning in 1866, Shashkov was a major contributor to the journal *Delo.* A representative of the democratic trend in Russian historiography, he was the author of works on the woman question, the worker question, and the history of Russian social thought. Shashkov's works on the history of Siberia are of particular interest.

WORKS
Sobr. soch., vols. 1–2. St. Petersburg, 1898.
REFERENCES
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Tsamutali, A. N. *Ocherki demokraticheskogo napravleniia v russkoi istoriografii 60–70-x gg. XIX v.* Leningrad, 1971. Pages 186–99.

[29–923–1]

SHASHMAKOM, in Uzbek and Tadzhik music:

(1) A system of six tonal systems used in *makom* (large-scale vocal and instrumental works in several sections)—*Buzruk, Rost, Navo, Dugokh, Segokh*, and *Irok.*

(2) The complete body of *makom* written in these tonal systems; musical works, each of which bears the name of its tonal system and consists of 20–40 instrumental and vocal sections. A *shashmakom* is performed by an ensemble of instrumentalists, soloists, and a chorus and sometimes is accompanied by dancing. The first collection of *shashmakom* (without text) was recorded by V. A. Uspenskii and published in 1924; a full cycle (with text) was first published between 1950 and 1967.

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Vyzgo, T. "K voprosu ob izuchenii makomov." In the collection *Istoriia i sovremennost': Problemy muzykal'noi kul'tury narodov Uzbekistana, Turkmenii i Tadzhikistana.* Moscow, 1972.

[29–923–2]

SHASTA, MOUNT, an extinct volcano in the southern Cascades, in the USA. Mount Shasta has an elevation of 4,317 m and is composed of andesites. Glaciers line its slopes. [29–875–1]

SHASTRI, LAL BAHADUR. Born Oct. 2, 1904, in Mughalsarai, now in the state of Uttar Pradesh; died Jan. 11, 1966, in Tashkent. Indian statesman and politician.

Shastri was the son of a teacher. He was educated at a university in Varanasi (Benares) and took part in the national liberation struggle. As a follower of M. Gandhi and a comrade of J. Nehru, Shastri quickly moved into the ranks of the leadership of the Indian National Congress Party (INCP). From 1935 to 1938, Shastri served as general secretary of the INCP committee in Uttar Pradesh, and he became the party's general secretary in 1951. After India won its independence in 1947, Shastri served in several ministerial positions in the central government from 1952 to 1963. After the death of Nehru, Shastri became the leader of a parliamentary faction of the INCP; in June 1964 he became prime minister, chairman of the Atomic Energy Commission, and chairman of the Planning Commission. In 1965 he made an official visit to the USSR. Shastri died in Tashkent, where he was attending a meeting between the Indian and Pakistani heads of state that had been called to mediate the Indian-Pakistani conflict. [29–875–3]

SHATALIN, STANISLAV SERGEEVICH. Born Aug. 24, 1934, in the city of Pushkin, Leningrad Oblast. Soviet economist. Corresponding member of the Academy of Sciences of the USSR (1974). Member of the CPSU since 1963.

In 1958, Shatalin graduated from the economics department of Moscow State University. From 1959 to 1965, he was a research worker and head of the intersector balance section of the Scientific Research Economics Institute of the State Planning Committee of the USSR. From 1965 to 1976 he was deputy director of the Central Economic Mathematical Institute of the Academy of Sciences of the USSR. In 1976, Shatalin became deputy director and in 1977 department head of the All-Union Scientific Research Institute of Systems Research of the State Committee for Science and Technology and the Academy of Sciences of the USSR and head of the subdepartment of mathematical methods of economic analysis in the economics department at Moscow State University. His principal works are devoted to the building of mathematical economic models and the methodology of national economic planning.

Shatalin has been awarded the Order of the Badge of Honor, and he received the State Prize of the USSR in 1968.

WORKS

Otraslevaia struktura obshchestvennogo proizvodstva. Moscow, 1965. (With Iu. V. Peshekhonov.)

Proportsional'nost' obshchestvennogo proizvodstva. Moscow, 1968.

Printsipy i problemy optimal'nogo planirovaniia narodnogo khoziaistva. Moscow, 1971. [29–875–4]

SHATALOV, VLADIMIR ALEKSANDROVICH. Born Dec. 8, 1927, in Petropavlovsk, Severnyi Kazakhstan Oblast. Soviet cosmonaut. Lieutenant general of aviation (1975). Twice Hero of the Soviet Union (Jan. 22, 1969, and Oct. 22, 1969). Candidate of technical sciences (1972). Member of the CPSU since 1953.

Shatalov graduated from the Lipetsk special air force school for primary pilot training in 1945 and from the Kacha Military Aviation Pilot School in 1949. He worked as a flight instructor. After graduating from the Order of the Red Banner Air Force Academy (now named after Iu. A. Gagarin), in 1956, Shatalov served in aviation units of the Soviet Army. He became a cosmonaut in 1963.

From Jan. 14 to Jan. 17, 1969, Shatalov completed a spaceflight as commander of the Soyuz 4 spacecraft. He performed a manual rendezvous and docking with the Soyuz 5 spacecraft, piloted by B. V. Volynov, allowing A. S. Eliseev and E. V. Khrunov to cross through open space to the Soyuz 4 spacecraft. The first experimental space station was thus established, remaining in flight for 4 hr 33 min 49 sec. Shatalov spent 71 hr 14 min in space. From Oct. 13 to Oct. 18, 1969, Shatalov, as commander of Soyuz 8, made a second spaceflight, with Eliseev. During the 118 hr 11 min spent in space, he was involved in a group flight with the Soyuz 6 and Soyuz 7 spacecraft. From Apr. 23 to Apr. 25, 1971, Shatalov, as commander of the Soyuz 10 spacecraft, completed a third spaceflight, with Eliseev and N. N. Rukavishnikov. During this flight, which lasted 47 hr 46 min, he docked with the orbiting station Salyut, in orbit since Apr. 19, 1971. The flight in a docked mode lasted 5 hr 30 min. Shatalov spent a total of 237 hr 18 min in space in the course of his three spaceflights.

Shatalov was a deputy to the ninth convocation of the Supreme Soviet of the USSR. He has been awarded three Orders of Lenin and various medals. A crater on the far side of the moon is named after him.

WORKS

Primenenie EVM v sisteme upravleniia kosmicheskim apparatom. Moscow, 1974. (With S. N. Seletkov and B. S. Skrebushevskii.)

Liudi i kosmos. Moscow, 1975. (With M. F. Rebrov.) [29–875–5]

SHATBERTI, an ancient Georgian monastery that flourished during the rule of the Tao-Klardzhenti principality, which existed in what is now Turkey. Shatberti was founded in the first half of the ninth century by the Georgian archimandrite Grigorii Khandzti. One of the greatest centers of Georgian culture, it was renowned for its illuminated manuscripts. The exact location of the monastery is unknown. [29–876–1]

SHATELEN, MIKHAIL ANDREEVICH. Born Jan. 1 (13), 1866, in Anapa, in what is now Krasnodar Krai; died Jan. 31, 1957, in Leningrad. Soviet electrical engineer. Corresponding member of the Academy of Sciences of the USSR (1931); Hero of Socialist Labor (1956).

Shatelen graduated from the University of St. Petersburg in 1888. In 1891 he joined the teaching staff of the University of St. Petersburg; he also taught at the St. Petersburg Mining Institute. In 1893 he was appointed a professor at the St. Petersburg Electrical Engineering Institute. Shatelen was a founder of the St. Petersburg Polytechnic Institute (now the Leningrad Polytechnic Institute), where he taught from 1901 to 1957. He took part in the development and implementation of the GOELRO plan. In 1929, Shatelen became the president of the Central Board of Weights and Measures; from 1929 to 1949, he was a member of the International Committee on Weights and Measures.

Shatelen's main works dealt with general problems of electrical engineering, illuminating engineering, metrology, and the history of technology. Shatelen received the State Prize of the USSR in 1949 and was awarded four Orders of Lenin, the Order of the Red Banner of Labor, and various medals.

REFERENCE

Chekanov, A. A., and B. N. Rzhonsnitskii. *Mikhail Andreevich Shatelen*. Moscow, 1972. [29–876–2]

SHATER, a tent-shaped superstructure in Russian architecture. *Shatry* were erected on bell towers and other towers, churches, and porches. They have the form of a tall pyramid on a base of four or more sides. In wooden architecture they were common through the late 18th century, and in stone architecture, in the 16th and 17th centuries.

Wooden *shatry* were formed by overlapping rows of logs with sides of decreasing length, and brick *shatry*, by sloping rows or by overlapping horizontal rows of brick. [29–877–2]

SHATERNIKOV, MIKHAIL NIKOLAEVICH. Born Oct. 9 (21), 1870, in Moscow; died there Sept. 1, 1939. Soviet physiologist. Honored scientist of the RSFSR (1935).

A student and close co-worker of I. M. Sechenov, Shaternikov graduated from Moscow University in 1896. From 1903 to 1924 he was a professor at the Moscow Advanced Courses for Women (later, the Second Moscow State University); from 1917 until his death, Shaternikov was a professor in the faculty of medicine at Moscow University (later, the First Moscow Medical Institute). At the same time, from 1920, he was the first director of the Institute of the Physiology of Nutrition.

Shaternikov's main works dealt with neuromuscular physiology, the physiology of the sense organs, and problems of metabolism and nutrition. Shaternikov developed a methodology for studying gas exchange in man; he studied gas exchange in the presence of various physiological and pathological conditions, using a number of instruments of his own design. The development of physiological nutritional norms for various professions and age groups of the population was begun under Shaternikov's direction.

WORKS

"K metodike issledovaniia gazoobmena." *Zhurnal eksperimental'noi biologii i meditsiny*, 1925, no. 2.

"Issledovaniia gazoobmena u cheloveka v dlitel'nykh opytakh. *Ibid.*, 1927, vol. 5, no. 15. (With O. P. Molchanova.)

"Azotistoe ravnovesie i otlozhenie belka v tele posle golodaniia." *Russkaia klinika*, 1929, vol. 12, no. 68.

"O belkovoi chasti pishchevykh ratsionov." *Voprosy pitaniia*, 1932, vol. 1, issues 1–2.

REFERENCES

Shapiro, Ia. "Zasluzhennyi deiatel' nauki professor Mikhail Nikolaevich Shaternikov." *Sovetskaia meditsina*, 1939, no. 20, p. 48.

"M. N. Shaternikov, 1870–1939." *Voprosy pitaniia*, 1939, vol. 8, no. 5, pp. 3–4. [29–877–3]

SHATILOV FOREST, a forest area near the village of Mokhovoe, Orlov Oblast, RSFSR. Shatilov Forest consists of 17 sections, with a total area of 1,082 hectares (ha). The total area of

forested land amounts to 918 ha, the main species being oak (47 percent), larch (13 percent), pine (11 percent), spruce (8 percent), birch (7 percent), and aspen (7 percent). Ash, maple, elm, and other species constitute 7 percent. There are 531 ha of planted timber stands. The forest was first planted in 1824, and many plantings from the 19th century have been preserved.

Shatilov Forest was one of the first forests to be planted to combat soil erosion in a steppe region and therefore has considerable practical and scientific significance in field protection. The forest was named in honor of I. N. Shatilov, a prominent figure in agriculture who played a large role in the development of the forest. [29–877–4]

SHA T'ING (pen name of Yang T'ung-fang). Born 1905 in Anhsien, Szechwan Province. Chinese writer.

Sha T'ing graduated from a teachers' seminary in Chengtu. He became associated with the Chinese League of Left Writers. His collections of short stories, *The Illegal Trip* (1932), *Mud Pies* (1936), and *Adversities* (1937), are filled with protest against social injustice. During the Sino-Japanese War of 1937–45, Sha T'ing fought in combat with the Eighth People's Army, an experience that he described in *With the Army* (1940) and *The Extraordinary Campaign* (1944). He depicted the struggle for existence in a remote rural area in the novels *The Gold Prospectors* (1943), *Beasts at Bay* (1945), and *Coming Home* (1948) and in various short stories. Sha T'ing edited the journal *Ssuch'uan wenhsüeh*.

WORKS

In Russian translation:

[Rasskazy.] In the collection *Sovremennye kitaiskie novelly*. Moscow, 1958.

[Rasskazy.] In the collection *Rasskazy kitaiskikh pisateli*, vol. 2. Moscow, 1959. [29–878–1]

SHATIRIAN, MIKHAIL ALEKSANDROVICH. Born Feb. 14 (27), 1916, in Tbilisi. Soviet Armenian writer. Member of the CPSU since 1940.

Shatirian, who graduated from the Moscow Library Institute in 1939, took part in the Great Patriotic War of 1941–45. His work was first published in 1942. He wrote the novel *Soldiers* (1955; Russian translation, 1958), the historical novella on a revolutionary theme *The Spring Came Again* (1960), and the novel *The Tale of the Palm* (1967; Russian translation, 1971), which deals with the 26 Baku Commissars. Shatirian has been awarded three orders and various medals.

WORKS

[Shat'iryan, M.] *P'ordzut'yun piesneri zhoghovatsu*. Yerevan, 1948.

In Russian translation:

Gnev zemli rodnoi: Roman. Moscow, 1963.

Muzykantskaia komanda. Moscow, 1970.

REFERENCE

Movetanay grakanut'yan patmut'yun, vol. 2. Yerevan, 1965. [29–878–2]

SHATKI, an urban-type settlement and the administrative center of Shatki Raion, Gorky Oblast, RSFSR. Situated on the Tesha River, a tributary of the Oka, Shatki is served by a railroad station on the Arzamas–Krasnyi Uzel line. Industry is represented by a butter factory, a cereal-products combine, and a plant that produces reinforced-concrete structural members. Shatki has a house of rest. [29–878–3]

SHATLYK GAS-CONDENSATE DEPOSIT, a deposit in the eastern part of the Turkmen SSR. Geologically, the Shatlyk deposit is located in an epiplatform region, with a Paleozoic basement and a Mesozoic and Cenozoic sedimentary mantle. It is confined to the Shekhitli-Dzhudzhuklin anticlinal fold, composed of sedimentary rocks ranging in age from the Jurassic to the Anthropogene.

Exploratory drilling was begun in 1967, and the pool of gas condensate in the Shatlyk horizon (the upper part of the Karabilian suite of the Upper Jurassic) was discovered in 1968. Exploitation of the deposit, which occupies an area of 615 sq km, was begun in the period 1973–75.

The Karabilian suite at the Shatlyk gas-condensate deposit has an estimated reserve of about 500–600 billion cu m of gas. The gas density is 0.588 g/cm^3. The methane content reaches 92–96 percent, with 2–3 percent heavy hydrocarbons. The initial content of stable condensate is 13.3 g/m^3; the condensate has a density of 0.790 g/cm^3. The daily extraction of gas amounts to about 90 million cu m (1976). [29–878–4]

SHATOV, VLADIMIR SERGEEVICH. Born December 1887 in Kiev; died Aug. 7, 1943. Participant in the October Revolution of 1917 and the Civil War of 1918–20. Soviet economic figure.

Shatov studied at the Kiev Polytechnic Institute and took part in Social Democratic circles. In 1906 he emigrated to the USA, where he became a member of the Industrial Workers of the World. He returned to Russia in 1917. During the October Days he was a member of the Petrograd military revolutionary committee as a representative of the Union of Anarchosyndicalist Propaganda. From 1918 to 1921, Shatov was extraordinary commissar for railroad defense for the Petrograd Military District and a member of the Revolutionary Military Council of the Seventh Army of the Western Front. After serving as minister of war and minister of railroad transport of the Far East Republic in 1921 and 1922, he turned to administrative work.

From 1927 to 1930, Shatov directed the construction of Turkestan-Siberian railroad and was head of the Board of Siberian Railroad Construction. From 1932 to 1936 he was head of the People's Commissariat of Railroads and of the Central Board of Railroad Construction. Shatov was awarded the Order of the Red Banner. [29–880–1]

SHATROVA, ELENA MITROFANOVNA. Born May 19 (31), 1892, in Moscow; died there July 15, 1976. Soviet Russian actress. People's Artist of the USSR (1968). Member of the CPSU from 1950.

Shatrova, upon graduating from a private theater school in 1912, worked in N. N. Sinel'nikova's theater in Kharkov. From 1918 to 1932 she was a leading actress with the former Korsh Theater and occasionally performed in other theaters. Her roles included Varia in Ostrovskii and Solov'ev's *The Wild Girl*, Liza in a dramatization of Turgenev's *A Nest of Gentry*, Marfin'ka in a dramatization of Goncharov's *The Precipice*, Liza and Masha in A. N. Tolstoy's *The Bitter Blossom* and *The Swallow*, Amalie in Schiller's *The Robbers*, Katharina in Shakespeare's *The Taming of the Shrew*, and Kupavina in Ostrovskii's *Wolves and Sheep*. She often played in translated versions of drawing-room comedies, for example, as Germaine in Verneuil's *The Lie*, Susie in Pagnol and Nivoux's *The Swamp*, and Georgine in de Flers and de Caillavet's *Golden Autumn*.

Shatrova, an actress of delicacy and grace, was distinguished for the lyricism and subtle humor of her characterizations. She often performed opposite her husband, N. M. Radin. The two became known for their comic wit and mastery of dialogue. In 1932, Shatrova joined the Malyi Theater. She appeared in comic and character roles in works from the classic repertoire, for example, as Lidiia, Mamaeva, and Kukushkina in Ostrovskii's *Easy Money, Even a Wise Man Stumbles*, and *A Profitable Post*, Anna Andreevna in Gogol's *The Inspector-General*, and Matrena in L. Tolstoy's *The Power of Darkness*. Shatrova's roles in Soviet plays included Potapova in Sofronov's *The Moscow Character* and Madame Stessel in Stepenov and Popov's *Port Arthur*.

Shatrova was a deputy to the Fourth and Fifth Congresses of the Supreme Soviet of the RSFSR. In 1964 she became vice-chairwoman of the presidium of the All-Union Theatrical Society. A recipient of the State Prize of the USSR in 1948 and 1949, she was awarded two Orders of Lenin, the Order of the October Revolution, the Order of the Red Banner of Labor, and several medals.

REFERENCE

Durylin, S. N., and A. P. Klinchin. *Elena Mitrofanovna Shatrova*. Moscow, 1958. [29–880–3]

SHATSK, a city and the administrative center of Shatsk Raion, Riazan' Oblast, RSFSR. Shatsk is situated on the Moscow-Kui-

byshev highway, 165 km southeast of Riazan' and 31 km south of the Nizhnemal'tsevo railroad station, which is on the Riazan'-Ruzaevka line. Established in 1553 as a fortified military post for the defense of the southern boundaries of the Russian state against invasion by the Tatars, Shatsk became a city in the Tambov Vicegerency in 1779 and a part of Tambov Province in 1796. Shatsk has a garment factory, a milk combine, and a plant producing liqueurs and spirits. The city also has an agricultural-mechanization technicum and a cultural-educational school. [29–919–1]

SHATSK, an urban-type settlement in Liuboml' Raion, Volyn' Oblast, Ukrainian SSR. Situated on the Iagodin-Kovel' line, 33 km from the Liuboml' railroad station, Shatsk has food-processing enterprises, an industrial combine, and a forestry technicum. [29–919–2]

SHATSKII, NIKOLAI SERGEEVICH. Born Aug. 16 (28), 1895, in Moscow; died there Aug. 1, 1960. Soviet geologist. Academician of the Academy of Sciences of the USSR (1953; corresponding member, 1943).

Shatskii enrolled in Moscow University in 1913 but was drafted into the army in his third year. From 1921 he taught at the Moscow Academy of Mines. Beginning in 1930, he taught at the Moscow Geological Prospecting Institute. At the same time, he worked at Gidroproekt (the S. Ia. Zhuk All-Union Project Surveying and Scientific Research Institute) and, after 1934, at the Geological Institute of the Academy of Sciences of the USSR, becoming the institute's director in 1956.

Shatskii's main works dealt with the comparative tectonics of ancient platforms (the Eastern European, Siberian, and North American platforms), the theory of geosynclines, and the duration of the processes of fold formation. Shatskii originated several new techniques and lines of investigation in solving tectonic problems, including the structural analysis of large tectonic forms of the crust, the comparative tectonic method of analysis, and a technique for analyzing facies and thicknesses of sedimentary formations. He was the first to formulate the principle of inheritance in geology and made a major contribution to the theory of geological formations. Under his guidance, the first *Geological Map of Eurasia* (scale of 1:6,000,000), *Tectonic Map of the USSR* (1953, 1956), and the *International Tectonic Map of Europe* (1964) were compiled. Shatskii identified the Riphean group and the Baikal folding. He introduced the concepts of anteclise, placosyncline, placanticline, and aulacogen, among others. Shatskii is the author of works about a number of classic naturalists, including C. Lyell, A. P. Karpinskii, C. Darwin, R. Murchison, A. D. Arkhangel'skii, and V. A. Obruchev. The school of Soviet tectonic specialists, which has received world recognition, took shape under Shatskii's leadership.

Shatskii received the State Prize of the USSR in 1946 and the Lenin Prize in 1958. He was awarded two Orders of Lenin, the Order of the Red Banner of Labor, and various medals.

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N. A. SHTREIS [29–881–1]

SHATSKII, STANISLAV TEOFILOVICH. Born June 1 (13), 1878, in the village of Voronino, in what is now Dukhovshchina Raion, Smolensk Oblast; died Oct. 30, 1934, in Moscow. Soviet educator; member of the collegium of the People's Commissariat for Education of the RSFSR (1929–34). Member of the CPSU from 1928.

Shatskii graduated from the division of natural sciences of the faculty of physics and mathematics at Moscow University. He began his educational work in 1905 in one of the outlying districts of Moscow, where he organized the first clubs in Russia for the children of workers. In 1911, using public funds, he and his wife, V. N. Shatskaia, organized a summer work colony known as Cheerful Life for members of the children's clubs.

After the October Socialist Revolution of 1917, Shatskii became head of the First Public Education Experiment Station of the People's Commissariat for Education of the RSFSR; he held this position from 1919 to 1932. The station had an urban division in Moscow and a rural division in Kaluga Oblast that included the Cheerful Life school-colony. It was a complex of pedagogical scientific research institutions, kindergartens, schools, extracurricular establishments for children, and cultural-educational establishments for adults. Methods of communist education were developed and put to practical test at the station. Particular attention was given to combining education with socially useful labor, to making classroom instruction more efficient, to developing group awareness, and to studying the interdependence of the school and its environment.

From 1932 to 1934, Shatskii headed the Central Experimental Laboratory of the People's Commissariat for Education of the RSFSR and served as the director of the Moscow Conservatory.

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L. N. SKATKIN [29–919–3]

SHATSKIN, LAZAR' ABRAMOVICH. Born 1902; died Jan. 10, 1937. Figure in the Soviet and international communist youth movements. Member of the Communist Party from May 1917.

Shatskin helped organize the Moscow committee of the Russian Communist League of Youth (RKSM) in 1917 and took part in the Civil War of 1918–20. From 1918 to 1922 he was a member of the Central Committee of the RKSM and served as the committee's secretary. Between 1919 and 1921 he also served as first secretary of the Communist Youth International (KIM). He was a member of the Central Committee of the Komsomol (All-Union Lenin Communist Youth League) from 1926 to 1928. Beginning in 1928, he engaged in state and party work.

Shatskin was a delegate to the First, Fourth, and Eighth Congresses of the Komsomol and to the Eighth through Thirteenth and the Fifteenth and Sixteenth Party Congresses. At the Fifteenth and Sixteenth Congresses he was elected to the Central Control Commission of the ACP(B). Shatskin was a delegate to the First through Third Congresses of the KIM and to the Second through Fifth Congresses of the Communist International (Comintern). Between 1919 and 1923 he served on the Executive Committee of the KIM.

In December 1930, Shatskin was removed from the Central Control Commission of the ACP(B) for factionalism.

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REFERENCE

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SHATT AL-ARAB, a river in the Mesopotamian Lowland.

The Shatt al-Arab is 195 km long and drains an area of more than 1 million sq km. Formed near the city of al-Qurnah by the confluence of the Tigris and Euphrates rivers, it forms a delta before emptying into the Persian Gulf. The channel of the river is between 700 and 1,000 m wide and from 7 to 20 m deep. The Karun River is a left tributary of the Shatt al-Arab.

High water on the Shatt al-Arab occurs in the spring; the water level is low in the autumn. The mean flow rate generally ranges from 1,000–2,000 cu m per sec to 6,000–8,000 cu m per sec; in particularly wet years it may reach 10,000–12,000 cu m per sec. The river is navigable; oceangoing vessels can sail as far as Basra. The cities of Basra (Iraq) and Abadan (Iran) are situated on the Shatt al-Arab. [29–882–1]

SHATUNOVSKII, SAMUIL OSIPOVICH. Born Mar. 12 (25), 1859, in the village of Velikaia Znamenka; died Mar. 27, 1929, in Odessa. Russian mathematician.

Shatunovskii was a professor at Novorossiia University in Odessa. His principal works deal with algebra, the axiomatics of linear magnitude and area, the substantiation of the concept of the volume of a polyhedron without the use of the concept of limit, and the structure of algebra. Particularly noteworthy is Shatunovskii's work on Galois theory as the study of congruences with respect to functional moduli, without the use of the law of the excluded middle, as applied to infinite sets.

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Chebotarev, N. G. "Samuil Osipovich Shatunovskii." *Uspekhi matematicheskikh nauk*, 1940, issue 7, pp. 316–21. [29–882–3]

SHATURA, a city (since 1936) under oblast jurisdiction and the administrative center of Shatura Raion, Moscow Oblast, RSFSR. Railroad station on the Moscow-Murom line, 127 km east of Moscow. Population, 27,000 (1974). Located in Shatura is the V. I. Ul'ianov-Lenin Shatura Electric Power Plant, as well as the Shaturtorf peat production association. The city also has a garment factory, a furniture combine, a meat-packing combine and a milk plant. Educational institutions include a technicum of the power industry. [29–883–1]

SHATURA ELECTRIC POWER PLANT (full name, V. I. Ul'ianov-Lenin Shatura Electric Power Plant), a fossil-fuel-fired steam electric power plant in the city of Shatura, Moscow Oblast, with a rated power of 1,330 megawatts (MW). Construction of the plant was begun in 1923, and the official ceremony of starting up the first generator of the state regional power plant was held on Dec. 6, 1925. Work on increasing capacity was begun soon after. The complete first stage, with a total rated power of 180 MW (three units of 44 MW each and three units of 16 MW each), went on line in 1933. The second stage, with a total rated power of 630 MW (three units of 210 MW each), went on line between 1966 and 1972. A third stage, now (1980) under construction, has a total rated power of 520 MW (two units of 210 MW each and one unit of 100 MW).

Milled peat and mazut are used as fuels. The water necessary for the plant's operation is supplied by a circulating system from the Shatura Lakes, with additional water from the Polia River. Electric power is transmitted through high-power, 110- and 220-kilovolt, transmission lines. The plant supplies electric power to the Moscow Power Grid of the Unified Central Power System, which is part of the Unified Power System of the USSR.

The plant was awarded the Order of Lenin (1939) and the Order of the Red Banner of Labor (1945).

V. N. OKHOTIN [29–883–2]

SHATURTORF, an urban-type settlement in Shatura Raion, Moscow Oblast. Shaturtorf has a railroad station on the Moscow-Murom line, 7 km from the city of Shatura. Industry is represented by a peat-processing enterprise. [29–883–3]

SHAUMIAN, LEV STEPANOVICH. Born Apr. 25, 1904, in Tbilisi; died May 24, 1971, in Moscow. Soviet journalist. Member of the CPSU from 1919. Son of S. G. Shaumian.

L. S. Shaumian studied at the Ia. M. Sverdlov Communist University in 1922 and 1923. He graduated from the Higher Party School under the Central Committee of the ACP(B) in 1948.

During the struggle of the Baku Commune against the Turkish interventionists in June and July 1918, L. S. Shaumian fought in a workers' *druzhina* (armed detachment). After the fall of Soviet power in Baku, he was arrested in September 1918 by counterrevolutionaries and imprisoned together with the Baku Commissars. In 1919 and 1920 he conducted underground party work in Baku and Tbilisi.

Between 1924 and 1932, Shaumian engaged in party work in Tsaritsyn (now Volgograd) and Rostov-on-Don. Between 1932 and 1946 he headed the editorial staffs of a number of newspapers; he was managing editor of *Ural'skii rabochii* from 1941 to 1946. In 1949 he joined the staff of the Sovetskaia Entsiklopediia Publishing House; in 1954 he became a member of the Chief Editorial Board of the *Great Soviet Encyclopedia* and the encyclopedia's deputy editor in chief.

Shaumian was awarded the Order of Lenin, two other orders, and various medals.

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SHAUMIAN, STEPAN GEORGIEVICH (party pseudonyms include Suren, Surenin, and Aiaks). Born Oct. 1 (13), 1878, in Tbilisi; died Sept. 20, 1918, between Pereval and Akhcha-Kuima stations on the Transcaspian Railroad. Communist party figure. One of the leaders of the revolutionary movement in the Caucasus; journalist; literary critic. Member of the Communist Party from 1900.

The son of a shop clerk, Shaumian graduated from the Tbilisi *Realschule* in 1898. In 1899, in the village of Dzhalal-Ogly (present-day city of Stepanavan), he organized the first Marxist circle in Armenia. He helped found the Union of Armenian Social Democrats in 1902 and emigrated late in that year to Germany, where he graduated in 1905 from the faculty of philosophy at Berlin University. He worked in foreign organizations of the RSDLP and published Social Democratic literature in Armenian and Georgian. He translated works by K. Marx, F. Engels, and V. I. Lenin into Armenian. Shaumian returned to Tbilisi in 1905.

One of the leaders of the Caucasian Union Committee of the RSDLP, Shaumian was a delegate to the Fourth and Fifth Congresses of the RSDLP in 1906 and 1907. He helped establish the Bolshevik organization in Baku. Shaumian founded and edited a number of Bolshevik newspapers and journals. In 1911 he was a member of the Russian Organizing Commission for the Sixth (Prague) All-Russian Conference of the RSDLP, which was held in 1912. He was co-opted at the conference as a candidate member in the Central Committee of the party. Shaumian became head of the Bolshevik organization in Baku in 1914 and a member of the Caucasian Bureau of the RSDLP in 1915.

After the February Revolution of 1917, Shaumian was chosen as chairman of the Baku soviet. A delegate to the First All-Russian Congress of Soviets, he was elected to the All-Russian Central Executive Committee. At the Sixth Congress of the RSDLP(B) he was elected a member of the Central Committee. In October 1917, Shaumian directed the First Congress of Bolshevik Organizations of the Caucasus, and in December he was appointed by the Council of People's Commissars of the RSFSR extraordinary commissar for Caucasian affairs. He led the suppression of the anti-Soviet revolt of the Musavatists in Baku in March 1918 and became chairman of the Baku Council of People's Commissars and commissar of external affairs in April. Shaumian was one of 26 Baku commissars executed by the Socialist Revolutionaries and British interventionists.

Shaumian was the author of works on Marxist-Leninist theory and philosophy and on art and literature. During their formative stages, his literary and esthetic views were influenced by the Russian revolutionary democrats. Shaumian considered literature and art specific forms of ideology and weapons in the class struggle. He defended the Leninist principle of *partiinost'* (party spirit) in literature and advocated the principles of realism and *narodnost'* (popular nature) of art. He wrote articles about L. N. Tolstoy and M. Gorky—for example, "Letter to the Editor in Memory of L. N. Tolstoy" (1910), "A Little About L. N. Tolstoy's Religion" (1911), and "Gorky" (1911). Shaumian's articles and letters contain original evaluations of Russian and foreign classics. With S. Spandarian, A. Miasnikov, and A. Karinian, he laid the foundations of Armenian Marxist criticism and esthetics.

Shaumian deserves considerable credit for the development of proletarian literature in Armenia and is known to have had a direct influence on the work of A. Akopian. In his articles "V. Papazian as Historian" (1912) and "Concerning the Anthology of Armenian Literature" (1916), Shaumian dealt with complex aspects of the history, literature, and social thought of the

Armenian people in the 19th and early 20th centuries, singling out in particular the work of Kh. Abovian and the activities of M. Nalbandian.

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[29–884–3]

SHAUMIANI (until 1925, Shulavery), an urban-type settlement in Marneuli Raion, Georgian SSR. Shaumiani is situated 7 km from the Shulaveri railroad station on the Tbilisi-Leninakan line. It has a grape-growing sovkhoz. The settlement is named in honor of S. G. Shaumian. [29–886–1]

SHAUMIANOVSK (until 1938, Nizhnii Agdzhakend), an urban-type settlement and the administrative center of Shaumianovsk Raion, Azerbaijan SSR. Shaumianovsk is situated 40 km southwest of the Geran' railroad station, which is on the Tbilisi-Baku line. There is a food-preserves plant in the settlement, which was renamed in honor of S. G. Shaumian. [29–886–2]

SHAUQI, AHMAD (also Ahmad Shawqi). Born Oct. 16, 1868, in Cairo; died there Oct. 14, 1932. Egyptian writer.

Shauqi came from an aristocratic family that was on close terms with the khedive's court. He studied law in France from 1887 to 1891. For his anti-British opinions, Shauqi was exiled to Spain from 1915 to 1919. In 1924 he was elected to the senate. He took part in congresses of Orientalists in Berlin (1891) and Geneva (1894).

Shauqi's poetry is thematically varied, ranging from panegyrics to children's poems and humorous verses. Four volumes of his divans have been published (1898, 1927, 1936, and 1943). They are works of the Egyptian neoclassical school and adhere to traditional literary models. However, their melodiousness (many of them have been set to music), as well as their generally understandable content and sincerity, made Shauqi the most popular poet of the Arabic world in the first half of the 20th century. In 1927 he was proclaimed "prince of poets."

Shauqi expressed sympathy toward Egyptian nationalism in his verse dramas on historical themes, which are obviously imitative and not particularly clear or well constructed. One of them, *The Great Ali Bey* (1893), may be considered the first original Arabic drama. Shauqi also wrote historical narratives and short stories.

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Daif, Sh. *Shauqi-shair al-asr al-hadith*. Cairo, 1957. [29–883–6]

SHAVER, a gear-cutting tool used for gear shaving. The cutting edges are arranged along the surface of the teeth of a spur or worm generating gear or along the surface of a generating rack. [29–1068–3]

SHAVERDIAN, DANUSH (also Daniel Aleksandrovich Shaverdov). Born Jan. 11 (23), 1882, in the village of Igaat, in what is now the Armenian SSR; died Oct. 24, 1941. Figure in the revolutionary movement in Transcaucasia. Member of the Communist Party from 1902.

The son of a *dvorianin* (nobleman), Shaverdian graduated from the faculty of law of the University of St. Petersburg in 1911. In 1902 he helped found the Union of Armenian Social Democrats, and in 1904 he began conducting party work in St. Petersburg and Tbilisi. He became a member of the executive committee of the Tbilisi soviet in March 1917, and in October of the same year he became a member of the Caucasian Regional Committee of the RSDLP(B). From 1918 to 1920, Shaverdian performed underground party work in Georgia, which was then controlled by the Mensheviks, and in Armenia, which was under the power of the bourgeois nationalist party Dashnaktsutiun. In 1919 he became a member of the Armenian Committee of the RCP(B) and the Foreign Bureau of the Communist Party (Bolshevik) of Armenia.

In 1921 and again from 1924 to 1928, Shaverdian was the trade representative of the Armenian Soviet Socialist Republic and the Transcaucasian Soviet Federated Socialist Republic in Turkey, and he organized the mass repatriation of Armenian working people. In 1922 and 1923 he served as people's commissar of justice and deputy chairman of the Council of People's Commissars of the Armenian SSR. Beginning in 1929 he was associated with the People's Commissariat for Foreign Trade of the USSR.

Shaverdian was a delegate to the Fourteenth Congress of the ACP(B) in 1925.

REFERENCE

Azatyan, H. G. *Danush Shahverdyan: Kyank'n u gortsuneut'yune*. Yerevan, 1975. [29–795–1]

SHAVGULIDZE, GEORGII VLADIMIROVICH. Born Nov. 6 (19), 1910, in Kutaisi; died Apr. 13, 1959, in Tbilisi. Soviet Georgian actor. People's Artist of the Georgian SSR (1955).

Shavgulidze was a pupil of K. A. Mardzhanishvili, under whose guidance he began his stage career in 1928 at the Kutaisi Theater (now the Mardzhanishvili Theater in Tbilisi). Known for his integral characterizations, he excelled in bold, romantic parts and was also physically striking and expressive in character roles. His best roles were Saiat-Nova in Gotua's *King Iraklii*, Farkhad in Khikmet's *Legend of Love*, Shpekin in Gogol's *The Inspector-General*, and Nikifor in Mosashvili's *His Star*. He also appeared in motion pictures, for example, in the title role in *David Guramishvili* (1946) and as Nino in *Keto and Kote* (1953).

Shavgulidze, a recipient of the State Prize of the USSR in 1952, was awarded two orders and several medals. [29–794–5]

SHAVING, in gear cutting, the finishing of untempered teeth on gear wheels by cutting thin chips with a shaver. Gear shaving is carried out on gear-shaving machines. It produces surfaces with an accuracy up to class 6 and a surface roughness up to class 8. [29–1068–4]

SHAVISHVILI, MIKHAIL KALISTOVICH. Born Sept. 2 (14), 1894, in Ozurgeti (now the city of Makharadze); died Mar. 8, 1966, in Tbilisi. Soviet architect. Honored Art Worker of the Georgian SSR (1947).

Shavishvili graduated from the Institute of Civil Engineering in Tbilisi in 1931. He joined the teaching staff in the same year and taught at the Georgian Polytechnical Institute from 1951 to 1954.

His most important structures were the physics and chemistry building of the University of Tbilisi (1940), building complexes for the Tbilisi Medical Institute (1940), the Georgian Polytechnical Institute in Tbilisi (1954), the Kutaisi Meskhishvili Theater (1955, with Sh. Tavadze), the residential settlement at the automotive plant (1958, with G. Chigogidze) in Kutaisi, and the Palace of Culture of Metallurgical Workers in Zestafoni (1962). [29–795–2]

SHAVLY, STIKHVAN (Stepan Antonovich Shumkov). Born Sept. 2 (15), 1910, in the village of Kamenka, in what is now Shentala Raion, Kuibyshev Oblast; died Feb. 15, 1976, in Cheboksary. Soviet Chuvash poet. People's Poet of the Chuvash ASSR (1974). Member of the CPSU from 1943.

Shavly, the son of poor peasants, graduated from the language and literature department of the Pedagogical Institute in Kazan (1939). Major themes in his works included V. I. Lenin (the narrative poem *The Green Statue*, 1957), the October Revolution, the struggle for the consolidation of Soviet power in Chuvashia (*October Poem*, 1953), and the courage and heroism of the Soviet people during the Great Patriotic War of 1941–45 (the narrative poems *The Pioneer From Kiev*, 1944; *Egor Madurov*, 1945; and *Zoia*, 1945). The narrative poem *Celestial Man* (1963) is a tribute to cosmonaut A. G. Nikolaev. Shavly wrote the collections of satirical verse *Pointing the Finger* (1958) and *Thorns* (1965) and the short-story collection *I Took the Sonorous Gusli in Hand* (1968).

Shavly translated into Chuvash the works of P. P. Ershov, M. Iu. Lermontov, I. A. Krylov, and J. Rainis. Shavly's works have been translated into the languages of the peoples of the USSR and into foreign languages.

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N. S. DEDUSHKIN [29–795–3]

SHAVROV, IVAN EGOROVICH. Born Mar. 14 (27), 1916, in the village of Shabuni, in what is now Vitebsk Raion, Vitebsk Oblast. Soviet military leader. General of the army (1973). Member of the CPSU since 1940.

The son of a peasant, Shavrov joined the Red Army in 1935. He graduated from a school for armored troops in 1938, the Military Academy of Mechanization and Motorization of the Workers' and Peasants' Red Army in 1941, and the K. E. Voroshilov Higher Military Academy in 1948. He completed the Higher Academic Courses at the Voroshilov academy in 1968.

During the Great Patriotic War, Shavrov served between 1941 and 1943 as a battalion chief of staff and as deputy chief of staff and chief of staff of a tank brigade. In 1943 he became chief of the operations section of the directorate in charge of the armored and mechanized forces of the Don Front and then held the same position in the Fourth Guards Tank Army. He was chief of staff of a tank corps between 1943 and 1945 on the Briansk, Southwestern, Don, Central, Fourth Ukrainian, and First and Second Baltic fronts.

After the war, Shavrov held staff and command positions in the armored and mechanized combat arms. He became first deputy commander of the Baltic Military District in October 1963, commander of the Leningrad Military District in May 1967, and head of the K. E. Voroshilov Military Academy of the General Staff of the Armed Forces of the USSR in February 1973. Shavrov was a member of the Central Committee of the CPSU from 1971 to 1976 and a deputy to the eighth convocation of the Supreme Soviet of the USSR. He has been awarded the Order of Lenin, four Orders of the Red Banner, the Order of Suvorov Second Class, two Orders of Kutuzov Second Class, two Orders of the Red Star, the Order For Service to the Motherland in the Armed Forces of the USSR Third Class, and various medals. Shavrov has also received foreign orders and medals. [29–796–1]

SHAVSHETI RANGE, a mountain range in southwestern Transcaucasia, on the border of the Adzhar ASSR and Turkey. The range measures approximately 65 km in length and rises to a maximum elevation of 2,812 m at Mt. Kheva. Plateau-like surfaces predominate in the relief. The range is composed of volcanogenic flysch and sandstones. The slopes are covered with broad-leaved and fir-spruce forests with evergreen undergrowth. Subalpine meadows grow along the ridge. [29–796–3]

SHAVTELI, IOANE. Dates of birth and death unknown. Georgian poet and odist of the 12th and early 13th centuries.

Shavteli wrote the religious panegyric *Praise to Our Lady of Vardzia*. The odic narrative poem *Abdul-Messiah*, which is worldly in content but full of Christian religious motifs, is also attributed to Shavteli. Some scholars believe that Abdul-Messiah is modeled on a historical figure.

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SHAVYRIN, BORIS IVANOVICH. Born Apr. 27 (May 10), 1902, in Yaroslavl; died Oct. 9, 1965, in Moscow. Soviet designer of mortars and rocket launchers. Hero of Socialist Labor (1945); doctor of technical sciences (1952). Member of the CPSU from 1943.

After his graduation from the Yaroslavl Evening Workers' School in 1925 and the N. E. Bauman Moscow Higher Technical School in 1930, Shavyrin, the son of a railroad worker, worked as an engineer and taught. He became a senior engineer and designer in 1932 and later headed design offices in various factories. In April 1942 he was appointed manager and chief designer of a newly created specialized design office, which he headed until the end of his life.

In 1937 and 1938, Shavyrin supervised and took part in the development of a Soviet mortar system, which comprised the 50-mm company mortar, the 82-mm battalion mortar, the 107-mm mortar to be carried on packsaddles, and the 120-mm regiment mortar. The simplicity and superiority of design of these mortars made it possible to mass-produce them quickly and to meet the needs of the front. In 1949 and 1950, Shavyrin directed the development of the 160-mm and 240-mm mortars as well as of a number of other weapons.

Shavyrin received the Lenin Prize in 1964 and the State Prize of the USSR in 1942, 1950, and 1951; he was awarded two Orders of Lenin, three other orders, and various medals.

REFERENCE

Latukhin, A. N. *Minomety*. Moscow, 1970.

A. N. LATUKHIN [29–796–4]

SHAW, GEORGE BERNARD. Born July 26, 1856, in Dublin; died Nov. 2, 1950, in Ayot St. Lawrence. English playwright. Irish by birth.

Shaw spent his early years in Dublin and worked as a clerk after he graduated from school in 1871. In 1876 he moved to London and devoted himself to journalism, including work as a music reviewer, and literature. His novels *The Irrational Knot* (1880), *Love Among the Artists* (1881), and *Cashel Byron's Profession* (1882) and the novel of sharp social content *An Unsocial Socialist* (1883, separate edition 1887; Russian translation *The Amateur Socialist*, 1910) were rejected by bourgeois publishers and were printed in socialist periodicals. As one of the leaders of the Fabian Society, Shaw worked for a number of years to propagate the ideas of socialism, publishing tracts, pamphlets, and books.

Even in Shaw's first literary work, his novels, the heart of his creative method was determined—the use of paradox as a means of overcoming prevailing ideologies. His first play, *Widowers' Houses* (1892), caused a scandal and was unsuccessful, as was the play that followed, *The Philanderer* (1893). *Mrs. Warren's Profession* (1894), which dealt with the theme of prostitution, was first staged in England in 1907. The difficulties with production forced Shaw to publish his plays (the press was not subjected to prior censorship). *Widowers' Houses*, *The Philanderer*, and

Mrs. Warren's Profession were published in a collection entitled *Plays Unpleasant* (1898); a second cycle, *Plays Pleasant*, was then published, including *Arms and the Man* (1894), *Candida* (1894), *The Man of Destiny* (1895), and *You Never Can Tell* (1895). These were followed by a third cycle, *Three Plays for Puritans* (1901), which included *The Devil's Disciple* (1896–97), *Caesar and Cleopatra* (1898), and *Captain Brassbound's Conversion* (1899).

One of the founders of the modern "drama of ideas," Shaw created a type of discussion play, in which the clash of ideas and hostile ideologies posed the most acute problems of social and personal morality. *Man and Superman* (1901–03), a "comedy and philosophy" by Shaw's definition, transforms the traditional theme of Don Juan: the hero is pursued by a woman. In the interlude of this play, "Don Juan in Hell," a strikingly forceful criticism of the vices of capitalist civilization is expressed through the mouth of the Devil. In *John Bull's Other Island* (1904), Shaw used his two main characters to contrast not only national types—the Irishman and the Englishman—but correspondingly the "romantic" and the "realist," as Shaw interpreted them. *Major Barbara* (1905) contains a criticism of bourgeois philanthropy; in the play Shaw first expressed the idea that bourgeois violence must be opposed by a force that serves social progress and justice. Even in the solution of personal problems, Shaw remained a distinctly social dramatist. *The Doctor's Dilemma* (1906) shows how medicine loses its humane character under bourgeois conditions; *Androcles and the Lion* (1913) criticizes dogmatic Christianity. *Getting Married* (1908), *Misalliance* (1910), and *Fanny's First Play* (1911) are devoted to questions of family, marriage, and education. *The Shewing-Up of Blanco Posnet* (1909) depicts the exposure of the religious sanctimoniousness of the petite bourgeoisie. *Pygmalion* (1913), which deals with problems of culture based on differing speech patterns and with general spiritual development, shows the moral superiority of a girl from the lower classes over an outwardly intelligent, aristocratic professor of phonetics.

Shaw responded to the October Revolution of 1917 in Russia with the grotesque farce *Annajanska, the Bolshevik Empress* (1918), in which he spoke out very determinedly for the use of violent methods to transform society. In the play *Heartbreak House* (1913–19), written under the obvious influence of A. P. Chekhov, he denounces the parasitism of the ruling class, their loss of spiritual values, and the erosion of individuality of character. On the other hand, old Captain Shotover in the play sees salvation in work and in the decisive reform of the entire structure of life. *Back to Methuselah* (1918–20), a "metabiological" drama consisting of five parts not connected by a common plot, depicts a whimsical utopia inhabited by a race of long-livers. *Saint Joan* (1923) is a tragedy, the only one written by Shaw. In his treatment of the story of Joan of Arc, Shaw introduced a new theme: the Maid's power comes not from a psychological obsession, but from reason, which is feared equally by the French and the English. When the "danger" represented by Joan has disappeared after her execution, she is exonerated; however, no one desires that she should come back to life.

After an interval of several years, Shaw returned to writing plays, startling the world with the freshness and wit of his "political extravaganzas" (so-called eccentric comedies): *The Apple Cart* (1929), *Too True to Be Good* (1931), *On the Rocks* (1933), *The Simpleton of the Unexpected Isles* (1934), and *Geneva* (1938), as well as with the historical play *Good King Charles's Golden Days* (1939) and the comedy *The Millionairess* (1936). The idea that capitalist society has reached an impasse and bourgeois democracy is experiencing an acute crisis runs through all of the plays; fascism is condemned in *Geneva*.

In 1931, Shaw visited the USSR, of which he had been a friend from the first years of the Great October Socialist Revolution. The fighting spirit of the publicist was evident in his public appearances until Shaw's last years. His last plays were *Buoyant Billions* (1948) and *Farfetched Fables* (1950).

Although their staging was delayed, Shaw's plays gradually gained widespread recognition and became a major force in the literature of the late 19th and the first half of the 20th century. His work bore the clear stamp of the publicist and was inspired by deep philosophical meditation on the social, cultural, and biological future of mankind. His remarkable skill turned his plays into a forum for social and philosophical discussion. Shaw's best plays have become part of the standard repertoire of many theaters in the Soviet Union. Shaw was awarded the Nobel Prize in 1925.

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A. A. ANIKST [29–1379–4]

SHAW, IRWIN. Born Feb. 27, 1913, in New York City. American writer.

Shaw graduated from Brooklyn College in 1934. His first play, *Bury the Dead* (1936), is notable for its sharp antiwar leanings. The play *The Gentle People: A Brooklyn Fable* (1939; Russian translation, 1965) sounded a warning to America about violence and gangsterism. Shaw's novel *The Young Lions* (1948; Russian translation, 1962) is among the best works about World War II; scenes of fascist barbarism alternate with realistic sketches of tyranny and discrimination in the US Army. In his sharply social novels, Shaw emphasizes the problem of preserving moral values and dwells on the spiritual strivings of the heroes (*The Troubled Air*, 1950; *Evening in Byzantium*, 1973; Russian translation, 1975). Shaw has also written collections of short stories, the publicist work *In the Company of Dolphins* (1964), and screenplays.

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Nightwork. London, 1975.
In Russian translation:
Solnechnye berega reki Lety. [Moscow, 1969.]
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SHAW, WILLIAM NAPIER. Born Mar. 4, 1854, in Birmingham; died Mar. 23, 1945, in London. English meteorologist. Member of the Royal Society of London (1891).

After graduating from Cambridge University in 1877, Shaw worked at the university. In 1900 he began working for the British Meteorological Council, and in 1905 he was named director of the Meteorological Office, where he remained until 1920. From 1920 to 1924 he was a professor of meteorology at the Imperial College in London. Shaw was president of the International Meteorological Committee from 1907 to 1923.

Shaw's principal works dealt with dynamic meteorology. Shaw studied the origin of cyclones. In 1925 he proposed a method of investigating the vertical temperature and moisture distributions in the atmosphere by means of adiabatic diagrams.

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The Air and Its Ways. Cambridge, 1923.
The Drama of Weather, 2nd ed. Cambridge, 1939. [29–1382–2]

SHAWI, NIQULA. Born Mar. 14, 1912, in Tripoli, Lebanon. Figure in the Lebanese working-class and national liberation movement.

In 1933, Shawi joined the Syrian Communist Party, which at that time included both Syrian and Lebanese Communists. In 1934 he was elected to the Central Committee of the SCP, and in 1937 he became secretary of the Central Committee. After the division of the SCP in 1944 into the independent Syrian and Lebanese Communist parties, Shawi became secretary and a member of the Central Committee of the Lebanese Communist Party (LCP). From 1948 to 1958, while the two parties were reunited as the Communist Party of Syria and Lebanon, he was a member of the party's Central Committee and Central Leadership. From 1958 to 1965, Shawi was secretary of the Central Committee of the LCP, and from 1965 to 1979 he was general secretary of the Central Committee. In 1979, Shawi became honorary president of the LCP. [29–883–5]

SHAWINIGAN (until 1958, Shawinigan Falls), a city in Canada, on the St. Maurice River, in Quebec Province. Population, 27,500 (1971). A hydroelectric power plant with a capacity of 1.5 gigawatts is located at Shawinigan. In addition to an aluminum smelter and textile enterprises, the city has a chemical industry and a pulp and paper industry. [29–1333–2]

SHAWNEE, an Algonquian-speaking tribe of North American Indians. Until the early 17th century the Shawnee lived in southeastern North America, along the Cumberland River in Tennessee, where they engaged in land cultivation and hunting. In the 17th and 18th centuries they were driven off their lands; they were initially pushed northward to Pennsylvania, then westward to Missouri. In the early 19th century Tecumseh, the war chief of the Shawnee, tried to organize a confederacy of Indian tribes to resist the advance of settlers beyond the Ohio River. The forces of the confederacy were dispersed, and the Shawnee were settled on a reservation in Kansas; eventually they were resettled in Oklahoma. According to the 1970 census, the Shawnee number 2,200, most of whom work as hired laborers. [29–886–3]

SHAYDA (Kazimkhan Khattak). Born 1727 in Afzalabad, now in Pakistan; died late 18th century in Rampur, now in India. Afghan (Pashtoon) poet. Representative of feudal secular poetry. Great-grandson of Khushhalkhan Khattak.

Shayda traveled widely in India. Influenced by Sufism, he joined the Naqshabandi, a Sufi sect. The Indian style and especially the work of Mirza Abdulkadir Bedil had a distinct influence on Shayda's poetry. For the first time in Afghan poetry, images, symbolism, and devices of the Indian style were widely reflected in Shayda's *Divan* (1767).

The themes of Shayda's poetry range from the intimate and lyrical to the philosophical and didactic. His works are exceptionally complex in form and abound in foreign vocabulary, mainly borrowed from classical Persian and Tadzhik poetry.

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SHAYKHI, followers of a Muslim Shiite sect established in the late 18th century by Sheikh Ahmad al-Ahsai (born 1744; died 1827 or 1828), who preached in Iran and Iraq. The first tenet of the sect was belief in the inevitability of the coming of the Mahdi, who would destroy the injustice that the Shaykhi thought had spread throughout the land. The second tenet was belief in the appearance of a man whom the Shaykhi called the Gate (*bab*), who would be an intermediary between the Mahdi and the people. The foundations of the sect's teachings were developed by the Bab (*see* BABISM). In the 1840's the sect essentially disintegrated. [29–1087–3]

SHAYKH 'UTHMAN, a city in the People's Democratic Republic of Yemen, a suburb of Aden. Population, 35,000 (1960). The city is a highway junction and a trade center. It has cottage industries specializing in pottery-making, weaving, and dyeing, as well as wine-making. [29–1088–1]

SHAYS, DANIEL. Born circa 1747 in Hopkinton, Mass. (now in New Hampshire); died Sept. 29, 1825, in Sparta, N.Y. Leader of a rebellion of poor farmers in the USA in 1786 and 1787.

From 1775 to 1780, Shays fought in the American Revolution. In 1777 he received the rank of captain for distinction in battle. After the war, Shays engaged in farming. In 1786 he headed a rebellion in Massachusetts (*see* SHAYS' REBELLION). After it was defeated, Shays was sentenced to death in 1787 but was pardoned in 1788. [29–1086–1]

SHAYS' REBELLION (1786–87), an uprising of poor farmers in the USA led by D. Shays; it took place under the conditions of the aggravation of the class struggle that existed after the close of the American Revolution.

The rebellion was joined by craftsmen and former soldiers. The rebels demanded equal distribution of land and wealth, the abolishment of all debts, and fair legal proceedings. They attacked courtrooms, destroyed files of debt prosecutions, and freed debtors. In December 1786, about 1,100 rebels unsuccessfully tried to seize the arsenal in Springfield, Mass. In February 1787 the rebels were defeated by government troops. Thirteen leaders of the uprising were sentenced to death, but they were subsequently pardoned. The rebellion was the culmination of the democratic movement in the USA in the last quarter of the 18th century. [29–1086–2]

SHAZHERE (also Shadzhara), the name used by some peoples of the East for oral or written historical and genealogical traditions. Knowledge of the origins of a family, clan, tribe, or people and their former clan and tribal organization was supplemented by descriptions of historical events and by documents. The *shazhere* of the Iurmats, a Bashkir tribe, contain information on the incorporation of the Bashkirs into the Russian empire. Some *shazhere* were in verse.

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SHCHADENKO, EFIM AFANAS'EVICH. Born 1885, in the *stanitsa* (large cossack village) of Kamenskaia, now the city of Kamensk-Shakhtinskii, Kamensk Raion, Rostov Oblast; died Sept. 6, 1951, in Moscow. Soviet military leader. Colonel general (1942). Member of the CPSU from 1904.

The son of a worker, Shchadenko became chairman of the Kamensk Committee of the RSDLP(B) in February 1917. During the October Revolution of 1917 he organized Red Guard detachments and helped crush counterrevolutionary centers in the Don region. In January 1918 he was elected a member of the Don Military Revolutionary Committee. After joining the Red Army in June 1918, Shchadenko served as a member of the Revolutionary Military Council of the First Horse Army from November 1919 to July 1920 and held the same position in the Second Horse Army from July until December 1920. Shchadenko completed two courses at the Military Academy of the General Staff in 1923. He commanded a cavalry division and was chief of a district political directorate. He became a member of the Military Council of the

Kiev Military District in May 1937 and deputy people's commissar of defense and chief of the Directorate for Command and Staff Personnel of the Workers' and Peasants' Red Army in November.

During the Great Patriotic War of 1941–45, Shchadenko served as deputy people's commissar of defense of the USSR. He was chief of the Main Directorate for Recruitment and Staffing of the Red Army from 1941 to 1943, a member of the Military Council of the Southern Front in September and October 1943, and a member of the Military Council of the Fourth Ukrainian Front from October 1943 to January 1944.

Shchadenko was a member of the Central Control Commission from 1930 to 1934 and a member of the Central Committee of the ACP(B) from 1939 to 1941. He became a candidate member of the Central Committee of the ACP(B) in 1941 and was a deputy to the first convocation of the Supreme Soviet of the USSR. Shchadenko was awarded four Orders of Lenin, four Orders of the Red Banner, the Order of Suvorov Second Class, the Order of the Red Star, and various medals. [29–1572–1]

SHCHAPOV, AFANASII PROKOF'EVICH. Born Oct. 5 (17), 1831, in the village of Anga, Verkholensk District, Irkutsk Province; died Feb. 27 (Mar. 10), 1876, in Irkutsk. Russian historian and publicist.

The son of a sexton, Shchapov studied at the Kazan Theological Academy from 1852 to 1856; he graduated with a baccalaureate degree. He taught Russian history at the theological academy from 1856 to 1860 and at Kazan University in 1860 and 1861. On Apr. 16, 1861, he delivered a revolutionary speech at a requiem for the victims of the Bezdna uprising of 1861; he was arrested and sent to St. Petersburg. After an investigation Shchapov was prohibited from teaching and was appointed an official for sectarian affairs in the Ministry of the Interior. In 1862 he was dismissed from his position and put under police supervision.

Shchapov was a contributor to such journals as *Otechestvennye Zapiski, Russkoe slovo, Vremia*, and *Vek*. Exiled to Siberia in 1864 on suspicion of being associated with A. I. Herzen and N. P. Ogarev, he went first to Anga and then to Irkutsk. In 1866 he served as an ethnographer on an expedition to Turukhansk Krai conducted by the Siberian Department of the Russian Geographic Society. In the summer of 1865, Shchapov was arrested in connection with the case of the Siberian *oblastniki* (revolutionary group of Siberian intellectuals). After his release he became a contributor to the journals *Delo* and *Zapiski Sibirskogo otdela RGO* (Notes of the Siberian Department of the Russian Geographic Society). He died of tuberculosis.

Shchapov wrote many works on the history of sectarianism and the schism (*raskol*), which he viewed as expressions of popular protest against social oppression. From 1856 to 1864, under the influence of G. Z. Eliseev and S. V. Eshevskii, he supported the *zemstvo-oblast* theory, which was accepted in Russian demographic historiography and which viewed the history of Russia from the standpoint of the interrelationships of separate areas ("oblasts"). Later, while in exile, Shchapov subjected the theory to criticism; influenced by the ideas of N. G. Chernyshevskii, D. I. Pisarev, H. T. Buckle, and the positivists, he attempted to apply the methods of natural science to the study of the history of the development of the Russian people.

Under the influence of the ideas advanced by Shchapov, a trend toward studying the effects of geography and economics developed in Russian historical science. This trend, which was progressive for its time, found expression in the works of such historians as V. O. Kliuchevskii.

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SHCHARA, a river in the Byelorussian SSR, a left tributary of the Neman. The Shchara is 325 km long and drains an area of 9,990 sq km. The river rises in the Byelorussian Shelf. It is fed by mixed sources, but predominantly by snow; high water occurs between late February and May. The mean flow rate 63 km from the mouth is 31 cu m per sec. The river freezes over between November and January, and the ice breaks up between late February and the first half of April. The Shchara is linked with the Iasel'da River of the Dnieper basin by the Oginskii Canal and Vygonovskoe Lake. There are locks on the lower and middle course of the river, along the last 200 km of its length. The city of Slonim is situated on the Shchara. [29–1573–1]

SHCHEBETOVKA, an urban-type settlement in Sudak Raion, Crimean Oblast, Ukrainian SSR. Shchebetovka is situated 27 km from Feodosiia. Its enterprises include the Koktebel' viticultural sovkhoz and plant. [29–1573–3]

SHCHEDRIN, FEODOSII FEDOROVICH. Born 1751 in St. Petersburg; died there Jan. 19 (31), 1825. Russian sculptor. Brother of Semen F. Shchedrin.

Shchedrin studied with N. F. Gillet at the St. Petersburg Academy of Arts from 1764 to 1773. He studied in Florence and Rome from 1773 to 1775 and in Paris from 1775 to 1785 on a stipend from the academy. In 1794, Shchedrin became an academician and an instructor at the academy; he was made rector in 1818.

Although his early work was baroque in tradition (for example, his dynamic *Mars*, gypsum, 1776, Scientific Research Museum of the Academy of Arts of the USSR, Leningrad), Shchedrin had become one of the foremost masters of Russian classicist sculpture by the late 1770's. His free-standing works are characterized by classical clarity, elegance, and subtle modeling (*Sleeping Endymion*, bronze, 1779; *Venus*, marble, 1792—both in the Russian Museum, Leningrad). A master of monumental decorative sculpture, Shchedrin attained an organic interdependence of the decorative and representational—a true synthesis of arts—particularly evident in the heroic and deeply patriotic sculptural ornament of the Admiralty in St. Petersburg (the figures on the colonnade of the central tower, three figures on the cornice wall, and the two groups of sea nymphs; limestone, 1812–13). Shchedrin also did a number of portraits, for example, *N. I. Panin* (bas-relief, marble, 1794, Historical Museum, Moscow) and *A. A. Nartov* (marble, 1811, Russian Museum, Leningrad).

REFERENCE

Kaganovich, A. *F. F. Shchedrin*. Moscow, 1953. [29–1580–1]

SHCHEDRIN, NIKOLAI PAVLOVICH. Born 1858 in Petropavlovsk, in what is now the Kazakh SSR; died Jan. 10, 1919, in Kazan. Russian revolutionary Narodnik (Populist).

The son of a *dvorianin* (nobleman), Shchedrin studied at the Omsk Military Gymnasium. In 1876 he joined the organization Land and Liberty in St. Petersburg; after it split in 1879, he became a member of the Black Partition. In the spring of 1880 he and E. N. Koval'skaia organized the Southern Russian Workers' Union in Kiev. Schedrin wrote the union's program and many proclamations.

In October 1880, Shchedrin was arrested. On May 29, 1881, the Kiev Military District Court sentenced him to death, but the sentence was commuted to life at hard labor. He served the first part of his sentence at the Kara Penal Colony, where he was chained to a wheelbarrow. In 1882 he was transferred to the Aleksei Ravelin, and in 1884, to Shlissel'burg Fortress; soon after his arrival at the fortress he became mentally ill. In 1896, Shchedrin was transferred to the Kazan Psychiatric Hospital, where he remained until his death.

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[29–1578–1]

SHCHEDRIN, RODION KONSTANTINOVICH. Born Dec. 16, 1932, in Moscow. Soviet composer. People's Artist of the RSFSR (1976).

In 1955, Shchedrin graduated from the Moscow Conservatory, where he had studied composition with Iu. A. Shaporin and piano with Ia. V. Flier. He has created important works in a variety of genres, including the operas *Not For Love Alone* (1961) and *Dead Souls* (based on the novel by N. V. Gogol; libretto by the composer, 1977) and the ballets *The Humpback Horse* (1960), *The Carmen Suite* (based on the opera by G. Bizet, 1967), *Anna Karenina* (1972), and *The Seagull* (1980). All the above works were first staged at the Bolshoi Theater in Moscow.

In his music Shchedrin methodically combines elements of Russian folklore and innovative compositional devices. Among his works are the oratorio *Lenin in the Heart of the People* (1969), *Poetic Oratorio* (to words by A. A. Voznesenskii; 1968), and two symphonies (1958 and 1965; second version, 1976). Shchedrin has also composed two concerti for orchestra—*Mischievous Ditties* (1963) and *Chimes* (1968); three concerti for piano and orchestra (1954, 1966, and 1973); works for piano, including 24 preludes and fugues (1970); and the *Polyphonic Notebook* (1972).

Shchedrin became chairman of the administrative board of the Composers' Union of the RSFSR in 1973. He was a deputy to the sixth, ninth, and tenth convocations of the Supreme Soviet of the RSFSR. He received the State Prize of the USSR in 1972 and was made an honorary corresponding member of the Bavarian Academy of Fine Arts in 1976. In 1962 he became a member of the Soviet Committee for the Protection of Peace. Shchedrin has been awarded two orders and various medals. [29–1578–2]

SHCHEDRIN, SEMEN FEDOROVICH. Born Apr. 6 (17), 1745, in St. Petersburg; died there Sept. 1 (13), 1804. Russian landscape painter. The brother of F. F. Shchedrin.

Shchedrin studied at the St. Petersburg Academy of Arts from 1759 to 1767. He received a stipend to study in Paris with F. Casanova from 1767 to 1769 and in Italy from 1769 to 1772. He stayed in Italy until 1776, at which time he returned to St. Petersburg to teach at the Academy of Arts. Shchedrin became an academician in 1779 and adjunct-rector in 1798. In 1799 he became head of the academy's landscape engraving class.

Shchedrin's paintings are in the spirit of sentimentalism. His park scenes—primarily of Peterhof, Gatchina, and Pavlovsk—combine principles of decorative and landscape painting. Yet despite conventional composition and color, they convey the beauty of nature and depict specific locales (for example, *The View of Gatchina Palace From Dlinnyi Island*, 1796; the panel *Stone Bridge at Gatchina Near Konetabl' Square*, 1799–1800—both at the Tret'iakov Gallery, Moscow).

Shchedrin helped establish the landscape as an independent genre in Russian painting and gave it a national character.

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SHCHEDRIN, SIL'VESTR FEODOSIEVICH. Born Feb. 2 (13), 1791, in St. Petersburg; died Oct. 27 (Nov. 8), 1830, in Sorrento. Russian landscape painter; one of the founders of the Russian realistic landscape school. Son of the sculptor F. F. Shchedrin and nephew of the landscape painter S. F. Shchedrin.

Shchedrin studied with M. M. Ivanov and F. Ia. Alekseev at the Academy of Arts in St. Petersburg from 1800 to 1812. In 1818 he received a stipend from the academy to study in Italy. Shchedrin's early landscapes were in the spirit of classicism. In Italy the artist evolved from a devotion to antiquity to a careful study of nature. Unlike his predecessors, he did studies in oil, observing the color and light relationships in the landscape (*The Coliseum*, 1819, Tret'iakov Gallery, Moscow).

In the series *The New Rome* (1823–25), Shchedrin conveyed a total picture of the city, depicting its modern and ancient buildings and scenes from everyday life. His desire for naturalness and for a thorough portrayal of nature in his works sparked Shchedrin's efforts to present a unity of nature and lighting; the same goals are evident in his plein-air representations and his use of uniform tonality and color. The paintings *Small Dock in Sorrento*, *On the Island of Capri*, and *View of Sorrento Near Naples* (all 1826, Tret'iakov Gallery) reveal a poetic treatment of nature. The ambience of light and air is conveyed by a very subtle range of silver hues, and genre motifs dissolve into the landscape. The series *Terraces in Sorrento* (1825–28) is permeated with a feeling of the sweetness of midday in summer, peaceful tranquility and happiness, and the beauty of everyday life. Genre motifs occupy a large place in the series, but at the same time there is a certain color intensity and emphasized emotionalism. Shchedrin's landscapes from 1828 through the 1830's, in particular the two versions of *Moonlit Night in Naples* (1828–29, Tret'iakov Gallery and Russian Museum, Leningrad), are marked by romantic animation and complex light and color effects.

Shchedrin's landscapes of Italy are full of poetic harmony, a harmony similar to that found in the works of the Russian poets K. N. Batiushkov, A. S. Pushkin, and E. A. Baratynskii. His realistic portrayal of nature and achievements in plein-air painting marked a new stage in the history of Russian landscape painting.

WORKS

Pis'ma iz Italii. Moscow-Leningrad, 1932.

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Fedorov-Davydov, A. *Russkii peizazh XVIII–nachala XIX veka*. Moscow, 1953. [29–1579–1]

SHCHEDROVSKII, IGNATII STEPANOVICH. Born Sept. 15 (27), 1815, in Raseiniai, Lithuania; died Dec. 25, 1870 (Jan. 6, 1871), in Moscow. Russian graphic artist, lithographer, and painter.

Shchedrovskii studied with J. Rustemas at the university in Vilnius. From 1833 to 1836 he attended the St. Petersburg Academy of Arts. Shchedrovskii produced detailed drawings whose truthful depiction of urban scenes and vivid social characterization of urban dwellers are reminiscent of the Venetsianov school. His works include the lithograph albums *Scenes From Russian Popular Life* (published 1839; the same works were redone for albums of colored autolithographs published in 1845 and republished in 1846, 1852, and 1855), *The Sbiten' Vendor* (1837, Russian Museum, Leningrad), and *The Carpentry Shop* (1839, Tret'iakov Gallery, Moscow).

REFERENCE

[Suris, B.] *I. S. Shchedrovskii*. Moscow, 1957. [29–1581–2]

SHCHEGLIAEV, ANDREI VLADIMIROVICH. Born Oct. 7 (20), 1902, in Moscow; died there Aug. 27, 1970. Soviet specialist in heat engineering. Corresponding member of the Academy of Sciences of the USSR (1953).

In 1926, Shchegliaev graduated from the N. E. Bauman Moscow Higher Technical School, where he was on the staff until 1930. Between 1930 and 1970, he was, successively, an instructor, a professor, and the head of a subdepartment at the Moscow Power Engineering Institute. In 1924, Shchegliaev joined the staff of the All-Union Scientific Research Heat Engineering Institute.

Shchegliaev's main works dealt with the study of thermal processes in steam turbines and with the development of systems for the control and automation of steam turbines. Shchegliaev developed a theory and proposed unique methods for the study of high-speed control processes.

Shchegliaev received the State Prize of the USSR in 1948 and 1952. He was awarded the Order of Lenin, four other orders, and various medals.

WORKS

Regulirovanie parovykh turbin. Moscow-Leningrad, 1962. (With S. G. Smel'nitskii.)
Parovye turbiny, 5th ed. Moscow, 1976. [29–1576–3]

SHCHEGLOV, AFANASII FEDOROVICH. Born Jan. 2 (15), 1912, in the village of Mikhali, in what is now Olenino Raion, Kalinin Oblast. Soviet military leader. General of the army (1970). Hero of the Soviet Union (Feb. 13, 1944). Member of the CPSU since 1939.

The son of a peasant, Shcheglov joined the Red Army in 1929. He graduated from the All-Russian Central Executive Committee Combined Military School in 1933, the M. V. Frunze Military Academy in 1939, and the K. E. Voroshilov Higher Military Academy in 1948. Shcheglov served in the Soviet-Finnish War of 1939–40 as an assistant department chief in the operations section of army headquarters. During the Great Patriotic War of 1941–45 he was commander of an artillery regiment in 1941 and 1942 and deputy chief of the operations section of the headquarters of the Leningrad Front in 1942 and 1943. He served on the Northern and Leningrad fronts as commander of the 63rd Guards Rifle Division in 1943 and 1944 and the 30th Guards Rifle Corps from October 1944 until the end of the war.

After the war, Shcheglov held command positions in the National Air Defense Forces and served from 1959 to 1966 as commander of the Baku Air Defense District. He became first deputy commander in chief of the National Air Defense Forces in July 1966 and was appointed the representative of the commander in chief of the Joint Armed Forces of the Warsaw Pact in one of the member countries in April 1974.

Shcheglov was a deputy to the sixth through eighth convocations of the Supreme Soviet of the USSR. He has been awarded four Orders of Lenin, three Orders of the Red Banner, the Order of Suvorov Second Class, the Order of Alexandr Nevsky, the Order of the Patriotic War First Class, the Order of the Red Banner of Labor, the Order of the Red Star, the Order for Service to the Motherland in the Armed Forces of the USSR Third Class, and various medals. Shcheglov has also received foreign orders and medals. [29–1575–1]

SHCHEGLOV, ALEKSANDR SERGEEVICH. Born Mar. 20, 1916, in the village of Chindianovo, in what is now Dubenki Raion, Mordovian ASSR. Soviet Mordovian writer. Member of the CPSU since 1940.

The son of a peasant, Shcheglov graduated from the Leningrad Institute of Journalism in 1939 and took part in the Great Patriotic War of 1941–45. He was first published in 1932. His works include the poetry collection *The Little Patriot* (1941), the narrative poem *Play, Bandura* (1944), the collections *Short Stories* (1951) and *Everybody Is Beautiful Here* (1963), the play *The Komsomol Card* (1950), and poems for children. His main themes are the heroism of the people during the Great Patriotic War and the comtemporary life of the Mordovian village.

Shcheglov was editor in chief of the journal *Siatko* from 1967 to 1971. His works have been translated into several languages of the USSR. Shcheglov has been awarded the Order of the Red Star and various medals.

WORKS
Alkukson' vechkema. Saransk, 1960.
Vishka p'esat. Saransk, 1965.
Utsiaska. Saransk, 1968.
In Russian translation:
Vernost': Povesti i rasskazy. Saransk, 1970.
Trudnaia liubov': Povesti i rasskazy. Saransk, 1976.
REFERENCE
Pisateli Sovetskoi Mordovii: Bibliograficheskii spravochnik. Saransk, 1970. [29–1574–2]

SHCHEGLOV, MARK ALEKSANDROVICH. Born Oct. 27, 1925, in Chernigov; died Sept. 2, 1956, in Novorossiisk. Soviet critic and literary scholar.

Shcheglov graduated from the philology department of Moscow State University in 1953. His work on Soviet authors includes articles on V. V. Ivanov, S. P. Antonov, and L. Leonov's novel *Russian Forest*; his work on the classical heritage includes articles on L. N. Tolstoy, F. M. Dostoevsky, and A. A. Blok. Shcheglov was also the author of critical-theoretical articles, such as "Realism in Contemporary Drama" (published 1956), "Faithfulness to Details" (published 1957), and "The Literary Sketch and Its Characteristics" (published 1958). His works reveal his subtle taste, public-minded spirit, and extensive knowledge of philology. Shcheglov's diaries and letters were published in 1963 under the title *Student Notebooks* and became widely known.

WORKS
Literaturnaia kritika. [Foreword by N. Gudzii.] Moscow, 1971.
Studencheskie tetradi. [Introductory article by V. Pankin.] Moscow, 1973.
REFERENCES
Surovtsev, Iu. "Liubimeishaia zhizn' okhvatyvaet menia." *Literaturnaia gazeta*, Aug. 20, 1963.
Burtin, Iu. "Mark Shcheglov—kritik." *Novyi mir*, 1966, no. 6.
Lakshin, V. "Mark Shcheglov: Napominanie ob odnoi sud'be." *Novyi mir*, 1969, no. 5.
Romanenko, V. "Sledovat' prizvaniiu." *Literaturnoe obozrenie*, 1975, no. 11. [29–1575–2]

SHCHEGLOVITOV, IVAN GRIGOR'EVICH. Born Feb. 13 (25), 1861; died Sept. 5, 1918. Reactionary state figure of tsarist Russia. Landowner in Chernigov Province.

Shcheglovitov graduated from a school of jurisprudence in 1881. In 1894 he became procurator of the St. Petersburg district court, and in 1903 he was made chief procurator of the criminal appellate department of the Senate. He prosecuted I. P. Kaliaev in 1905. Shcheglovitov served as minister of justice from 1906 until July 1915. One of the organizers of the coup d'etat of June 3, 1907, he was a close associate of P. A. Stolypin and a patron of the League of the Russian People. He was directly involved in organizing the Beilis case.

In 1915, Shcheglovitov was chairman of the congress of monarchists. With the help of G. E. Rasputin he was appointed chairman of the Council of State in 1917. Imprisoned in the Peter and Paul Fortress in the first days of the February Revolution of 1917, Shcheglovitov was executed by order of a revolutionary tribunal. [29–1576–1]

SHCHEGLOVSK, until 1932, the name of the city of Kemerovo, center of Kemerovo Oblast, RSFSR. [29–1576–2]

SHCHEGOLENOK, VASILII PETROVICH. Born 1805(?) in the village of Boiarshchina, Kizhi Volost (small rural district), in what is now the Karelian ASSR; died not earlier than 1886. Russian *skazitel'*, or singer of *byliny* (epic folk songs). Peasant.

In his performance of *byliny* Shchegolenok tended to combine different plots. Texts written down from his performances were published by P. N. Rybnikov, A. F. Gil'ferding, and E. V. Barsov. Shchegolenok was acquainted with L. N. Tolstoy, who borrowed a number of plots from him.

REFERENCE
Sokolov, Iu. M. "Lev Tolstoi i skazitel' Shchegolenok." *Letopisi Gos. lit. muzeia*, 1948, book 12. [29–1577–1]

SHCHEGOLEV, PAVEL ELISEEVICH. Born Apr. 5 (17), 1877, in the village of Verkhniaia Katukovka, in what is now Panino Raion, Voronezh Oblast; died Jan. 22, 1931, in Leningrad. Soviet literary scholar and historian.

In 1895, Shchegolev enrolled in the faculty of Oriental languages at the University of St. Petersburg. He was expelled in 1899, however, for taking part in student demonstrations. In 1903 his work *Vladimir Raevskii: The First Decembrist* appeared in print, and in 1905 *Griboedov and the Decembrists* was published. In 1906 and 1907, Shchegolev, together with V. Ia. Bogucharskii and V. L. Burtsev, published the journal *Byloe*, which dealt with revolutionary history, and in 1908 he helped edit the journal *Minuvshie gody*. Between 1905 and 1917, Shchegolev published the memoirs of the Decembrists M. A. Fonvizin, E. P. Obolenskii, V. I. Shteingel', A. E. Rozen, and N. V. Basargin. The first edition of Shchegolev's well-known book *The Duel and Death of Pushkin* came out in 1916. In July 1917 he resumed publication of *Byloe*, and the journal continued to be published until 1926.

After the February Revolution of 1917, Shchegolev served on the Extraordinary Investigatory Commission of the Provisional Government and reviewed the archives of the Police Depart-

ment. After the October Revolution of 1917, he published the collections of documents *The Fall of the Tsarist Regime* (vols. 1–7, 1924–27) and *The Petrashevskii Circle* (vols. 1–3, Moscow-Leningrad, 1926-27). An excellent textual critic and a specialist in sources, Shchegolev wrote a number of works that drew heavily on archival materials, including works on the history of the revolutionary movement in Russia and studies on the life and works of A. S. Pushkin, A. S. Griboedov, and M. Iu. Lermontov.

In 1930 and 1931, Shchegolev was a member of the editorial committee for the publication of the first complete edition of Pushkin's works to be issued in the Soviet period; the works were published in six volumes. In the 1920's he collaborated with A. N. Tolstoy in writing the plays *Azef* and *The Conspiracy of the Empress*. Together with O. D. Forsh, he wrote the scenario for the motion picture *The Palace and the Fortress*. Shchegolev was one of the founders of the Museum of the Revolution in Leningrad.

WORKS

Pushkin: Ocherki. St. Petersburg, 1912.
Istoricheskie etiudy. St. Petersburg, 1913.
P. G. Kakhovskii. Moscow, 1919.
Dekabristy. Moscow-Leningrad, 1926.
Pushkin i muzhiki. Moscow [1928].
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Pushkin: Isseldovaniia, stat'i, materialy, [3rd ed] vols. 1–2. [Moscow-Leningrad] 1928–31.
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Tolstoi, A. "P. E. Shchegolev." *Zvezda*, 1976, no. 5.

E. Iu. Litvin and I. L. Belen'kii [29–1576–6]

SHCHEGOLEV, VIACHESLAV IVANOVICH. Born Dec. 30, 1940, in Moscow. Soviet checkers player (international checkers). Honored Master of Sport (1964). International grandmaster (1960). Member of the CPSU since 1969.

Shchegolev was world champion on several occasions during the years 1960–61 and 1964–65 and USSR champion in 1959, 1963, 1964, and 1976.

WORKS

Ot novichka do chempiona. [Moscow, 1969]. [29–1576–5]

SHCHEKATIKHINA-POTOTSKAIA, ALEKSANDRA VASIL'EVNA. Born May 8 (20), 1892, in Aleksandrovsk (present-day Zaporozh'e) died Oct. 23, 1967, in Leningrad. Soviet master of painting on porcelain, painter, and graphic artist.

From 1908 to 1915, Shchekatikhina-Pototskaia studied at the Drawing School of the Society for the Encouragement of the Arts in St. Petersburg, where she was the student of I. Ia. Bilibin and of N. K. Rerikh from 1913 to 1915. She also studied at the Rançon Academy in Paris under F. Vallotton and M. Denis. She helped create the genre of Soviet "agitational porcelain."

Shchekatikhina-Pototskaia's highly expressive style of painting can be attributed to her subtle mastery of graphic technique, as well as to her use of stylized decorative forms, bright, simple color schemes, and free brushstrokes. Examples of her work include a dish from the series "The Hunt" (1933) and the decanter with goblets "The Little Fish" (1941).

Shchekatikhina-Pototskaia was awarded the Order of the Badge of Honor and several medals.

REFERENCE

Noskovich, V. "*A. V. Shchekatikhina-Pototskaia*. Leningrad, 1959.

[29–1582–2]

SHCHEKINO, a city under oblast jurisdiction and the administrative center of Shchekino Raion, Tula Oblast, RSFSR. Situated on the Moscow-Simferopol' highway. Railroad station on the Tula-Orel line, 22 km south of Tula. Population, 72,000 (1977).

Coal is mined near Shchekino, in the Moscow Basin. The city's chemical industry includes the production association Azot and a synthetic-fiber plant, both located in the settlement of Pervomaiskii, which is under the jurisdiction of the Shchekino city soviet. Shchekino has an experimental machine shop for the production of entry-driving mining equipment and a plant for the repair of industrial equipment. Shchekino's construction-materials enterprises include a pilot plant and the plant Kislotoupor. The city has food enterprises as well as a chemical engineering technicum, an economics technicum, and a museum of local lore. [29–1582–3]

SHCHEKOTOV, NIKOLAI MIKHAILOVICH. Born May 18 (30), 1884, in Moscow; died there Dec. 6, 1945. Russian and Soviet art historian, art critic, and artist.

From 1902 to 1908, Shchekotov attended lectures at the Polytechnic Academy in Friedberg and at the Engineering School in Mannheim. During that period he also traveled in Greece, Italy, Germany, and Austria. He first studied ancient Russian art with I. S. Ostroukhov; at the same time (1910–11) he studied painting at K. F. Iuon's school in Moscow. In 1918 he began his career as a critic, publicist, and museum official. Shchekotov was a member of the collegium of the People's Commissariat of Education from 1918 to 1922, director of the Russian Historical Museum from 1921 to 1925, and director of the Tret'iakov Gallery in 1925 and 1926. He was a member of the Association of Ártists of Revolutionary Russia from 1923 to 1932. His principal theoretical works are on the history of Russian and Soviet art.

WORKS

Stat'i, vystupleniia, rechi, zametki. Moscow, 1963. (Contains bibliography.) [29–1582–4]

SHCHEL'IAIUR, an urban-type settlement in Izhma Raion, Komi ASSR. Shchel'iaiur has a landing on the left bank of the Pechora River, 147 km northwest of the Irael' railroad station on the Kotlas-Vorkuta line. The settlement is a repair and operational center for river shipping. [29–1589–3]

SHCHELKALOV, ANDREI AND VASILII IAKOVLEVICH, two state and political figures in Russia in the second half of the 16th century and the early 17th century.

Andrei Iakovlevich Shchelkalov. Date of birth unknown; died circa 1597.

Shchelkalov was a *d'iak* (administrative clerk) by 1562 and a *dumnyi d'iak* (duma clerk) by 1566, and he took part in the *zemskii sobor* (national assembly) of 1566. He rose in office in the summer of 1570, during the period of the *oprichnina*, when the most prominent administrators in the *prikazy* (central administrative offices) were executed. Shchelkalov headed the Razriadnyi Prikaz (War Office), Pomestnyi Prikaz (Office of Land Grants), the Prikaz Kazanskogo Dvortsa (Kazan Palace Prikaz), and one of the *cheti* (financial departments in charge of collection of taxes). He retired from office in 1594.

Vasilii Iakovlevich Shchelkalov. Date of birth unknown; died late 1610 or early 1611.

Shchelkalov was a *d'iak* in the Razboinyi Prikaz (Justice Office) in the 1560's, and he took part in the *zemskii sobor* of 1566. He headed the Razriadnyi Prikaz from 1576 or 1577 to 1594 and one of the *cheti* from 1570 to 1601. In mid-1594 he became the head of the Posol'skii Prikaz (Foreign Office), and in 1595 he was made keeper of the seal. Shchelkalov fell from favor in 1601, but the First False Dmitrii conferred on him the rank of *okol'nichii* (the rank immediately below boyar). [29–1584–4]

SHCHELKIN, KIRILL IVANOVICH. Born May 4 (17), 1911; died Nov. 8, 1968, in Moscow. Soviet physicist. Corresponding member of the Academy of Sciences of the USSR (1953). Three times Hero of Socialist Labor. Member of the CPSU from 1940.

After graduating from the Crimean Pedagogical Institute in Simferopol' in 1932, Shchelkin worked at the Institute of Chemical Physics of the Academy of Sciences of the USSR. He was also a professor at the Moscow Institute of Engineering Physics. Shchelkin's main works were devoted to the physics of combustion and explosion. Shchelkin proved that the influence of the flow turbulence of the initial mixture on the process of flame acceleration is significant. He developed the concept of the transition of slow combustion to detonation and experimentally inves-

tigated combustion in a turbulent flow. He showed that upon artificially inducing turbulence in a mixture that is incapable of detonation, the flame propagation velocities are close to the detonation velocities. Shchelkin proposed the theory of spin detonation.

Shchelkin was awarded four Orders of Lenin, two other orders, and various medals. He was a laureate of the Lenin Prize and four State Prizes of the USSR.

WORKS

Gazodinamika goreniia. Moscow, 1963. (With Ia. K. Troshin.)
[29–1585–1]

SHCHELKOVO, a city (since 1925) under oblast jurisdiction and administrative center of Shchelkovo Raion, Moscow Oblast, RSFSR. Located on the Kliazma River, a tributary of the Oka. Railroad station 35 km northeast of Moscow. Population, 91,000 (1977). Shchelkovo produces chemicals, machinery, cotton cloth, industrial fabrics, silk, and felt. The city also has a chemical and mechanical technicum. [29–1585–2]

SHCHELOKOV, NIKOLAI ANISIMOVICH. Born Nov. 13 (26), 1910, in the *stanitsa* (large cossack village) of Almaznaia, now within the city limits of Kadievka, Voroshilovgrad Oblast, Ukrainian SSR. Soviet state and party figure. General of the army (1976). Doctor of economic sciences (1978). Hero of Socialist Labor (1980). Member of the CPSU since 1931.

The son of a metallurgical worker, Shchelokov graduated from the Dnepropetrovsk Metallurgical Institute in 1933. For most of the period between 1933 and 1938, he worked as an engineer and shop head at metallurgical plants in the Ukraine. In 1938 and 1939 he was first secretary of the Krasnogvardeiskoe raion committee of the Communist Party of the Ukraine (Bolshevik) in Dnepropetrovsk, and from 1939 to 1941 he was chairman of the Dnepropetrovsk city executive committee. Shchelokov served in the Soviet Army from 1941 to 1946 and fought in the Great Patriotic War.

In 1946 and 1947, Shchelokov was deputy minister of local industry of the Ukrainian SSR, and from 1947 to 1951 he was in the administrative apparatus of the Central Committee of the Communist Party of the Ukraine. From 1951 to 1962 and again in 1965 he served as first deputy chairman of the Council of Ministers of the Moldavian SSR; in 1957 and 1958 and from 1962 to 1965 he was chairman of the Council of the National Economy of the Moldavian SSR. In 1965 and 1966, Shchelokov was second secretary of the Central Committee of the Communist Party of Moldavia. In 1966 he became minister of internal affairs of the USSR and a candidate member of the Central Committee of the CPSU. Shchelokov became a member of the Central Committee in April 1968. He served as a deputy to the fourth through tenth convocations of the Supreme Soviet of the USSR.

Shchelokov has been awarded three Orders of Lenin, two Orders of the Red Banner, the Order of Bogdan Khmel'nitskii Second Class, the Order of the Patriotic War First Class, the Order of the Red Banner of Labor, the Order of the Red Star, and various medals. [29–1586–1]

SHCHELOKOV, NIKOLAI KONONOVICH. Born May 23 (June 4), 1887; died Apr. 12, 1941, in Moscow. Soviet military leader. Major general (1940).

The son of a Ural Cossack, Shchelokov graduated from the Mikhail Artillery School in 1907. He commanded a battery and an artillery battalion during World War I and rose to the rank of colonel. Shchelokov was demobilized in 1918.

After refusing an offer by the counterrevolutionary Ural Host Government to head the White Cossack Ural Army, Shchelokov enlisted in the Red Army in July 1918 and organized cavalry units. He commanded a cavalry regiment from January to October 1919 and the 8th Cavalry Division, a unit in S. M. Budennyi's horse cavalry corps, in October and November of the same year. Shchelokov was chief of staff of the First Horse Cavalry Army from January to April 1920 and from February to April 1921 and the Second Horse Cavalry Army from July to November 1920.

Between 1923 and 1928, Shchelokov served in the Workers' and Peasants' Red Army as an assistant inspector and a deputy inspector of the cavalry. He taught tactics and artillery at the All-Russian Central Executive Committee Military School from 1928 to 1934, when he was granted a pension. He was head of the department of cavalry at the M. V. Frunze Military Academy in 1940 and 1941. Shchelokov was awarded the Order of the Red Banner. [29–1586–2]

SHCHEPILLO, MIKHAIL ALEKSEEVICH (also M. A. Shchepilla). Year of birth unknown; died Jan. 3 (15), 1826. Decembrist. Lieutenant in the Chernigov Regiment. Member of the Society of the United Slavs and the Southern Society of Decembrists.

On Dec. 29, 1825, Shchepillo, together with I. I. Sukhinov, A. D. Kuz'min, and V. N. Solov'ev, freed S. I. Murav'ev-Apostol from arrest. During the uprising of the Chernigov Regiment, Shchepillo commanded the 6th Musketeer Company. Leading an advance party, he died in fighting near the village of Trilesy. Shchepillo is buried in a common grave with A. D. Kuz'min and I. I. Murav'ev-Apostol near the village of Ustinovka, in what is now Vasil'kov Raion, Kiev Oblast. [29–1589–6]

SHCHEPIN-ROSTOVSKII, DMITRII ALEKSANDROVICH. Born 1798; died Oct. 22 (Nov. 3), 1858, in Shuia. Decembrist. Captain in the Moscow Life Guards Regiment. Prince.

Shchepin-Rostovskii graduated from the Naval Cadet Corps. Although he was not formally a member of any of the Decembrists' secret societies, he attended meetings at the homes of K. F. Ryleev and E. P. Obolenskii, where the plans for the uprising were discussed. On Dec. 14, 1825, Shchepin-Rostovskii, along with A. A. Bestuzhev and M. A. Bestuzhev, led the soldiers of the Moscow Regiment onto Senate Square. Sentenced to 20 years at hard labor, he was confined to the Chita stockade until 1839, when he was moved to a settlement in Eneseisk Province to serve the remainder of his sentence. Shchepin-Rostovskii returned to Yaroslavl Province after the amnesty of 1856 and moved to Shuia in 1858. [29–1589–7]

SHCHEPKIN, EVGENII NIKOLAEVICH. Born May 13 (25), 1860, in Moscow; died Nov. 12, 1920, in Odessa. Russian historian, pedagogue, and public figure. Grandson of the actor M. S. Shchepkin.

After graduating from Moscow University in 1883, E. N. Shchepkin remained associated with the chair of world history; he became a privatdocent in 1892. In 1898 he was named a professor at Novorossiia University in Odessa. Shchepkin was active in the liberal movement of the early 20th century and was a member of the Constitutional Democrat (Cadet) fraction in the First State Duma. After being dismissed from his position for signing the Vyborg Appeal of 1906, he taught at private schools in Odessa. He broke with the Cadets during the period of reaction. After the February Revolution of 1917, Shchepkin returned to Novorossiia University and joined the Borot'bysty party. He became a member of the Communist Party in 1919.

Shchepkin studied the diplomatic and military history of the era of the Seven Year's War, the personality of the First False Dmitrii, Russian-Varangian relations, and feudalism in Western Europe. Shchepkin was the author of a number of textbooks.

REFERENCE

Pamiati Evgeniia Nikolaevicha Shchepkina. Odessa, 1927.
[29–1590–2]

SHCHEPKIN, MIKHAIL SEMENOVICH. Born Nov. 6 (17), 1788, in the village of Krasnoe, Oboian' District, in what is now Belgorod Oblast; died Aug. 11 (23), 1863, in Yalta. Russian actor famous for introducing realism in the Russian theater.

Shchepkin was the son of a serf who managed the estates of Count G. S. Vol'kenshtein. In 1799 he was enrolled at the provincial public school in Sudzha, where in 1800 he appeared on the stage for the first time, as Rozmarin in a school production of Sumarokov's *The Quarreler*. During the years 1801–03 he acted in the Vol'kenshteins' private theater and also waited on table at the estate. Shchepkin began his professional stage career in 1805,

in the Barsovs' troupe in Kursk. In 1816 he joined I. F. Shtein's troupe in Kharkov, the best in southern Russia, and soon became the troupe's foremost comic actor. In 1822 his freedom was bought by subscription.

On the provincial stage Shchepkin played various roles in plays and comic operas. He was a brilliant, spirited actor noted for his humor and true-to-life characterizations. Early in his career Shchepkin had already revealed exceptional powers of observation and an amazing capacity for work; he had also made a serious theoretical and practical study of acting.

In 1823, Shchepkin was accepted into the company of the Moscow Theater, known since 1824 as the Malyi Theater. His social and artistic views developed considerably as a result of his close ties with such leading figures of Russian culture as A. S. Pushkin, N. V. Gogol, V. G. Belinskii, A. I. Herzen, and T. G. Shevchenko. Shchepkin appeared in the first productions of the plays of A. S. Griboedov, Gogol, Pushkin, I. S. Turgenev, and A. V. Sukhovo-Kobylin. He also went to great lengths to popularize the plays and to have them freed from the censor's bans.

Shchepkin's work in the 1830's and 1840's was of enormous importance. He virtually revolutionized the contemporary school of acting, bringing it closer to the realistic principles of Pushkin and Gogol. Shchepkin asserted the actor's important civic mission and devoted his work to the moral upbringing of the public and to the criticism of social ills. Believing that the actor should not rely on momentary inspiration, he worked to determine objective rules of acting and developed a creative method based on generalized observations of life. He stressed the actor's need to think through his artistic tasks thoroughly and to subordinate the entire creative process to a "general idea," stating that the actor should not merely imitate, but penetrate "into the soul of the role" and crawl, "so to speak, into the skin of the character" (*Zapiski, pis'ma* . . . , 1952, p. 250).

Shchepkin created his best characterizations in works of the Russian satirical playwrights, seeking to portray characters that would reflect the essence of an entire social group. Overcoming the resistance of the censor, he succeeded in staging scenes from Griboedov's *Woe from Wit* in 1831 and the complete version in 1832. He also played the role of Famusov in these productions; in his interpretation, Famusov was devoid of aristocratic respectability, fawning on Molchalin and hating everything new. Shchepkin created a profoundly truthful characterization as the Mayor in Gogol's *The Inspector-General* (1836), raising the role to the level of satirical generalization and exposing the injustice of Nicholas I's regime. He also created satirical characterizations of the gentry in Gogol's plays—as Podkolesin and Kochkarev in *Marriage*, Uteshitel'nyi in *The Gamblers*, and Burdiukov in *The Lawsuit*, as well as the Baron in Pushkin's *The Covetous Knight*.

Another side of Shchepkin's creative art was linked with characters drawn from the common people. He conveyed a distinctive national spirit in plays by Ukrainian dramatists, for example, as Chuprun in Kotliarevskii's *The Magician Soldier* and Makagonenko in *Natalka Poltavka*, also by Kotliarevskii, and in the title role in Kvitko-Osnov'ianenko's *Shel'menko the Orderly*. In the vaudeville *The Sailor*, Shchepkin penetrated the tragic soul of the old sailor. "The triumph of his art," wrote Belinskii, "consists in the fact that he is able to interest the audience in the fate of a simple man—to cause them to weep and be disturbed about the sufferings of a mere sailor" (*Poln. sobr. soch.*, vol. 8, 1955, p. 533). Psychological depth and poignancy were typical of Shchepkin's performances of Moshkin and Kuzovkin in Turgenev's *The Bachelor* and *The Boarder*.

One of Shchepkin's best roles during his last period was that of Muromskii in Sukhovo-Kobylin's *Krechinskii's Wedding* (1855). He also performed roles in plays by other writers, notably Liubim Tortsov in A. N. Ostrovskii's *Poverty Is No Crime*, Harpagon in Molière's *The Miser*, and Polonius in Shakespeare's *Hamlet*.

Shchepkin's letters, remarks, memoirs, and accounts of his talks with students reveal that he had evolved a complete system of views on an actor's creative art. His work affirmed critical realism as the leading creative method in the Russian theater. The traditions of stage realism, as established by Shchepkin, were of major significance in the Malyi Theater, which is referred to as the House of Shchepkin. Shchepkin's heritage and ethical principles served as the basis for the realistic system of acting created by K. S. Stanislavsky.

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IU. A. DMITRIEV [29–1590–3]

SHCHEPKIN, VIACHESLAV NIKOLAEVICH. Born May 25 (June 6), 1863, in Timonino (Nikol'skoe), in what is now Moscow Oblast; died Dec. 2, 1920, in Moscow. Russian Slavicist, linguist, paleographer, and historian of ancient Russian art. Corresponding member of the St. Petersburg Academy of Sciences (1913). Grandson of the actor M. S. Shchepkin.

A student of F. F. Fortunatov's, V. N. Shchepkin graduated from Moscow University in 1885. He became a professor at the university in 1907 and at the Advanced Courses for Women in 1906. In 1887 he took up a position at the Historical Museum in Moscow, where he devised a scientific cataloging system for the Department of Manuscripts and Books in Old Russian Typeface. Shchepkin's master's dissertation, *Treatise on the Language of the Savvina Kniga* (1898–99), was a major study of the phonetics of Old Church Slavonic. His doctoral dissertation, *The Bologna Psalter* (1906), dealt with the phonetics and morphology of the Middle Bulgarian work and presented valuable material for the study of Old Bulgarian dialects. Shchepkin's works include *Introduction to Slavic Studies* (1914), *Textbook of Russian Paleography* (1918), and studies of the Novgorod school of icon painting.

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S. B. BERNSHTEIN [29–1590–1]

SHCHEPKINA-KUPERNIK, TAT'IANA L'VOVNA. Born Jan. 12 (24), 1874, in Moscow; died there July 27, 1952. Soviet Russian writer and translator. Honored Art Worker of the RSFSR (1940). Great-granddaughter of the actor M. S. Shchepkin.

Shchepkina-Kupernik began her career as a playwright in 1892. Her prose works, such as the short-story collections *Those Who Labor and Are Burdened* (1903), *In the Wings* (1903), and *That Was Yesterday* (1907; destroyed by the censor), were similar in ideology to the democratic literature of the late 19th and early 20th centuries. Her poem "From the Fallen Strongholds of Port Arthur" (1905) became a folksong.

Shchepkina-Kupernik also wrote travel sketches and memoirs. The most valuable part of Shchepkina-Kupernik's literary legacy is her translations of Western European classics, including works by E. Rostand, Lope de Vega, Molière, Goldoni, and R. B. Sheridan.

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SHCHERBA, LEV VLADIMIROVICH. Born Feb. 20 (Mar. 3), 1880, in St. Petersburg; died Dec. 26, 1944, in Moscow. Soviet linguist. Academician of the Academy of Sciences of the USSR (1943) and the Academy of Pedagogical Sciences of the RSFSR (1944).

In 1903, Shcherba graduated from the University of St. Petersburg, where he had studied under I. A. Baudouin de Courtenay. He became a professor at the University of Petrograd in 1916. In 1943 he was given a position in the Academy of Sciences of the USSR and the Academy of Pedagogical Sciences of the RSFSR.

Shcherba's principal works dealt with problems of general linguistics, Russian studies, Romance philology, Slavic studies, lexicography, and pedagogy. In his master's dissertation, "Russian Vowels With Respect to Quality and Quantity" (1912), he provided an analysis of the phoneme that anticipated the theory of

phonemes subsequently developed in European linguistics. He also studied problems of orthography and orthoepy. Shcherba's works on the theory and methods of teaching foreign languages were instrumental in creating a Soviet school of methodology.

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V. A. VINOGRADOV [29–1592–2]

SHCHERBACHEV, DMITRII GRIGOR'EVICH. Born Feb. 6 (18), 1857; died Jan. 18, 1932, in Nice. Russian military leader. General of the infantry (1914).

The son of a nobleman, Shcherbachev graduated from the Mikhail Artillery School in 1876 and the Academy of the General Staff in 1884. Between 1901 and 1906 he commanded a regiment and a rifle brigade. He was head of the Academy of the General Staff from 1907 to 1912, when he assumed command of the IX Army Corps, which fought in the battle of Galicia at the start of World War I and occupied L'vov.

Shcherbachev was commander of the Eleventh Army of the Southwestern Front from April to October 1915 and the Seventh Army of the same front from October 1915 to April 1917. In April he was appointed assistant to the king of Rumania for military operations and commander in chief of the Russian armies on the Rumanian Front.

The Rumanian and Southwestern fronts were combined in December 1917 to form the Ukrainian Front under Shcherbachev's command. Shcherbachev adopted a counterrevolutionary position and supported the Ukrainian Directory until January 1918. In February of that year he concluded an armistice with Germany in Focşani, and in March he consented to the introduction of Rumanian troops into Bessarabia.

Shcherbachev attempted to form six corps based on nationality (two Polish, two Ukrainian, one Russian, and one Muslim), which were to be used for counterrevolutionary purposes. His efforts, however, were unsuccessful. In April 1918, in Paris, he set up an agency of the Volunteer Army. The agency helped the White Guards with the Entente's supplies but failed in its efforts to form White Guard units in Bohemia and Serbia from among Russian prisoners of war and from volunteers.

After the Civil War, Shcherbachev withdrew from public life. [29–1596–2]

SHCHERBACHEV, VLADIMIR VLADIMIROVICH. Born Jan. 12 (24), 1889, in Warsaw; died Mar. 5, 1952, in Leningrad. Soviet composer and teacher.

Shcherbachev studied in the faculty of history and philology at the University of St. Petersburg from 1906 to 1910. In 1914 he graduated from the St. Petersburg Conservatory, where he had studied composition with A. K. Liadov and M. O. Shteinberg. He played an active role in the construction of Soviet musical culture: in the period from 1918 to 1923 he was a lecturer in, and head of, the music department of the People's Commissariat for Education and was music director of the Touring Theater.

Shcherbachev composed in various genres. He is known primarily for his five symphonies, but the *Thunderstorm Suite* (1934), based on his music to the motion-picture version of A. N. Ostrovskii's play, and the musical comedy *The Tobacco Captain* (1943) also gained popularity. His other compositions include chamber music, piano pieces, and art songs. Shcherbachev was a professor at the Leningrad Conservatory from 1923 to 1931 and from 1944 to 1948 and at the Tbilisi Conservatory in 1931 and 1932. Among his students were V. V. Zhelobinskii, G. N. Popov, and M. I. Chulaki. He served as chairman of the administrative board of the Leningrad Division of the Composers' Union of the RSFSR from 1935 to 1937 and from 1944 to 1948.

Shcherbachev was awarded the Order of the Red Banner of Labor and a medal. [29–1596–1]

SHCHERBAK, ALEKSANDR EFIMOVICH. Born June 13 (25), 1863 (according to some sources, Aug. 30, 1863), in Chernigov Province; died Apr. 23, 1934, in Sevastopol'. Soviet physician; a pioneer in scientific physical therapy, health resort science, and physical preventive medicine.

Shcherbak graduated from the St. Petersburg Military Medical Academy in 1887. In 1894 he became a professor in the department of nervous and mental diseases of Warsaw University. He left his position in 1910 in protest against the reactionary policies of L. A. Kasso, the minister of education. In 1914 he organized the institute of physical methods of therapy in Sevastopol' and became the institute's director. Shcherbak's research was devoted to the pathogenesis and symptoms of nervous and mental diseases, the physiological effects of physical factors, and anatomical and physiological interactions in physical therapy procedures. He devised and introduced into practice new techniques of reflex and segmental physical therapy (for example, of the cervical and lumbar areas) and proposed a method for investigating thermoregulatory, skin-muscle, and skin-skin reflexes.

Shcherbak founded a school of physical therapy and health resort science.

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SHCHERBAKOV, ALEKSANDR SERGEEVICH. Born Sept. 27 (Oct. 10), 1901, in the city of Ruza, in what is now Moscow Oblast; died May 10, 1945, in Moscow. Soviet state and party figure. Colonel general (1943). Member of the Communist Party from 1918.

The son of a worker, Shcherbakov became a worker himself in 1912. He engaged in Komsomol work between 1918 and 1922 and was a delegate to the Third and Fourth Congresses of the Russian Communist League of Youth. He studied at the Ia. M. Sverdlov Communist University from 1921 to 1924 and the Institute of the Red Professors from 1930 to 1932.

Shcherbakov worked in the apparatus of the Central Committee of the ACP(B) from 1932 to 1936. In 1934 he became first secretary of the Writers' Union of the USSR. Between 1936 and 1938 he was secretary of the Leningrad and Irkutsk oblast committees of the ACP(B) and secretary of the Donetsk oblast committee of the Communist Party of the Ukraine. Between 1938 and 1945 he held the position of first secretary of the Moscow oblast committee and of the Moscow city committee of the ACP(B). In 1941, Shcherbakov was named a secretary of the Central Committee of the ACP(B). In addition, in 1942 he became chief of the Main Political Directorate of the Soviet Army, head of the Soviet Information Bureau, and deputy people's commissar of defense.

A delegate to the Sixteenth through Eighteenth Congresses of the ACP(B), Shcherbakov was elected a member of the Central Committee at the Eighteenth Congress. He was a deputy to the first convocation of the Supreme Soviet of the USSR. Shcherbakov, who was awarded three Orders of Lenin, three other orders, and various medals, is buried on Red Square at the Kremlin Wall. [29–1593–2]

SHCHERBAKOV, DMITRII IVANOVICH. Born Jan. 1 (13), 1893, in Novozybkov, in what is now Briansk Oblast; died May 25, 1966, in Moscow. Soviet geologist and geochemist. Academician of the Academy of Sciences of the USSR (1953; corresponding member, 1946).

Shcherbakov was a student of V. I. Vernadskii and A. E. Fers-

man. After graduating from Tavrida University (now the University of Simferopol') in 1922, he worked for the Commission for the Study of Natural Productive Forces and in other organizations of the Academy of Sciences of the USSR. Between 1928 and 1938 he was scientific director first of the Tadzhik-Pamir expedition and then of the Middle Asian expedition of the Academy of Sciences of the USSR. From 1930 to 1938 he worked at the M. V. Lomonosov Geochemical Institute (later the Institute of Geochemistry, Mineralogy, and Petrography of the Academy of Sciences of the USSR). From 1938 to 1941 he was head of the section on mineralogy and geochemistry of the Institute of Geological Sciences of the Academy of Sciences of the USSR. Between 1943 and 1948 he was scientific director of a section at the All-Union Institute of Mineral Raw Materials. In 1963 he became director of two scientific divisions of the Institute of the Geology of Ore Deposits, Petrography, Mineralogy, and Geochemistry of the Academy of Sciences of the USSR. Between 1953 and 1963 he was academician-secretary of the department of geological and geographic sciences of the Academy of Sciences of the USSR.

Shcherbakov conducted geological studies in Middle Asia and the Caucasus, on the Kola Peninsula, and in Transbaikalia. His major research was in the field of trace and rare elements. His scientific prognoses provided the basis for the discovery of commercial deposits of antimony and mercury in Kirghizia, native sulfur in the Karakum Desert, and molybdenum, tungsten, and arsenic in the Caucasus. Shcherbakov was one of the pioneers in orientation and superdeep drilling and in the determination of the absolute ages of geological formations and the compilation of metallogenic maps. He is also known as a popularizer of the geological and geographic sciences.

A recipient of the Lenin Prize, Shcherbakov was awarded two orders of Lenin, three other orders, and various medals. The mineral shcherbakovite (a silicate of niobium and tantalum) is named after Shcherbakov.

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Dmitrii Ivanovich Shcherbakov: Zhizn' i deiatel'nost', 1893–1966. Moscow, 1969.
F. I. VOL'FSON [29–1594–1]

SHCHERBAKOV, PETR PETROVICH. Born Apr. 7 (19), 1887, in Moscow Province; died Oct. 27 (Nov. 9), 1917, in Moscow. Participant in the struggle for Soviet power in Moscow. Member of the Communist Party from 1911.

The son of a weaver, Shcherbakov in 1908 became a factory worker in Moscow, where he conducted revolutionary work. In 1915 he was named secretary of the Lefortovo raion committee of the RSDLP. He was exiled to Irkutsk Province in 1916, but in April 1917 he became a member of the Blagushe-Lefortovo raion committee of the RSDLP(B) in Moscow and a deputy to the raion soviet. Shcherbakov was a member of the presidium of the Trade Union of Moscow Textile Workers, chairman of the administrative board of the raion division of the union, and one of the organizers of the Red Guards in the raion. During the October Days of 1917 he organized the provision of medical care for the Red Guards of Lefortovo Raion. He died during the fighting against the cadets of the Aleksei Military School.

Shcherbakov is buried in Red Square near the Kremlin Wall.

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SHCHERBAKTY, an urban-type settlement and the administrative center of the Shcherbakty Raion, Pavlodar Oblast, Kazakh SSR. Shcherbakty is served by a railroad station on the Pavlodar-Kulunda line, 85 km northeast of Pavlodar. It has a machinery and repair plant, a butter factory, a poultry farm, and a grain elevator. The settlement also has a forestry and land reclamation station and a technicum for farm mechanization. [29–1595–1]

SHCHERBATOV, MIKHAIL MIKHAILOVICH. Born July 22, 1733; died Dec. 12, 1790. Prince. Russian state and public figure. Historian and publicist.

While still a young child, Shcherbatov was registered in the Semenovskii Guards Regiment. He received a broad and thorough education at home. In 1759 and 1760 he wrote a series of articles presenting reactionary sociopolitical views; for example, he rejected the equality of all people and called for strong state authority. In 1762, Shcherbatov retired from military service with the rank of captain, and in 1767 he entered the civil service. In the late 1760's he served on the commission for the compilation of a new legal code and emerged as a leader of the *rodovitoe dvorianstvo* (hereditary nobility) opposed to the government. In 1778 he served as president of the Chamber Collegium, and in 1779 he became a senator. Shcherbatov retired circa 1788 with the rank of actual, or active, privy councillor.

In the 1770's, Shcherbatov produced a series of publicist articles and notes, and in the late 1780's he wrote *On the Decline of Morals in Russia*, in which he sharply criticized government policies and the morals of those at the court. In 1783 he wrote the utopian novel *Journey to the Land of Ophir*, in which he set forth his conception of the ideal state—essentially a police state supported by the nobility and exploiting the labor of slaves. In his *History of Russia From Earliest Times*, which ended at 1610, Shcherbatov stressed the role of the feudal aristocracy and treated historical progress as nothing more than advances in knowledge, science, and the intelligence of individuals. Nevertheless, the work is of considerable value, since it incorporates a wealth of material from such sources as chronicles and legal documents.

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SHCHERBATSKOI, FEDOR IPPOLITOVICH. Born Aug. 30 (Sept. 11), 1866, in Kielce, Poland; died Mar. 18, 1942, in Borovoe, Akmolinsk Oblast, Kazakhstan. Soviet specialist in Indian, Tibetan, and Buddhist studies. Academician of the Academy of Sciences of the USSR (1918).

A student of I. P. Minaev's, Shcherbatskoi graduated from the University of St. Petersburg in 1889. Subsequently sent abroad, he studied Indian poetry with G. Bühler in Vienna and philosophy with H. Jacobi in Bonn. Appointed a professor at the University of St. Petersburg in 1900, he continued to teach at the university after it became Leningrad State University.

In 1897, Shcherbatskoi and S. F. Ol'denburg established the series *Bibliotheca Buddhica*, in which many of the world's leading Orientalists published texts, translations, and studies of written works from India, Tibet, and Mongolia. In 1928, Shcherbatskoi became head of the Institute of Buddhist Culture in Leningrad; the institute was later converted into the Indo-Tibetan Center of the Institute of Oriental Studies of the Academy of Sciences of the USSR. Shcherbatskoi went to Mongolia in 1900 and studied Tibetan manuscripts in the libraries of Buddhist monasteries. In 1910 he traveled to India to study Buddhist scientific literature written in Sanskrit.

Shcherbatskoi's principal works were devoted to the philosophy of Buddhism and an analysis of the philosophical foundations of northern Mahayana Buddhism, a tradition widespread in Tibet, Mongolia, China, Japan, and Korea. His studies of Buddhist philosophy and logic provided original analyses and included translations and interpretations of sources; they influenced the development of Buddhist and Indian studies and opened the field of ancient Indian logic to European science. Shcherbatskoi was the founder of the Russian school of Buddhist studies. He translated and published a number of works of Sanskrit and Tibetan literature.

Shcherbatskoi was an honorary member of learned societies in Great Britain, Germany, and France.

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(For a full bibliography of Shcherbatskoi's works see *Bibliografiia Indii* [3rd ed.], Moscow, 1976.)

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A. S. BARKHUDAROV [29–1595–3]

SHCHERBINA, BORIS EVDOKIMOVICH. Born Oct. 5, 1919, in the city of Debal'tsevo, Donetsk Oblast, Ukrainian SSR. Soviet state and party figure. Member of the CPSU since 1939.

The son of a railroad worker, Shcherbina graduated from the Kharkov Institute of Railroad Transport Engineers in 1942 and from the party school of the Central Committee of the Communist Party of the Ukraine (Bolshevik) in 1948. For most of the period between 1942 and 1944 he was secretary of the Kharkov oblast committee of the Komsomol of the Ukraine, and in 1942 and 1943 he worked in the apparatus of the Central Committee of the All-Union Komsomol. Shcherbina began performing party work in 1944. In 1950 and 1951 he was secretary of the Kharkov city committee of the Communist Party of the Ukraine (Bolshevik), and between 1951 and 1961 he was secretary and second secretary of the Irkutsk oblast committee of the CPSU. In 1961 he became first secretary of the Tiumen' oblast committee of the CPSU; in 1963 and 1964 he was first secretary of the Tiumen' rural oblast committee of the CPSU. In 1973, Shcherbina became minister of construction of petroleum and gas industry enterprises of the USSR.

Shcherbina became a candidate member of the Central Committee of the CPSU in 1961 and a member in 1976. He served as a deputy to the sixth through tenth convocations of the Supreme Soviet of the USSR. Shcherbina has been awarded two Orders of Lenin, the Order of the October Revolution, two other orders, and various medals. [29–1597–1]

SHCHERBINA, FEDOR ANDREEVICH. Born Feb. 1 (13), 1849, in the *stanitsa* (large cossack village) of Novodereviankovskaia, in the Kuban'; died 1936 in Prague. *Zemstvo* (local self-government) statistician; Narodnik (Populist). Corresponding member of the St. Petersburg Academy of Sciences (1904).

Shcherbina received his education at the Petrovskoe Agricultural Academy (now Timiriazev Agricultural Academy) and Novorossiia University (now University of Odessa). He headed the Voronezh Zemstvo Statistical Bureau from 1884 to 1903 and served in the Second State Duma as a member of the Popular Socialists in 1907. Shcherbina emigrated after the October Revolution of 1917.

Shcherbina was the first to compile Russian budget statistics. His studies—especially the work *Peasant Budgets* (1900)—long provided the methodological framework for the analysis of peasant and worker consumption patterns. V. I. Lenin used Shcherbina's findings extensively in his works *What the "Friends of the People" Are and How They Fight the Social-Democrats* and *The Development of Capitalism in Russia*. Although Shcherbina made a number of methodological errors in his research—largely as a result of his use of the wrong statistical-analysis methods ("abuse of 'average magnitudes'")—Lenin valued his work highly. At the same time, however, Lenin sharply criticized Shcherbina the Narodnik (*Poln. sobr. soch.*, 5th ed., vol. 1, pp. 224–25; vol. 3, pp. 162–63).

Shcherbina wrote several historical works, including the *History of the Kuban' Cossack Host* (vols. 1–2, 1910–13), and engaged in social commentary, with articles on such matters as agricultural communes, the artel movement, and peasant life.

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SHCHERBINA, NIKOLAI FEDOROVICH. Born Dec. 2 (14), 1821, in the village of Gruzko-Elanchinskaia, near Taganrog; died Apr. 10 (22), 1869, in St. Petersburg. Russian poet.

Shcherbina wrote poems on classical themes and in the style of the ancient Greeks. They affirm the cult of beauty and a rational serene perception of the world, for example, the collection *Greek Verses* (1850). In the second half of the 1850's civic motifs became prominent in such works of his as the cycle *Iambs and Elegies*. Toward the end of his life, Shcherbina primarily wrote satires, including *Album of a Hypochondriac* (1841–61) and *Satirical Chronicle* (1861–69).

Shcherbina's satires and epigrams were hostile to the government, but they also contained frequent attacks on the revolutionary democrats.

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SHCHERBINA, VLADIMIR RODIONOVICH. Born June 24 (July 7), 1908, in the city of Georgievsk, in what is now Stavropol' Krai. Soviet Russian critic and literary scholar. Corresponding member of the Academy of Sciences of the USSR (1976). Member of the CPSU since 1939.

Shcherbina graduated from the literature department of the Krasnodar Pedagogical Institute in 1929. He was first published in 1933. He became deputy director of the A. M. Gorky Institute of World Literature in 1953.

Shcherbina is the author of books on A. S. Novikov-Priboi and A. N. Tolstoy. In his critical articles and scholarly works he propagandizes on behalf of the achievements of socialist realism and polemizes with bourgeois theorists of aesthetics. His works include *Our Contemporary: The Concept of the Human Being in 20th-century Literature* (1964), *Problems of Literary Scholarship in the Light of the Heritage of V. I. Lenin* (1971), and *The Writer in the Contemporary World: Literature, Ideology, Culture* (1973).

Shcherbina was awarded the Order of the Red Banner of Labor in 1968.

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Muliarchik, A. "Vysokaia missiia kul'tury." *Ibid.*, 1974, no. 10. [29–1597–2]

SHCHERBINKA, a city (since 1975) in Podol'sk Raion, Moscow Oblast, RSFSR. Shcherbinka is located on the Moscow-Simferopol' highway, and it has a railroad station 34 km south of Moscow. Its enterprises include the Moscow Experimental Elevator Plant, a plant for the production of refractories for electric smelting, a branch of the Podol'sk Refractory Plant, and a factory producing metal clothing accessories. [29–1598–2]

SHCHERBITSKII, VLADIMIR VASIL'EVICH. Born Feb. 17, 1918, in Verkhnedneprovsk, in what is now Dnepropetrovsk Oblast, Ukrainian SSR. Soviet party and state figure. Twice Hero of Socialist Labor (1974, 1977). Member of the CPSU since 1941.

The son of a worker, Shcherbitskii graduated from the Dnepropetrovsk Institute of Chemical Engineering in 1941. He had engaged in Komsomol work in 1934 and 1935. Shcherbitskii served in the Soviet Army from 1941 to 1945 and fought in the Great Patriotic War. Beginning in 1946, he held a series of engineering and technical positions in Dneprodzerzhinsk.

From 1948 to 1951, Shcherbitskii served as second secretary of the Dneprodzerzhinsk city committee of the Communist Party (CP) of the Ukraine. He was party organizer of the Central Committee of the CPSU at the F. E. Dzerzhinskii Dnieper Metallurgical Plant in Dneprodzerzhinsk in 1951 and 1952 and first secretary of the Dneprodzerzhinsk city committee of the CP of the Ukraine from 1952 to 1954.

Shcherbitskii served as second secretary of the Dnepropetrovsk oblast committee of the CP of the Ukraine in 1954 and 1955 and as first secretary from 1955 to 1957. He was a secretary of the Central Committee of the CP of the Ukraine from 1957 to 1961 and chairman of the Council of Ministers of the Ukrainian SSR from 1961 to 1963.

Shcherbitskii was first secretary of the Dnepropetrovsk oblast committee of the CP of the Ukraine from 1963 to 1965 and chairman of the Council of Ministers of the Ukrainian SSR from 1965 to 1972. In 1972 he became first secretary of the Central Committee of the CP of the Ukraine.

Shcherbitskii was a member of the Central Auditing Commission of the CPSU from 1956 to 1961, when he became a member of the Central Committee of the CPSU. He was a candidate member of the Presidium of the Central Committee of the CPSU from 1961 to 1963 and in 1965 and 1966. He was chosen a candidate member of the Politburo of the Central Committee of the CPSU in 1966 and a member in April 1971. Shcherbitskii became a member of the Presidium of the Central Committee of the CP of the Ukraine in 1957 and a member of the Politburo in 1966.

Shcherbitskii was a deputy to the fifth through ninth convocations of the Supreme Soviet of the USSR. He was named a member of the Presidium of the Supreme Soviet of the USSR in 1972. Shcherbitskii has been awarded six Orders of Lenin, the Order of the October Revolution, and various medals. [29–1598–3]

SHCHETINKIN, PETR EFIMOVICH. Born Dec. 21, 1884 (Jan. 2, 1885), in the village of Chufilovo, in what is now Spas-Klepiki Raion, Riazan' Oblast; died Sept. 30, 1927, in Ulan Bator; buried in Novosibirsk. Partisan leader in Siberia in the Civil War of 1918–20. Member of the CPSU from 1918.

The son of a peasant, Shchetinkin lived in Siberia and worked as a carpenter. He was awarded four Crosses of St. George and two French orders during World War I and, as a bearer of all four classes of the Cross of St. George, was promoted to ensign. In 1917 he became a staff captain.

After the October Revolution of 1917, Shchetinkin played an active role in the establishment of Soviet power in Achinsk and served as chief of the criminal investigation department and head of the operations department of the Achinsk soviet. In late May 1918 he assumed command of a Red Guard detachment assigned to fight the White Czechs and White Guards.

Shchetinkin went underground after the fall of Achinsk and directed the formation of partisan detachments. In late 1918 he led a combined detachment that routed an enemy punitive detachment. After joining A. D. Kravchenko's partisan detachment in Eniseisk Province in early 1919, Shchetinkin became chief of staff of the partisan army.

Shchetinkin served in 1920 as a member of the Extraordinary Revolutionary Tribunal, which tried the former Kolchak ministers. Later that year he became deputy chairman of the Achinsk district executive committee and a member of the district party committee. In 1920 he also served in a detachment of partisans and volunteers that fought against General P. N. Wrangel. Heading a Red Army expeditionary detachment that was sent at Sukhe-Bator's request and V. I. Lenin's orders, Shchetinkin helped rid the Mongolian People's Republic of General Ungern von Sternberg's counterrevolutionary bands in 1921.

Shchetinkin was chief of staff of the Unified State Political Directorate in the Siberian Frontier District from 1922 to 1926. At the invitation of the government of the Mongolian People's Republic, he served as an instructor to the State Military Guard in Mongolia in 1927. Shchetinkin was awarded the Order of the Red Banner.

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S. N. PUCHKOV [29–1599–3]

SHCHETOVO, an urban-type settlement in Voroshilovgrad Oblast, Ukrainian SSR, under the jurisdiction of the Antratsit city soviet. Shchetovo has a railroad station on the Chernukhino-Dolzhanskaia Line. Coal is mined at Shchetovo, and the settlement has a milk plant. [29–1602–2]

SHCHIGRY, a city (since 1779) under oblast jurisdiction and administrative center of Shchigry Raion, Kursk Oblast, RSFSR. Railroad station on the Kursk-Kastornaia line, 61 km northeast of Kursk. Population, 18,000 (1974). Enterprises in Shchigry include the Geomash Production Association, the Avangard Production Association, which manufactures plastics, a plant manufacturing reinforced-concrete products, and a brickyard. The food-processing industry is represented by a bread-products combine, a butter factory, and a meat- and poultry-packing plant. [29–1603–4]

SHCHIPACHEV, STEPAN PETROVICH. Born Dec. 26, 1898 (Jan. 7, 1899), in the village of Shchipachi, in what is now Kamyshlov Raion, Sverdlovsk Oblast; died Jan. 2, 1980, in Moscow. Soviet Russian poet. Member of the CPSU from 1919.

The son of a peasant, Shchipachev graduated from the literature division of the Institute of the Red Professors in 1934. His first collections of verse were noted for their declamatory quality and their concern with cosmic themes. His poems written in the mid-1930's included in such collections as *Under the Skies of My Motherland* (1937) and *Lyrics* (1939) have a lyric intonation.

Shchipachev's verse exhibits the songlike quality of classical Russian poetry but gives the themes of nature and love a modern ring. In his wartime verses and narrative poems, such as *Verses From the Front* (1942), the lyric principle merges with the heroic. The poet deals with the motherland and V. I. Lenin in the narrative poem *Little House in Shushenskoe* (1944). In the postwar years Shchipachev published the collection *Verse* (1948; State Prize of the USSR, 1949) and the narrative poem *Pavlik Morozov*, (1950; State Prize of the USSR, 1951). He also produced the narrative poems *The Heir* (1965), *Song of Moscow* (1968), and *Twelve Months Around the Sun* (1969).

Civic motifs pervade Shchipachev's verses written in the 1970's, which are included in such collections as *To My Life's Comrades* (1972) and *I Am Thinking of the Motherland* (1974). The poems of this period are also characterized by a keen interest in the inner world of the individual.

Shchipachev was awarded the Order of Lenin and the Order of Friendship of Peoples; some of his works have been translated into other languages of the USSR and into foreign languages.

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L. P. PECHKO [29–1603–5]

SHCHIRETS, an urban-type settlement in Pustomyty Raion, L'vov Oblast, Ukrainian SSR. Shchirets is located on the Shcherek River, a tributary of the Dnestr. It has a railroad station. The settlement is the site of the Steklopribor plant, a mixed-feed plant and a gypsum plant. A plant manufacturing reinforced-concrete products and an asphalt plant were under construction in Shchirets in 1978. [29–1605–1]

SHCHIRSKII, IVAN (monastic name, Innokentii). Year of birth unknown; died after 1714. Ukrainian painter and engraver.

Shchirskii worked in Vilnius (until 1682), in Chernigov (from 1683), at the Kiev-Pecherskaia Laura (from 1687), in Moscow (from 1688 to 1689), and in Lübech (from 1690). All that remains of Shchirskii's works are 28 copper engravings. The engravings include works devoted to religious themes, for example, *Ioann Zlatoust* (1682). In the festive allegorical *Heaven and Truth* (1683) the artist reproduced images from real life. Shchirskii also

did battle scenes, genre scenes, and landscapes. His interest in rendering three-dimensional space and form broke with the conventions of medieval art. [29–1605–4]

SHCHOGOLEV, IAKOV IVANOVICH. Born Oct. 24 (Nov. 5), 1823, in the city of Akhtyrka, in what is now Sumy Oblast; died May 27 (June 8), 1898, in Kharkov. Ukrainian poet.

Shchogolev graduated from the University of Kharkov in 1848. He was a civil servant until 1871. Shchogolev was first published in 1843. The author of the poetry collections *Vorsklo* (1883) and *Slobozhanshchina* (1898), he was close to the Ukrainian romantics. Shchogolev idealized the bygone times of the Zaporozh'e cossacks and condemned the bourgeois mores that were undermining the traditions of patriarchal life. In many poems he expressed sympathy for the unfortunate and oppressed. A master of lyric descriptions of nature, Shchogolev often used images and motifs from folklore.

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SHCHORS, NIKOLAI ALEKSANDROVICH. Born May 25 (June 6), 1895, in the settlement of Snovsk, now the city of Shchors, Chernigov Oblast, Ukrainian SSR; died Aug. 30, 1919, near the village of Beloshitsa, now the village of Shchorsovka, Korosten' Raion, Zhitomir Oblast, Ukrainian SSR; buried in Samara, now Kuibyshev. Hero of the Civil War of 1918–20. Member of the Communist Party from 1918.

The son of a railroad engineer, Shchors graduated from a military feldsher school in Kiev in 1914 and an accelerated course at the Vil'na Military School in Poltava in 1916. He served in World War I, first as a feldsher and then as a junior officer on the Southwestern Front. He was promoted to sublieutenant in 1917.

After the October Revolution in 1917, Shchors returned to Snovsk, where he formed a partisan detachment in February 1918. In March and April he commanded a combined detachment from Novozybkov District. The detachment fought as part of the First Revolutionary Army against German interventionists. In September 1918, Shchors formed the Bogun 1st Ukrainian Soviet Regiment from partisan detachments in the Unecha region. He led the regiment in fighting against German occupation troops and supporters of the hetman in October and November. In November, Shchors assumed command of the 2nd Brigade of the 1st Ukrainian Soviet Division, which included the Bogun and Tarashcha regiments and which liberated Chernigov, Kiev, and Fastov from the forces of the Ukrainian Directory.

On Feb. 5, 1918, Shchors was appointed commandant of Kiev and was presented with an honorary weapon by the Provisional Workers' and Peasants' Government of the Ukraine. He commanded the 1st Ukrainian Soviet Divison from Mar. 6 to Aug. 15, 1919. In a swift advance, the division liberated Zhitomir, Vinnitsa, and Zhmerinka from Petliura's troops and smashed Petliura's main forces in the Sarny-Rovno-Brody-Proskurov region. Attacked by Petliura and the forces of bourgeois Poland in the summer of 1919, the division defended itself heroically in the Sarny–Novograd-Volynskii–Shepetovka region. Outnumbered, however, the division was forced to withdraw to the east.

On Aug. 21, 1919, Shchors was named commander of the 44th Rifle Division, into which the 1st Ukrainian Soviet Division had been incorporated. The division stubbornly defended the Korosten' rail junction, enabling the evacuation of Kiev and allowing the Southern Group of the Twelfth Army to escape from encirclement.

Shchors was killed as he fought in the front ranks of the Bogun Regiment. He showed himself to be a talented military commander and set an example in combat leadership. Shchors demonstrated great personal courage and skillfully trained and inspired his men.

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SHCHORS (prior to 1935, Snovsk), a city (since 1924) and administrative center of Shchors Raion, Chernigov Oblast, Ukrainian SSR. Shchors is situated on the Snov River, a tributary of the Desna, 69 km northeast of Chernigov. It has a railroad station on the Gomel'-Bakhmach Line. Shchors has a furniture factory, a butter factory, a food-processing combine, and enterprises servicing the railroad industry. The N. A. Shchors Memorial Museum is located in the city. [29–1615–1]

SHCHORSK, an urban-type settlement in Krinichki Raion, Dnepropetrovsk Oblast, Ukrainian SSR. Shchorsk has a railroad station (Bozhedarovka) on the Verkhovtsevo–Krivoi Rog line. A grain elevator and an asphalt-concrete plant are located in the settlement. [29–1615–2]

SHCHUCH'E, a city and the administrative center of Shchuch'e Raion, Kurgan Oblast, RSFSR. Railroad station on the Cheliabinsk-Kurgan line, 170 km west of Kurgan. Shchuch'e has a butter factory, a grain elevator, a food-processing combine, and a machine-building plant that manufactures fire-fighting equipment. [29–1623–4]

SHCHUCH'E OZERO, an urban-type settlement in Oktiabr'skii Raion, Perm' Oblast, RSFSR. Railroad station on the Kazan'-Sverdlovsk line, 250 km south of Perm'. Shchuch'e Ozero has a logging and timber distribution establishment. [29–1623–5]

SHCHUCH'IA (in the upper course, Bol'shaia Shchuch'ia), a river in Tiumen' Oblast, RSFSR; a left tributary of the Ob'. The Shchuch'ia has a length of 565 km and drains an area of 12,300 sq km. The river rises in Bol'shoe Shchuch'e Lake in the Polar Urals and empties into an arm of the Malaia Ob'. The Shchuch'ia is fed by snow and rain, and high water occurs between June and September. The mean flow rate 141 km from the mouth is 109 cu m per sec. The river freezes over in October and is completely frozen from February to the end of April; the ice breaks in late May or early June. Various species of whitefish (*Coregonus*), including ciscoes and broad whitefish, spawn in the Shchuch'ia. [29–1623–6]

SHCHUCHIN, a city (since 1962) and the administrative center of Shchuchin Raion, Grodno Oblast, Byelorussian SSR. Shchuchin is located 7 km from the Rozhanka railroad station on the Lida-Grodno line. Industry is represented by the Avtoprovod Plant, a creamery, and a bread-baking combine. [29–1623–1]

SHCHUCHINSK, a city under oblast jurisdiction and administrative center of Shchuchinsk Raion, Kokchetav Oblast, Kazakh SSR. Located on Lake Shchuch'e, 75 km southeast of Kokchetav. Railroad station (Kurort-Borovoe) on the Petropavlovsk-Tselinograd line. Population, 46,000 (1974).

Shchuchinsk has railroad and motor-vehicle transportation enterprises, as well as a glassworks, plants producing nonmetallic construction materials and reinforced-concrete articles, a milk plant, a meat-packing plant, a garment factory, and a branch of the Kokchetavmebel' Production Association. Educational institutions include an industrial-pedagogical technicum, a polytechnical school, and a pedagogical school. The city has a nature museum. The resort of Borovoe is located 25 km northeast of Shchuchinsk. [29–1623–2]

SHCHUGOR, a river in the Komi ASSR, a right tributary of the Pechora. The Shchugor has a length of 300 km and drains an area of 9,660 sq km. It rises on the western slopes of the Northern Urals. The river is fed by rain and snow. High water occurs between May and July, and there are freshets in the autumn. The mean flow rate 30 km from the river's mouth is 252 cu m per sec. The Shchugor freezes over in late October or November, and the ice breaks up in May or early June. The river is a spawning ground for salmon. [29–1615–3]

SHCHUKAREV, ALEKSANDR NIKOLAEVICH. Born Nov. 2 (14), 1864, in Moscow; died Apr. 25, 1936, in Kharkov. Soviet physical chemist.

Shchukarev graduated from Moscow University in 1889 and worked there from 1891 to 1909. Beginning in 1911, he was a professor at the Kharkov Technological Institute (now the Kharkov Polytechnic Institute). Shchukarev's main works were devoted to chemical kinetics and chemical thermodynamics, the study of solutions, thermochemistry, and electrochemistry. Shchukarev investigated critical phenomena in gas-liquid systems and in solutions. He designed an isothermic calorimeter for the study of slow thermal processes.

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SHCHUKIN, ALEKSANDR NIKOLAEVICH. Born July 9 (22), 1900, in St. Petersburg. Soviet scientist in the fields of radio engineering and radiophysics. Academician of the Academy of Sciences of the USSR (1953). Lieutenant general of engineer troops; twice Hero of Socialist Labor. Member of the CPSU from 1944.

In 1927, Shchukin graduated from the Leningrad Electrical Engineering Institute, where he taught from 1929 to 1941. From 1933 to 1945 he also taught at the Naval Academy, where he became a professor in 1939 and head of a subdepartment in 1940. During these years, Shchukin also worked at the Central Radio Laboratory (1923–28), the Leningrad Electrophysical Institute of the Academy of Sciences of the USSR (1928–32), and the Naval Scientific Research Institute of Communications and Telemechanics (1932–38). From 1965 he was deputy chairman and from 1969 chairman of the scientific council on the complex problem of radio wave propagation of the Academy of Sciences of the USSR. Shchukin is one of the organizers of radar research in the USSR. His main works deal with the propagation of electromagnetic oscillations in various media, the processes of ionization in the earth's atmosphere, and the effects of such processes on the propagation of radio waves; a large part of Shchukin's research has been devoted to communications and automatic control and the applications of probability theory in these areas. His course *Propagation of Radio Waves*, written in 1940, has played a major role in the training of Soviet radio specialists.

Shchukin received the Lenin Prize and the State Prize of the USSR. He has been awarded five Orders of Lenin, the Order of the October Revolution, two other orders, and various medals.

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SHCHUKIN, BORIS VASIL'EVICH. Born Apr. 5 (17), 1894, in Moscow; died there Oct. 7, 1939. Soviet Russian actor. People's Artist of the USSR (1936).

In 1920, Shchukin enrolled in the dramatic studio directed by E. B. Vakhtangov, subsequently joining the troupe of the Vakhtangov Theater. Shchukin was greatly influenced by his teacher's aesthetics, which emphasized vivid theatricality, irony, and associations with folk buffoonery and the grotesque. One of the most important actors of the Soviet realistic school, Shchukin brilliantly combined the principles of comedy and drama. On the stage his simple outer appearance belied a refined intellect.

Shchukin made an important contribution to the development of the Soviet theater in the title role in Gorky's *Egor Bulychov and the Others*, as Pavel Suslov in *Virineia* by Seifullina and Pravdukhin, and as Polonius in Shakespeare's *Hamlet*. Shchukin was one of the first actors to portray V. I. Lenin on the stage and in motion pictures, in Pogodin's play *Man With a Gun* (1937) and in M. I. Romm's films *Lenin in October* (1937) and *Lenin in 1918* (1939).

Shchukin was awarded the State Prize of the USSR (1941, posthumously) and the Order of Lenin.

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SHCHUKIN, IVAN SEMENOVICH. Born Apr. 28 (May 10), 1885, in Moscow. Soviet physical geographer. Doctor of geographical sciences (1935). Honored Scientist of the RSFSR (1957).

Shchukin graduated from Moscow University in 1911. In 1918 he became a docent in the subdepartment of geography of Moscow State University. From 1935 to 1941 he was a professor and senior research worker at the Geographic Institute of the Academy of Sciences of the USSR.

Shchukin is one of the founders of the Soviet school of geomorphology. In 1944 he organized the subdepartment of geomorphology in the department of geography at Moscow State University and headed the subdepartment from 1944 to 1960. His long years of expeditionary research in the Caucasus and Middle Asia have provided the basis for his works on general and regional geomorphology and physical geography. He has compiled a four-language encyclopedic dictionary of terms of physical geography.

Shchukin has been awarded the Order of Lenin, two other orders, and various medals. Since 1955 he has been an honorary member of the Geographical Society of the USSR. Two peaks in the Gissar-Alai, an inlet on Lake Urup, a mountain range in East Antarctica, and a glacier in the Dzungarian Alatau have been named after Shchukin.

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SHCHUKIN, NIKOLAI LEONIDOVICH. Born Apr. 13 (25), 1848; died June 2, 1924. Russian scientist in railroad transport.

After graduating from the St. Petersburg Institute of Technology in 1873, Shchukin taught at the institute, becoming a professor in 1889. From 1883 to 1907, he taught at the Military Engineering Academy. In 1906, he became a teacher in the Advanced Courses for Women in St. Petersburg.

A number of steam locomotives were built according to Shchukin's designs, including the 1–3–0 series N locomotives and 0–4–0 tank locomotives. Shchukin also designed, for example, passenger cars for the Nikolaevskaia Railroad (now called the Oktiabr' Railroad), a freight car with a load capacity of 1,200 *poody* (about 20 tons), and the class 4 passenger car. Between 1897 and 1907, the world's first kerosine pipeline, which extended from Baku to Batumi, was built according to Shchukin's design and under his direction; it was converted to a petroleum pipeline in 1931. In 1922, Shchukin was put in charge of a technical council for the building of the first Soviet diesel locomotive, which was designed by Ia. M. Gakkel'.

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SHCHUKIN, STEPAN SEMENOVICH. Born 1758 in St. Petersburg; died there Oct. 10 (22), 1828. Russian portrait painter.

Shchukin studied with D. G. Levitskii at the St. Petersburg

Academy of Arts from 1776 to 1782. He studied in Paris with J. B. Suvée from 1782 to 1786. Beginning in 1788, Shchukin taught at the academy in St. Petersburg (academician from 1797), where his students included A. G. Varnek and V. A. Tropinin.

Shchukin's portraits combine idealized elements of formal portraiture with realistic characterization. At times they anticipate the traits of romanticism in Russian painting of the early 19th century; examples are Shchukin's portraits of Paul 1 (1797) and a self-portrait (mid-1790's) at the Russian Museum in Leningrad. Shchukin also painted miniatures. [29–1618–1]

SHCHUKO, VLADIMIR ALEKSEEVICH. Born July 5 (17), 1878, in Tambov; died Jan. 18, 1939, in Moscow. Soviet architect and theater artist.

Shchuko studied with L. N. Benois at the St. Petersburg Academy of Arts from 1896 to 1904. He became an academician of architecture in 1911. Shchuko's best works are marked by a creative application of the principles of classical architecture and a search for simple forms closely related to the new types of public buildings and new equipment. In the prerevolutionary period he designed Building No. 63–65 on Kirov Prospect (formerly Kamennoostrovskii Prospect) in Leningrad (1908–11) and the Russian pavilion at the International Exhibition in Rome (1911).

Shchuko's major projects during the Soviet period were done in collaboration with V. G. Gel'freikh. They include the monumental entry to Smolny (1923–25), the architectural part of the monument to V. I. Lenin at Finland Station in Leningrad (1926), the M. Gorky Drama Theater in Rostov-on-Don (1930–35), the new building of the V. I. Lenin Library of the USSR (1928–40, Moscow), the Bol'shoi Kamennyi Bridge (1936–38, Moscow, with participation by M. A. Minkus), the main pavilion of the All-Union Agricultural Exhibition (1939, Moscow), the Government Building of the Abkhaz ASSR in Sukhumi (1932–39), and the viaduct in Sochi (1936–37, with others).

Shchuko also was a theater artist. He designed the set and costumes for the Starinnyi Theater in St. Petersburg in 1907 and for various theaters in Leningrad from 1919 to 1932. He also was the set and costume designer for a production of *Boris Godunov* at the Malyi Theater in Moscow in 1937. Shchuko was an accomplished graphic artist and watercolorist (*V. A. Shchuko Album: Drawings and Watercolors*, Moscow, 1940).

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[29–1618–2]

SHCHUROVSKII, GRIGORII EFIMOVICH. Born Jan. 30 (Feb. 11), 1803, in Moscow; died there Mar. 20 (Apr. 1), 1884. Russian geologist.

Shchurovskii graduated from the medical faculty of Moscow University in 1826. In 1835 he became a professor of mineralogy and geology at the university. Between 1863 and 1880 he was head of the department of geognosy and paleontology, which he had organized. Shchurovskii studied the geological structure of the Urals and the Altai. He was president of the Society of Lovers of Natural Science, Anthropology and Ethnology from its founding in 1864 and one of the founders of the Polytechnical Museum in Moscow.

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SHCHUSEV, ALEKSEI VIKTOROVICH. Born Sept. 26 (Oct. 8), 1873, in Kishinev; died May 24, 1949, in Moscow. Soviet architect. Honored architect of the USSR (1930); academician of the Academy of Sciences of the USSR (1943).

Shchusev studied with L. N. Benois at the St. Petersburg Academy of Arts from 1891 to 1897; he became an academician in 1910. He was director of the Tret'iakov Gallery from 1926 to 1929. Shchusev established the Museum of Architecture in Moscow in 1946 and served as its director until 1949. He taught at the Stroganov Industrial Arts School from 1913 to 1918, the State Higher Arts and Technical Studios from 1920 to 1924, and the Moscow Architectural Institute in 1948 and 1949.

Shchusev's early projects were restorations of ancient Russian architecture: reconstruction of the 12th-century Church of St. Basil in Ovruch, the Marfa-Mar'ia Cloister (1980–12), and the Kazan Railroad Station in Moscow (begun 1914). His work was particularly diverse in Soviet times. He participated in the plans for rebuilding Moscow (1918–25) and served as chief architect for the All-Russian Agricultural and Domestic Industrial Exhibition in Moscow (1922–23). His work of the 1920's showed some influence of constructivism, as seen in the Research Institute of Health Resort Science and Physical Therapy in Sochi (1927–31) and the building of the People's Commissariat of Agriculture in Moscow (1928–33, today the Ministry of Agriculture).

Shchusev's greatest achievement is the V. I. Lenin Mausoleum in Moscow. The mausoleum was designed in a very short period of time, and construction of a wooden structure was completed in 1924. In 1930 the wooden structure was replaced by a monumental granite structure of similar design. (Shchusev's concept was realized, under his direction, by the architects Iu. A. Dul'gier, L. B. Karlik, V. A. Mikhailov, A. K. Rostkovskii, I. A. Frantsuz, and G. K. Iakovlev.) Only a limited part of the architectural complex of Red Square, the mausoleum is not only a very impressive memorial structure but also serves as a reviewing stand for parades, as if emphasizing the majesty of Lenin's ideas.

Shchusev's work in the 1930's and 1940's shows a desire to develop the progressive traditions of past architecture. He used elements of classical architecture in construction of the Hotel Moskva (1932–38, with others), the Moskvoretskii Bridge (1936–38), and an administrative building on Dzerzhinskii Square in Moscow (1946). Shchusev used themes of Georgian national architecture in the design of the branch of the Institute of Marxism-Leninism of the Central Committee of the CPSU in Tbilisi (1938). He used Uzbek traditions in the A. Navoi Bol'shoi Opera and Ballet Theater in Tashkent (1938–47). Elements of 17th-century Russian architecture can be seen in the design of the Komsomol'skaia-Kol'tsevaia Subway Station (opened 1952) in Moscow. City planning projects occupy an important place in Shchusev's work, including plans for rebuilding the following cities destroyed during the Great Patriotic War of 1941–45: Istra (1942–43), Novgorod (1943–45), and Kishinev (1947).

Shchusev wrote more than 200 scholarly works and articles dealing with a broad range of architectural problems. He was awarded the State Prize of the USSR four times—in 1941, 1946, 1948, and 1952. He also received the Order of Lenin, two other orders, and various medals.

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K. N. AFANAS'EV [29–1621–2]

SHE, a nationality of China. The She, who inhabit the provinces of Fukien, Chekiang, and Kwangtung, belong to the aboriginal population of South China. According to a 1975 estimate, they number 300,000. Related linguistically to the Yao, they have no writing system. The She have been sinicized to a great extent and often speak Chinese even among themselves. They have retained animist beliefs. The She engage chiefly in the cultivation of rice on paddies; handicrafts are highly developed among them.

REFERENCE
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SHEBALIN, MIKHAIL PETROVICH. Born May 27 (June 8), 1857, in the village of Novoselki, Kazan Province; died Feb. 24, 1937, in Moscow. Russian revolutionary; member of the People's Will organization.

Shebalin came from a noble family. He graduated from the mathematics faculty of the University of St. Petersburg in 1882. In the fall of that year he joined the People's Will, and in 1883 he organized underground "traveling printshops" in St. Petersburg and Kiev. Shebalin printed the first two issues of *Listki "Narod-*

noi voli". He reestablished the Kiev organization of the People's Will and merged it with the Youth Party of the People's Will. Shebalin was arrested in Kiev on Mar. 4, 1884. He was sentenced in the Trial of the 12, held in the Kiev Military District Court on Nov. 1–9, 1884, to 12 years of penal servitude; he served the sentence in the Shlissel'burg Fortress.

Shebalin subsequently lived in exile in Yakutsk Oblast until 1906, when he returned to European Russia and took part in the social movement. From 1909 to 1911 he was in exile in Arkhangel'sk Province. He was a member of the Socialist Revolutionary Party from 1911 until 1918. In February 1922, Shebalin became head of the P. A. Kropotkin Museum in Moscow and a member of the All-Union Society of Former Political Prisoners and Exiles.

WORKS

Klochki vospominanii. Moscow, 1935. [29–1064–1]

SHEBALIN, VISSARION IAKOVLÉVICH. Born May 29 (June 11), 1902, in Omsk; died May 28, 1963, in Moscow. Soviet composer, pedagogue, and public figure. People's Artist of the RSFSR (1947); doctor of the arts (1941).

In 1928, Shebalin graduated from the Moscow Conservatory, where he had studied composition under N. Ia. Miaskovskii. Shebalin's music, which is pictorial in nature, communicates an ideological message and affirms a lofty and positive ideal; it develops the traditions of the Russian classics and is characterized by its noble use of melody, which often recalls the lyric and epic songs of Russian folklore.

Shebalin composed the operas *The Taming of the Shrew* (based on the play by Shakespeare; 1957, Bolshoi Theater) and *Sun Over the Steppes* (concert performance, Moscow, 1959), the musical comedy *Bridegroom From the Embassy* (1942), and the cantata *Moscow* (1946; words by B. V. Lipatov; State Prize of the USSR, 1947). An important composition is the dramatic symphony *Lenin* (1931; revised version, 1959), scored for narrator, soloists, chorus and orchestra; the work is based on V. V. Mayakovsky's narrative poem *Vladimir Il'ich Lenin*.

Shebalin is also known for his five symphonies, violin concerto (1940), and chamber music, including nine string quartets, of which the most famous is the String Quartet No. 5, on Slavic Themes (1942; State Prize of the USSR, 1943). His other works include art songs, choruses, music for motion pictures and plays, and arrangements of Russian folk songs. An important part of Shebalin's oeuvre are his completed versions of Russian and Ukrainian musical classics, such as the operas *Sorochintsy Fair* by Mussorgsky and *The Zaporozhian Cossack Beyond the Danube* by Gulak-Artemovskii and Glinka's *Symphony on Two Russian Themes*.

Shebalin became a professor at the Moscow Conservatory in 1935 and served as its director from 1942 to 1948. In addition to the Czech composer V. Kučera, his students included L. M. Auster, E. V. Denisov, K. Kh. Kuzham'iarov, A. A. Nikolaev, A. N. Pakhmutova, V. R. Tormis, T. N. Khrennikov, and K. S. Khachaturian. Shebalin was chairman of the administrative board of the Moscow organization of the Composers' Union of the USSR in 1941 and 1942 and served as a deputy to the second convocation of the Supreme Soviet of the RSFSR. Shebalin was awarded the Order of Lenin, the Order of the Red Banner of Labor, and various medals.

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Literaturnoe nasledie: Vospominaniia, perepiska, stat'i, vystupleniia. Moscow, 1975.

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Vissarion Iakovlevich Shebalin: Stat'i, vospominaniia, materialy. Moscow, 1970. V. M. Blok [29–1063–4]

SHEBEKE. (1) Openwork designs or designs imitating them in the applied art of Azerbaijan.

(2) Window frames and gratings assembled from standard wooden components held together only by dowels and frequently ornamented with pieces of varicolored glass. *Shebeke* were in wide use in 18th- and 19th-century Azerbaijani architecture. Openwork lattices are also common in Arab countries, where they are called *musharabiia*, and in Middle Asia, where they are known as *pandzhara*. [29–1064–2]

SHEBEKINO, a city (since 1938) under oblast jurisdiction and administrative center of Shebekino Raion, Belgorod Oblast, RSFSR. Located on the Nezhegol' River in the Don River basin. Railroad station on a branch line from the Belgorod-Kupiansk line, 39 km southeast of Belgorod. Population, 36,000 (1974).

Enterprises in Shebekino include chemical and biochemical plants. Various plants produce machinery, leather goods, butter, household chemicals, and reinforced-concrete products. There is also an automotive repair plant. The settlement also has combines producing construction materials, bread, and food products. Educational institutions in Shebekino include a research-and-design institute specializing in the planned production of surface-active agents, a chemistry and mechanics technicum, and a technicum of automotive transport. [29–1064–3]

SHEBERGHAN, a city in northern Afghanistan, located at an oasis. Administrative centre of Jozjan Province. Population, 56,500 (1970). Sheberghan is a center for raising karakul sheep. There is rug making in the city. Some of the natural gas that is extracted near Sheberghan is sent by pipeline to the USSR. [29–1173–1]

SHEBOLDAEV, BORIS PETROVICH. Born May 15 (27), 1895, in Paris; died Oct. 30, 1937. A leader in the struggle to establish Soviet power in the Caucasus. Member of the Communist Party from 1914.

The son of a doctor, Sheboldaev moved with his family to St. Petersburg in 1900. He was drafted into the army in 1916 and became deputy chairman of the Revolutionary Military Committee of the Caucasian Army in the following year. In 1918 he became a member of the Baku committee of the RCP(B), deputy people's commissar for military affairs of the Baku council of people's commissars, and a commissioner of the Revolutionary Military Council of the Twelfth Army.

In 1920, Sheboldaev became secretary of an oblast committee of the RCP(B) and deputy chairman of the Revolutionary Committee of Dagestan. In the period from 1923 to 1925 he initially headed a department of the Central Committee of the Communist Party (Bolshevik) of Turkmenistan and served as secretary of the Tsaritsyn (Volgograd) provincial committee of the RCP(B); he then took up a position in the administrative apparatus of the Central Committee of the ACP(B). He served as a secretary of the Lower Volga Krai Committee of the ACP(B) from 1928 to 1930, the Northern Caucasus Krai Committee from 1931 to 1934, the Azov–Black Sea Krai Committee from 1934 to 1937, and the Kursk oblast committee of the ACP(B) in 1937.

Sheboldaev was a delegate to the Fifteenth, Sixteenth, and Seventeenth Party Congresses. At the Fifteenth Congress he was elected a member of the Central Control Commission, and at the Sixteenth and Seventeenth Congresses a member of the Central Committee of the ACP(B). Sheboldaev was awarded the Order of the Red Banner. [29–1065–3]

SHEBUEV, VASILII KOZ'MICH. Born Apr. 2 (13), 1777, in Kronstadt; died June 16 (28), 1855, in St. Petersburg. Russian painter.

Shebuev studied at the St. Petersburg Academy of Arts with I. A. Akimov and G. I. Ugriumov from 1782 to 1797. He received a stipend from the academy to study in Rome from 1803 to 1807. He taught at the academy in 1807, becoming a professor in 1812 and rector in 1832. Shebuev was one of the leading masters of late classicism and academism. His works, which were mainly on historical and religious subjects, are noted for strict academicism of line, skillful composition of many-figured scenes, and an interest in national history. Examples of his work are *The Feat of the Merchant Igolkin* (1839, Russian Museum, Leningrad) and a ceiling in the meeting hall of the Council Building at the St. Petersburg Academy of Arts (1833). Some of his works reflect romantic and realistic trends, including *Fortunetelling: Self-portrait* (1805, Tret'iakov Gallery) and *Portrait of the Retired Official Shvykin* (1833, Russian Museum). [29–1066–1]

SHEBUNINO, an urban-type settlement in Nevel'sk Raion, Sakhalin Oblast, RSFSR. Shebunino is situated in the southwestern part of Sakhalin Island, on the Sea of Japan. It is the terminus of the Il'inskii-Shebunino railroad line. Lignite is mined nearby. [29–1066–2]

SHED, a structure for keeping furbearing animals. A shed consists of a lean-to with a gable roof, under which cages are arranged in two, four, or six rows. The supporting structure, or framework, is made of wood, steel, or reinforced concrete. The roof is tile or slate. The passages between the rows of cages are paved with asphalt. In regions with large snowdrifts the cages are set on posts, and there are closed corridors. [29–1078–1]

SHEEHY AFFAIR, the prosecution by British authorities of the Irish patriot Nicholas Sheehy, who publicly condemned the national and religious discrimination against the Irish. In 1765, Sheehy was accused of belonging to the White Boys, a clandestine peasant organization. Owing to a lack of any evidence, the court found Sheehy not guilty. However, Sheehy was soon brought to trial again on a charge of murdering a police informant and was convicted on the testimony of suborned witnesses; he was sentenced to death and was hanged. The legal reprisal against Sheehy was a manifestation of the policy of terror practiced by the British colonizers in Ireland. [29–1176–4]

SHEEPSKIN SHEEP RAISING, the raising of sheep to obtain high-quality sheepskins for coats. Sheepskin sheep raising began developing in Russia in the late 18th century, when a cottage industry producing sheepskins for coats emerged in certain districts of Yaroslavl' and Kostroma provinces to meet the demand for warm fur clothing. The sheepskins were obtained from local northern short-tailed sheep. The Romanovo breed, from which sheepskins are obtained today, was developed through long-term breeding of sheep herds and the selection of sheep for the quality of their sheepskins.

Romanovo sheepskins are light, strong, and very warm and have an attractive appearance. The good qualities of the sheepskins are determined by the characteristics of the wool, which, unlike the wool of other coarse-wooled sheep, consists entirely of down and guard hairs. Three to four months after shearing, the down, which grows more rapidly, overgrows the guard hairs by 2–3 cm and forms locks with attractive tight curls. The optimal proportion between the guard hairs and the down and the difference in their coloration are responsible for the lovely light blue tint of the wool. The relatively short guard hairs provide the down with an elastic support and prevent the wool from matting.

Sheepskins from young animals, five to eight months of age, are the most valuable. In production, animals are usually slaughtered at nine to ten months of age, when the wool has grown out at least 3 cm after the first shearing; this results in a good-size carcass and hide. Sheepskin sheep raising is highly productive: Romanovo sheep are very fertile, capable of lambing three times in two years. On leading farms, 300–330 lambs are born per year per 100 ewes.

As of Jan. 1, 1976, there were 578,000 Romanovo sheep in the USSR. A small number has been exported to France and Rumania to help upgrade local breeds.

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Nikolaev, A. I. *Ovtsevodstvo*, 4th ed. Moscow, 1973. [29–1518–2]

SHEEP SORREL (*Rumex acetosella*), a perennial herbaceous plant of the family Polygonaceae. The leaves are alternate. The lower leaves are petiolate and speary, and the upper ones are sessile and lanceolate. The small unisexual flowers are in panicles. (The plant is dioecious.) The fruit is a shiny three-angled nutlet.

Sheep sorrel is distributed in the temperate and subtropical zones of the northern hemisphere. It is almost ubiquitous in the USSR. A sucker-forming weed, the plant occurs mainly in plantings of thinned perennial herbs. It often forms thickets on fallow fields, wastelands, and dry meadows, as well as along roads and in dumps. Sheep sorrel serves as forage for sheep and pigs. When eaten in large quantity, however, it causes severe poisoning owing to the presence of a large quantity of calcium oxalate in all its parts. The plant is especially toxic during the period of seed maturation.

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SHEERNESS, a city and port in Great Britain, in the county of Kent. Situated at the entrance to the Thames estuary, on the Isle of Sheppey. Part of the borough of Queensborough-in-Sheppey. Population, 106,700 (1976). Government dockyards are located in the city. [29–1227–2]

SHEET-METAL FORMING AND FORGING (in Russian, *shtampovka*), in metalworking, pressure-shaping processes in which articles are formed by a special tool—a press tool or die; such production processes constitute a branch of the forging and stamping industry. A distinction is made between die forging and sheet-metal stamping on the basis of the type of stock and between the analogous cold and hot pressure-shaping processes on the basis of the temperature of the process. Compared with classical (smith) forging, these processes provides greater efficiency, since the entire workpiece or a significant part of it is subjected to simultaneous plastic deformation.

Die forging is capable of producing articles with more complex shapes than is possible with smith forging, and the articles require significantly less machining to complete production. Metal flow is limited by the walls of the die, which increases the resistance to deformation with increasing complexity of the shape of the article. Heating of the workpiece reduces the resistance to deformation by a factor of 10–15 and increases the ductility of the metal. Cold die forging is used for the production of small articles weighing less than 1 kg; hot die forging is used for articles weighing up to 1.5–2 tons. Heavier items are produced by smith forging. The boundary between the two processes is changing with the improvement of forging equipment and the increasing deformation forces generated by such equipment. Since the cost of dies and stock metal is a major component of the cost of the finished products, the use of die forging is economically advantageous in series production.

Die forging is accompanied by metal loss when the flash is removed. The use of closed dies lessens waste, but the unit loads are greater than in open dies, which reduces the durability of the dies. When open dies are used, waste can be reduced by preliminary processing of the stock in preforming die impressions and forging rolls, by the use of stock blanks that approximate the shape of the final product, and by selecting the proper shape for the flash gutter. In hot working processes the surface of the metal stock is oxidized, forming a layer of scale, which also leads to metal losses. Such losses can be reduced by nonoxidizing heating in fuel-fired furnaces (in a protective atmosphere) or by rapid heating in induction heating units. The use of high-speed processes (with hammer velocities of 10–25 m/sec) lessens the cooling of the stock during deformation and produces articles with thin edges. Isothermic pressure-shaping processes, mainly for nonferrous metals, are also used to lessen cooling of the stock; the technique calls for the die to be heated to temperatures close to the forging temperature. The combined use of casting and hot pressure-shaping processes is being introduced. In this method, the stock blank is cast in a shape close to that of the final product; after the metal hardens and cools to forging temperatures, the blank is die-forged in open or closed dies. The die forging improves the mechanical properties of the cast blank; the waste formed is immediately remelted.

In sheet-metal forming, the metal stock consists of sheet, strip, or ribbon metal. The process is used in the production of flat (sheet) and folded articles (including those with complex shapes), in which the thickness is considerably less than the other dimensions—usually less than 10 mm. Stock of greater thickness is usually hot-stamped to forging temperature. Sheet-metal forming (especialy cold stamping) does not usually require metal cutting to finish the article. The technique is suitable for production runs with various output quantities.

Special techniques are used in small-series production: pressure shaping with elastic media (a fluid, rubber, or polyurethane) and techniques that use the energy of a shock wave in a fluid (explosive and electrohydraulic forming) or the action of powerful, rapidly varying magnetic fields (magnetic pulse forming). Processes with differential heating are sometimes used to increase the maximum permissible deformation of the metal stock. The section of the metal blank to be deformed is heated by contact

with a heated tool or the passage of an electric current. The correct distribution of temperatures and of the corresponding metal properties in the stock significantly increases the maximum possible deformation.

Various types of equipment are used in sheet-metal forming and forging, including hammers, crank presses, horizontal forging machines, hydraulic presses, and automatic forging and stamping machines. Large-series production uses automatic machines and automated production lines as well as all types of loading and manipulating devices (including industrial robots), which contribute to a significant increase in labor productivity.

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E. A. POPOV [29–1449–2]

SHEET PILING, a solid wall formed by wooden, reinforced-concrete, or steel sheet piles driven into the ground. Sheet piling serves as a watertight barrier and prevents the ground from collapsing during the construction of hydraulic engineering installations, such as dams, embankments, lock chambers, docks, and cofferdams. It also provides a temporary enclosure for foundation areas or trenches. Very high sheet piling is equipped with stays, or steel braces, which are located in the upper part of the wall and are anchored in soil not subject to collapse. The piles are driven into the ground by pile drivers or by means of vibration drivers. [29–1410–4]

SHEFFIELD, a city and county borough in Great Britain, situated on the Don River. Capital of the metropolitan county of South Yorkshire. Population, 558,000 (1976). Sheffield, a major center of heavy industry, is the country's largest producer of quality steel. The city produces machinery, including machine tools and electrical-engineering and hydraulic equipment. It has long been known for its metalwork, hardware, cutlery, and jewelry. Arms are also produced. Other important branches of industry are food-processing and light industry.

Museums in Sheffield include the Sheffield Municipal Museum (founded 1875), which houses a collection of metalware, and the Mappin and Graves art galleries. The city has a university. [29–1168–1]

SHEFNER, VADIM SERGEEVICH. Born Dec. 30, 1914 (Jan. 12, 1915), in Petrograd. Soviet Russian writer. Member of the CPSU since 1945.

Shefner, the son of a military man, studied in the *rabfak* (workers' school) at the University of Leningrad and served in the Great Patriotic War (1941–45). His poetry collection *Defense* (1943), his narrative poem *Meeting in the Suburb* (1945), and his novella *Sister of Sorrow* (1970) were devoted to the heroic defenders of Leningrad. In his poetry collections *Signs of the Earth* (1961), *Vaults* (1967), and *Freeboard* (1970) he turned toward the traditions of Russian philosophical lyric poetry.

Shefner has also written tales of fantasy, entertaining and ironic in tone, that raise moral questions. They include the novellas *Girl at the Precipice, or The Notes of Kovrigin* (1964), *The Man With Five "No's," or the Confession of a Simpleton* (1967), and *The Utter Mystery* (1970).

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[29–1166–5]

SHEFSTVO, in the USSR, a type of social activity. It consists of systematic comradely assistance rendered by an organization or institution (the chief, or *shef*) to another group. For example, *shefstvo* may apply to a kolkhoz, school, or military unit. [29–1167–1]

SHEGARKA, a river in Novosibirsk and Tomsk oblasts, RSFSR; a left tributary of the Ob'. The Shegarka measures 382 km in length and drains an area of 12,000 sq km. It rises on the southeastern part of the Vasiugan Plain and is fed mainly by snow. The mean flow rate 177 km from the mouth is 12.6 cu m per sec.

The Shegarka freezes in late October or November, and the ice breaks up in the second half of April or early May. In the upper course it freezes through for two or three months in some winters, and in the summer it dries up. The Shegarka is used to float timber. It is navigable for a distance of 214 km from the mouth. [29–1077–2]

SHEHU, MEHMET. Born Jan. 10, 1913, in Corrushi, in southern Albania; died Dec. 17, 1981. Albanian state and political figure.

Shehu studied at a military school in Naples in the mid-1930's. From 1937 to 1939 he fought in the ranks of the international brigades in Spain. Interned in France in 1939, he returned to Albania in 1942 and took part in the struggle against the fascist occupiers and in the activities of the Communist Party of Albania (CPA; since 1948, Albanian Workers Party [AWP]). In 1943, Shehu was elected a candidate member of the Central Committee of the CPA. In 1943 and 1944 he commanded the 1st Partisan Brigade and then a division of the National Liberation Army. In 1944 and 1945 he was a member of the Antifascist National Liberation Council.

After the liberation of Albania from fascist troops in November 1944, Shehu became deputy chief of the General Staff of the People's Army; he twice served as chief of the General Staff, in 1946 and 1947 and again in 1948. He became a member of the Central Committee of the AWP and the Politburo of the Central Committee in 1948; from 1948 to 1953 he was secretary of the Central Committee. From 1948 to 1954, Shehu was deputy chairman of the Council of Ministers and minister of internal affairs. He became chairman of the Council of Ministers in 1954 and was appointed to the additional post of minister of national defense in 1974. Shehu was first elected a deputy to the People's Assembly in 1947. [29–1169–3]

SHEIBANIDS (also Shaybanids), the descendants of Shiban, a son of Jochi and brother of Batu.

One of the most important of the Sheibanids was the founder of the Sheibanid dynasty of Uzbek khans, Muhammad Sheibani (1451–1510), a son of Shah-Budag-Sultan and grandson of Abulkhair (Abu al-Khayr). In 1499, Sheibani Khan embarked on the conquest of Mavera-un-Nahr; in 1500 he took the Timurid capital of Samarkand and founded the Sheibanid state. He established his rule over all Mavera-un-Nahr and Khorasan and in 1508 and 1509 plundered the Kazakhs. In 1510, Sheibani Khan was defeated and killed at Merv by the Iranian shah Ismail I.

After the death of Sheibani Khan's uncle, Kochkunju Khan (ruled 1510–30), and the brief reign of his son Abu Said (ruled 1530–33), Sheibani Khan's nephew Abu al-Ghazi (ruled 1533–39) became the head of the Sheibanid state. The Sheibanids, who considered themselves the rightful successors to the Timurids, warred continuously with the Safavids for Khorasan and the second Timurid capital, Herat.

Under Abdullah-Khan II ibn Iskander (ruled 1557–98), from 1583 khan of all the Uzbeks, the power of the khan was strengthened considerably. After the death of Iskander and the assassination of his son Abd al-Mumin, the Sheibanid dynasty came to an end. Pir Muhammad II, the last Sheibanid, controlled only a small part of the state; he was killed, in an internecine struggle, the same year he took power. The Ashtarkhanids, succeeded the Sheibanids in 1599.

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[29–1082–1]

SHEIBANID STATE, a feudal state in Middle Asia from 1500 to 1598. The capital was at Samarkand until 1560, when it was moved to Bukhara.

The Sheibanid state was formed after nomadic Uzbeks under Sheibani Khan arrived in Middle Asia and conquered central Mavera-un-Nahr (*see* SHEIBANIDS). The state included all the former possessions of the Timurids. After Sheibani Khan was routed by the Iranian shah Ismail I Safavid in 1510, it divided into two Uzbek states: the Sheibanid state in Mavera-un-Nahr and the Khiva Khanate, which was independent of the Sheibanids and had its capital initially at Urgench and later at Khiva; the former Timurid possessions in Khorasan passed to Iran.

The Sheibanid state was divided into districts that were controlled by members of the dynasty. Among the largest districts were Bukhara, Samarkand, Tashkent, Balkh, and Khisar. To the ruler of the state belonged the outward prerogatives of power: he bore the honorific title of khan, his name was invoked during the Friday prayer, and silver coins were minted with his name.

The institution of land grants—the *soyurghal* and *tiyul*—underwent further development in the Sheibanid state. As a result of redistribution, the state lands came to be owned by the dynasty and by elite clans from nomadic Uzbek tribes that had come from the steppes. The exploitation of the peasantry consisted mainly of a tax rent, most of which was a fixed amount equal to 30–40 percent of the harvest and was collected in kind.

Numerous campaigns and raids on Khorasan and continual internecine strife among the feudal lords led to extensive destruction of the economy. A brief period of stability that began under Abdullah-Khan II ibn-Iskander was insufficient to repair the damage inflicted on handicrafts and trade. An important factor in the development of the Sheibanid state was the establishment of economic and diplomatic relations with Russia and with the Mogul Empire in India.

Under the Sheibanid state the designation "Uzbeks" was first applied to the Turkic-speaking population of Mavera-un-Nahr and Khorasan; the Old Uzbek literary language reached an advanced state of development. The leading cultural center was Bukhara, whose most famous poets and prose writers were Khodzha Hassan Nisari, Zainaddin Vasifi, Kamal al-Din Benai, and Abdurakhman Mushfiki. In the 16th century large-scale historical works devoted to the state were written, notably Benai's *Sheibani-name* and *Futukhati-khani*, Muhammad Salikh's *Sheibani-name*, Khwandamir's *Habib-al-siyar*, Ruzbehan's *Mekhmannamai Bukhara*, and Hafiz Tanysh's *Abdullah-name*.

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SHEIDAI. Born circa 1730; died 1800. Turkmen poet.

Sheidai, a member of the Salor tribe, lived in the Bukhara Khanate. In his poems he denounced the vices of society and abuse of power, in particular the duplicity and sanctimoniousness of the clergy. Setting his hopes on the enlightenment and self-improvement of man, he called for diligence, humaneness, and modesty. In the poem "The Condition of the Turkmens," he glorified the Ghuz-Turkmen tribes of the ninth to 13th centuries, contrasting them with the spiritually impoverished society of the 18th century.

Sheidai's lyric love poems followed the canons of Eastern poetry with its stereotyped images, similes, and flowery epithets. His works were influenced greatly by Persian culture, for example, his *dastan* of love and adventure *Gul and Sanubar* (translated into Russian as *Prince Sanubar*, 1909).

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SHEIKH, among Arab nomads the head or leader of a clan, tribe, or tribal alliance. In Islamic countries the term also acquired the general meaning of a venerable man; it is most often applied to leaders of Muslim sects and dervish orders (equivalent terms are "pir" and "murshid"), prominent theologians, and Muslim jurists. On the southern Arabian Peninsula and in the area of the Persian Gulf, several small states are ruled by sheikhs. [29–1086–4]

SHEIKHZADE, MAKSUD. Born Oct. 25 (Nov. 7), 1908, in Agdash, in what is now the Azerbaijan SSR; died Feb. 19, 1967, in Tashkent. Soviet Uzbek writer. Honored Art Worker of the Uzbek SSR (1964). Azerbaijani by nationality. Member of the CPSU from 1960.

Sheikhzade graduated from the Baku Pedagogical Institute in 1933 and taught the history of Uzbek literature at the Tashkent Pedagogical Institute from 1938. He first published his works in 1929. In the collection *The Third Book* (1934) he introduced free verse into Uzbek poetry. His poems employed motifs from contemporary life, and his civic lyric poetry was especially topical. He was the author of the collection of patriotic poems *For What Are We Fighting?* (1942) and such narrative poems as *Zhenia, The Third Son*, and *Aksakal*, which were devoted to the Great Patriotic War (1941–45). The drama *Dzhalaliddin* (1941) dealt with the struggle against the Mongol invasion in the 13th century. In 1958, Sheikhzade published the lyric philosophical *Poem About Tashkent* (Russian translation, 1959), and in 1961, the collection of lyric poems *Years and Roads*. The tragedy *Mirza Ulug Beg* (1964; Russian translation, 1966) is devoted to the famous 15th-century Uzbek astronomer. Sheikhzade translated the works of A. S. Pushkin, M. Iu. Lermontov, Shakespeare, V. V. Mayakovsky, and N. S. Tikhonov into Uzbek.

Sheikhadze was awarded the Order of the Badge of Honor and several medals.

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KH. G. KOROGLY [29–1087–1]

SHEIN, ALEKSEI SEMENOVICH. Born 1662; died Feb. 12, 1700. Military leader and state figure of Russia; great-grandson of M. B. Shein.

A. S. Shein received the rank of boyar in 1682 and that of *blizhnii*, or privy, boyar in 1695. He served as *voevoda* (military governor) in Kursk in 1683 and 1684. Shein was one of the military commanders who fought in the Crimean campaigns of 1687 and 1689 and in the Azov Campaign of 1695. He was commander in chief of the land forces in the Azov Campaign of 1696 and was granted the title generalissimo.

During the period of the Great Embassy, Shein was appointed by Peter I as commander in chief of the Russian Army and head of three military *prikazy* (offices). Shein defeated large Crimean Tatar and Nogai forces in 1697 and suppressed the uprising of the *strel'tsy* (semiprofessional musketeers) in 1698. [29–1080–4]

SHEIN, MIKHAIL BORISOVICH. Date of birth unknown; died Apr. 28, 1634. Russian military leader and state figure. Helped suppress uprisings of peasants and *kholopy* (bondmen) in 1602 and 1603 and the peasant uprising led by I. I. Bolotnikov in 1606 and 1607.

Shein became an *okol'nichii* (a noble ranking below the boyars) in 1605 and a boyar in late 1606 or early 1607. In late 1607 he was appointed *voevoda* (military governor) of Smolensk. During the intervention in Russia by Polish and Lithuanian feudal lords, Shein directed the defense of Smolensk of 1609–11. When the Poles took Smolensk on June 3, 1611, the wounded Shein was captured and taken to Poland with his family.

Shein returned to Russia in 1619 and became one of the closest associates of Patriarch Filaret. Shein headed a *sysknoi prikaz*, or office for the search, pursuit, and capture of fugitive *posadskie liudi* (merchants and artisans), in 1620 and 1621 and from 1625 to 1628 and the Pushkarskii Prikaz (Office of Field Ordnance) from 1628 to 1632. In the 1620's and early 1630's he took part in numerous diplomatic negotiations, some of them secret.

In April 1632, Shein was appointed commander of the army in the Russo-Polish War of 1632–34. After the Russian troops were

forced to capitulate on Feb. 15, 1634, he was unjustly accused of numerous mistakes and crimes, including treasonous acts beneficial to Władysław IV, and was executed by order of the Boyar Duma. Shein's property was confiscated, and members of his family were exiled. [29–1081–1]

SHEIN, PAVEL VASIL'EVICH. Born 1826 in Mogilev; died Aug. 14 (27), 1900, in Riga. Russian and Byelorussian folklorist and ethnologist.

Shein began collecting folklore materials in the mid-1850's. His works, which are well organized and contain a wealth of material, include the collections *Russian Folk Songs* (1870), *Byelorussian Folk Songs* (1874), *Materials for the Study of the Life and Language of the Russian Population of Northwestern Krai* (vols. 1–3, 1887–1902), and *Great Russia in Its Songs, Ceremonies, Customs, Beliefs, Stories, and Legends* (vol. 1, fascs. 1–2, 1898–1900).

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SHEINDLIN, ALEKSANDR EFIMOVICH. Born Aug. 22 (Sept. 4), 1916, in Kuibyshev. Soviet specialist in heat physics and power engineering. Academician of the Academy of Sciences of the USSR (1974; corresponding member, 1964). Member of the CPSU from 1945.

After graduating from the Moscow Power Engineering Institute in 1937, Sheindlin first worked as an engineer in a factory and then as an assistant at the institute. From 1941 to 1945 he was in the Red Army. From 1945 to 1967 he worked at the Moscow Power Engineering Institute, where he received the doctor of technical sciences degree in 1954 and became a professor in 1955. He became head of a laboratory at the Institute of High Temperatures of the Academy of Sciences of the USSR in 1960 and the institute's director in 1961. Since 1967 he has also been head of a subdepartment at the Moscow Physicotechnical Institute.

Of great importance have been Sheindlin's experimental and theoretical studies of the thermodynamic properties of water vapor at supercritical parameters. Sheindlin directed the construction and successful operation of the world's first experimental model magnetohydrodynamic installation (U-02, 1964) for the direct conversion of heat energy into electricity and the first such industrial pilot installation (U-25, 1971).

Sheindlin received the Lenin Prize in 1959, the State Prize of the USSR in 1976, and the Polzunov Prize in 1963. He has been awarded the Order of Lenin, two other orders, and various medals.

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[29–1083–4]

SHEINKMAN, IAKOV SEMENOVICH. Born Dec. 22, 1890, in Tobol'sk; died Aug. 8, 1918, in Kazan. Figure in the Russian revolutionary movement. Member of the Communist Party from 1910.

The son of a worker, Sheinkman entered the University of St. Petersburg in 1910; he was arrested for taking part in student disturbances and placed in the prison known as Kresty. After his release, Sheinkman emigrated to Switzerland in 1912 and took part in the Basel Congress of the Second International. He became involved in party work in Ekaterinburg (now Sverdlovsk) in 1914.

In September 1917, Sheinkman traveled to Kazan, where he served as deputy chairman of the provincial food committee and chairman of the RSDLP(B) faction in the Kazan soviet. He served on the Investigatory Commission of the Petrograd military revolutionary committee in October 1917 and became chairman of the Kazan soviet and of the provincial committee of the RCP(B) in November.

Sheinkman was a delegate to the Fifth All-Russian Congress of Soviets and a member of the commission appointed to frame a draft of the Constitution of the RSFSR. He helped suppress the Left Socialist-Revolutionary Revolt of 1918 and served on the investigatory commission of the Council of People's Commissars that conducted an inquiry into the revolt.

Beginning on July 19, 1918, Sheinkman directed the defense of Kazan against the White Czechs. After the city was taken, Sheinkman was captured by White Guards and shot.

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[29–1084–3]

SHEINMANN, IURII MIKHAILOVICH. Born June 17 (30), 1901, in Kiev; died Apr. 4, 1974, in Moscow. Soviet geologist. Doctor of geological and mineralogical sciences (1946). Honored Scientist of the RSFSR (1973).

Sheinmann graduated from the Leningrad Institute of Mines in 1927. Between 1923 and 1938 he worked on the Geological Committee and conducted studies in Transbaikalia, the Tien-Shan Mountains, and Sinkiang. Between 1939 and 1946 he worked on a study of the geological structure, tectonics, and magmatism of the northern part of the Siberian Platform. Beginning in 1947, he worked at various geological institutions in Siberia and Moscow and conducted field studies in the Altai and Saian mountains and in various areas of the northeastern part of the USSR. From 1960 he worked at the O. Iu. Shmidt Institute of Earth Physics of the Academy of Sciences of the USSR.

Sheinmann's main works were devoted to general problems of tectonics, the clarification of the relationship between magmatic and tectonic processes, and the origin of magmas, particularly alkaline magmas. Sheinmann developed the idea of the earth's abyssal structure, the tectosphere, which predetermines the appearance and development of geosynclines.

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A. Ia. Saltykovskii [29–1084–4]

SHEINOVO, a village in Bulgaria, south of Shipka Pass, the scene of a battle on Dec. 27–28, 1877 (Jan. 8–9, 1878), during the Russo-Turkish War of 1877–78.

The Turkish forces of 30,000–35,000 men, commanded by Vesel Paşa, occupied positions in the mountains on the approaches to Shipka Pass and in a fortified camp at Sheinovo. During the winter Russian offensive, the Southern Detachment of General F. F. Radetskii (54,000 men), located in the region of Shipka and nearby passes, was assigned the mission of crossing the Balkans and advancing on Kazanluk and Adrianople. Two detachments were to cross the Balkans: the left column, under the command of General N. I. Sviatopolk-Mirskii (about 19,000 men, including one Bularian unit, and 24 guns), and the right column, under the command of General M. D. Skobelev (16,500 men, including five Bulgarian units, and 14 guns). They were to advance through Triavna (Tryavna) and Imitli passes, respectively, and envelop Vesel Paşa's main forces (23,000 men) from the flanks, near Sheinovo. Part of the Southern Detachment was to pin down the Turkish troops by attacks from the direction of Shipka Pass.

The offensive began on December 24 (January 5); the troops advanced slowly, especially the right column, because of the difficulty of traveling on narrow mountain roads deeply covered with snow. On December 26 (January 7), the left column assembled to the south of Triavna Pass; the right column was delayed, and its advance party did not take Imitli until the night of December 26 (January 7). On the morning of December 27 (January 8), the left column attacked the Sheinovo camp from the east, took the first line of fortifications, and repulsed a Turkish counterattack.

The right column, which had not had time to assemble, limited itself to feints. On December 28 (January 9), the Turkish troops attacked the left column twice but were driven back. The Russian troops occupied the village of Shipka (northeast of Sheinovo) and one eastern redoubt, approaching the Sheinovo camp from the east. Soon after, the right column, which had approached the Turkish camp from the west at a quick march, passed to the offensive and seized one western redoubt. The surrounded Turkish troops surrendered at 3 P.M.

A total of 22,000 men, under the command of Vesel Paşa, were taken prisoner, and 83 guns were captured. The Turkish losses were 1,000 dead and wounded, while the Russian losses amounted to 5,000. As a result of the elimination of the strong Turkish grouping in the Sheinovo area, the enemy line of defense was breached and the road to Adrianople lay open. [29–1085–1]

SHEKHTEL', FEDOR OSIPOVICH. Born July 26 (Aug 7), 1859, in St. Petersburg; died July 7, 1926, in Moscow. Soviet architect. Academician of Architecture of the St. Petersburg Academy of Arts (from 1902). Chairman of the Moscow Architectural Society (1906–22).

Shekhtel' taught at the Stroganov Industrial Arts School from 1896 to 1926. He was a prominent representative of *art nouveau* at the turn of the century. His works included a trade building on Kirov Street (1898), the former Riabushinskii house on Kachalov Street (1900), the Yaroslavl Railroad Station (1902), and architectural details on the Art Theater (1902), all in Moscow. His later buildings were distinguished by more rational and severe forms, including the trade building of the Merchants' Society on Malyi Cherkasskii Lane (1909) in Moscow.

REFERENCE

Kirichenko, E. I. *Fedor Shekhtel'*. Moscow, 1973. [29–1169–2]

SHEKHURDIN, ALEKSEI PAVLOVICH. Born Mar. 10 (22), 1886, in the village of Bykovo, Urzhum District, Viatka Province (present-day Urzhum Raion, Kirov Oblast); died Mar. 1, 1951, in Saratov. Soviet plant breeder. Honored Scientist of the RSFSR (1947).

Shekhurdin studied at the Aleksandrovo-Nartassy Agricultural School in Viatka Province from 1901 to 1904. He graduated from the Saratov Agricultural Institute in 1928. From 1904 to 1907, Shekhurdin trained at and then managed Professor I. A. Stebut's farm in the village of Krotnoe, Tula Province. In 1911 he became a laboratory assistant at the Saratov Agricultural Experiment Station (now the Scientific Research Institute of Agriculture of the Southeast). Between 1920 and 1924 he developed several varieties of spring wheat, including Lutestsens 62, Al'bidum 604, and Gordeiforme 432. He became a professor in 1945. From 1946 to 1948, Shekhurdin worked in the subdepartment of plant breeding and seed raising of the Saratov Agricultural Institute. He was the first in the USSR to develop and apply to the breeding of grain crops the techniques of nonrelated and multiple complex hybridization.

A recipient of the State Prize of the USSR in 1942, Shekhurdin was also awarded the Order of Lenin and two other orders.

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SHEKI, a historical region in northern Azerbaijan, north of the Kura River. From the third to fifth centuries, Sheki was a region of Caucasian Albania. In 654 it was captured by the Arabs. In the ninth century its rulers attempted to extend their influence to Aran.

Sheki is first mentioned in historical sources as an independent state in the late 14th century; its ruler was Sidi Ahmed Orlat, who belonged to the turkized Mongol tribe of the Orlats. In 1402 troops from Sheki took part in Tamerlane's campaign against the Turkish sultan Bayazid. Under the Kara Keshish Ogly dynasty, which ruled from 1444 to 1551, Sheki was a flourishing agricultural country, and it produced beautiful silk, which was its principal export commodity. After the rise of the Safavid state, Sheki at times recognized the authority of the Safavids, but it retained a considerable degree of autonomy.

In 1551 Sheki's forces were defeated by the Iranian shah Tahmasp, and Sheki lost its independence. In the mid-18th century, however, the Sheki Khanate arose on the territory.

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SHEKI (until 1968, Nukha), a city under republic jurisdiction and the administrative center of Sheki Raion, Azerbaijan SSR. Located in the southern foothills of the Greater Caucasus, 77 km north of the Evlakh railroad junction. Population, 44,000 (1974).

Sheki has a silk production association, a garment factory, a tobacco fermentation plant, a brickyard, a meat-packing plant, and a combine of the food-processing industry. Educational institutions include textile and agricultural technicums and pedagogical, medical, and music schools. A people's amateur theater and a museum of local lore are located in the city. A house-museum is devoted to the Azerbaijani writer and educator M. F. Akhundov, who was born in Sheki. The Palace of the Khans of Sheki is also open as a museum. [29–1089–1]

SHEKI KHANATE, a feudal state in northern Azerbaijan that existed from the mid-18th century to the early 19th century.

The khanate was established during the struggle of the Azerbaijanis, led by Itadji Chelebi-khan, against Persian domination. It was divided into eight *magals* (districts), each of which was governed by a *naib*. The economy was based on agriculture, especially sericulture, but handicrafts were also highly developed.

Beginning in the late 18th century, the khans of Sheki sought protection from Russia to meet the threat of Persian conquest. In 1805 a treaty was signed uniting the khanate with Russia; the union was confirmed by the Treaty of Gulistan in 1813. In 1819 the khanate became a *provintsiia* (subprovince) under Russian military administration. In 1840 the *provintsiia* was renamed Sheki District and incorporated into Caspian Oblast. The area became part of Baku Province in 1859 and Elizavetpol' Province in 1868.

REFERENCE

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SHEKSHEMA, an urban-type settlement in Shar'ia Raion, Kostroma Oblast, RSFSR. Shekshema is served by a railroad station on the Bui-Kotel'nich line. The settlement has a forestry station of the Shar'ia Logging and Timber Distribution Establishment and a plant that produces wooden containers. [29–1098–2]

SHEKSNA, an urban-type settlement and the administrative center of Sheksna Raion, Vologda Oblast, RSFSR. Water, railroad, and highway routes intersect at Sheksna. Situated on the Vologda-Leningrad highway, the settlement is served by the Sheksna railroad station and has a landing on the Volga-Baltic Waterway. It has a poultry farm, a butter factory, and plants that manufacture fiberboard and wood and flax products. The Muzlesdrev Timber Plant and a hydroengineering complex are also located at Sheksna. [29–1090–4]

SHEKSNA, a river in Vologda Oblast, RSFSR; a left tributary of the Volga. The Sheksna is 139 km long and drains an area of 19,000 sq km. It rises in Beloe Lake and empties into Sheksna Bay of the Rybinsk Reservoir. The river is fed primarily by snow.

Its mean flow rate 28 km from the mouth is 172 cu m per sec. The Sheksna freezes over between late October and December, and the ice breaks up in April or early May. Its flow is regulated by the Cherepovets Hydroengineering Complex, which raises the water level of Beloe Lake. The river is part of the Volga-Baltic Waterway and the Severnaia Dvina Waterway System. The city of Cherepovets is situated on the shore of Sheksna Bay, near the mouth of the river. [29–1090–3]

SHELAGSKII, CAPE, a cape in northeast Asia, at the entrance to Chaun Bay, an inlet of the East Siberian Sea. The cape is situated at 70° 06′ N lat. and 170° 36′ E long. It is rocky and juts out into the sea for 9 km. [29–1098–3]

SHELAPUTY (also Shaloputy), a Russian religious sect akin to the Khlysty (*see* KHLYST). [29–1098–4]

SHELEBI, NIKOLAI IVANOVICH (real surname, Polorussov). Born May 1 (13), 1881, in the village of Novoe Uzeevo, in what is now Aksubaevo Raion, Tatar ASSR; died Jan. 12, 1945, in Cheboksary. Soviet Chuvash poet. People's Poet of the Chuvash ASSR (1936).

Shelebi was the son of a poor peasant. In his first work, the song "Russia" (1905), he exposed the unjust social order of tsarist Russia and called upon the people to struggle against it. In the poem "The Serpent" (1907), he used allegory to express his confidence in the ultimate defeat of the forces of evil. Between 1912 and 1915, Shelebi composed the satirical poem "Vasianka" and the narrative poem *Cheremshan and Kondurcha*. His poems and songs written after the Great October Revolution include "Lenin," "A Chuvash Woman," and "The Chuvash Kolkhoz."

Although Shelebi lost his sight in 1931, he continued to write. The verses he produced during the Great Patriotic War of 1941–45 attracted a wide audience. Among the most famous of these works are "I Summon," "The Storm," and "The Song of a Hero Pilot." Shelebi was awarded the Order of the Badge of Honor.

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N. S. DEDUSHKIN [29–1100–2]

SHELEKHOV (also Shelikhov), a city under oblast jurisdiction in Irkutsk Oblast, RSFSR. Shelekhov has a railroad station (Goncharovo) on the Trans-Siberian Railroad, 20 km southwest of Irkutsk. Shelekhov was founded in 1962 during the construction of an aluminum plant nearby. Industry is represented by shops that repair tractors and other machinery and plants that manufacture cable, lime, asphalt concrete, reinforced-concrete products, and wood products. The city was named in honor of G. I. Shelikhov. [29–1102–1]

SHELENKOV, ALEKSANDR VLADIMIROVICH. Born Dec. 13 (26), 1903, in the village of Zamesh'e, in what is now Smolensk Oblast. Soviet cameraman. Honored Art Worker of the RSFSR (1959).

Shelenkov graduated from the department of camera operation of the State Technicum of Cinematography in 1929. Until 1945 he was a cameraman for the Soiuzdetfil'm motion-picture studio, and after 1945 he worked for Mosfil'm. He worked with the cameraman I. E. Chen beginning in 1944.

Shelenkov's films have included *Dzhul'bars* (1936), *Salavat Iulaev* (1941), *Zoia* (1944), *Rainis* (1949), *Far From Moscow* (1950), *Admiral Ushakov* (1953), *The Ships Are Storming the Bastions* (1953), *Romeo and Juliet* (1955), the joint Soviet-Bulgarian film *A History Lesson* (1957), *The Communist* (1958), the joint film of the USSR and the German Democratic Republic (GDR) *Five Days, Five Nights* (1961), and the joint Soviet-Polish film *Jarosław Dąbrowski* (1974–76). Shelenkov and Chen also shot a number of scenes for the film *War and Peace* (1966–67), including the battles of Schöngrabern and Austerlitz and the hunt.

Shelenkov was awarded the State Prize of the USSR in 1946, 1947, 1950, and 1951. He has been awarded two orders and several medals.

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"Operator i fil'm." *Mosfil'm*, no. 2. Moscow, 1961. [29–1100–3]

SHELFORD, VICTOR ERNEST. Born Sept. 22, 1877, in Chemung, N.Y.; died Dec. 27, 1968. American zoologist; specialist in ecology, primarily the ecology of aquatic organisms. First president of the Ecological Society of America.

Between 1904 and 1914, Shelford worked at the University of Chicago. Beginning in 1914, he worked at the University of Illinois, where he held the rank of professor from 1927 to 1946.

Shelford's main works dealt with biocenology—with its theory and terminology and with the methodology of field and laboratory studies. In addition to hydrobiological experiments, Shelford studied the interaction of organisms in terrestrial communities, the effect of climate on a community, and succession. He worked on the classification of mixed communities. Shelford was the first to describe the nature of North America from the ecological point of view.

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[29–1118–3]

SHELGUNOV, NIKOLAI VASIL'EVICH. Born Nov. 22 (Dec. 4), 1824, in St. Petersburg; died there Apr. 12 (24), 1891. Russian revolutionary democrat, journalist, and literary critic.

The son of a nobleman, Shelgunov graduated from the Forestry Institute in 1841 and joined the staff of the forestry department of the Ministry of State Domains. He became a professor at the Forestry Institute in the late 1850's and produced a number of works on forestry.

Shelgunov made the acquaintance of M. L. Mikhailov in 1855. During a trip to London in 1858 and 1859, the two men met A. I. Herzen and N. P. Ogarev. Upon his return to Russia, Shelgunov became an associate of N. G. Chernyshevskii and contributed to the journals *Sovremennik*, *Russkoe slovo*, and *Vek*. He took part in the revolutionary movement of the 1860's and, with Mikhailov, wrote the proclamation *To the Younger Generation*. He was also the author of the proclamation "To Russian Soldiers From Their Well-wishers," which was not published. In his article "The Working Proletariat in England and France" (*Sovremennik*, 1861, nos. 9–11), Shelgunov familiarized the Russian public with F. Engels' work *The Condition of the Working Class in England*.

In 1862, Shelgunov resigned his position and went to Nerchinsk Krai, where Mikhailov was serving a sentence of hard labor. As a result of an official investigation of the proclamations, Shelgunov was arrested in Irkutsk in March 1863. He was brought to St. Petersburg and imprisoned in the Aleksei Ravelin. At the end of 1864 he was exiled to Vologda Province, and until 1877 he lived as an exile in various provincial cities.

Shelgunov became a leading contributor to the journal *Delo* in 1866 and took on the duties of editor after G. E. Blagosvetlov died in November 1880. Arrested on June 28, 1884, for maintaining contacts with émigrés, Shelgunov was exiled to Smolensk Province for five years.

Between 1886 and 1891, Shelgunov published in the journal *Russkaia mysl'* a series of articles entitled "Sketches of Russian

Life." In numerous articles on history, economics, and social relations, he called for a peasant revolution, which, he believed, could bring Russia straight to socialism, without going through capitalism. In his view, social progress depended on the struggle of the masses against exploitation. In the last years of his life Shelgunov, influenced by Marxism, moved toward an understanding of the leading role of the working class in the revolutionary movement. During the 1880's he criticized Tolstoyism and the small deeds theory.

In his literary criticism Shelgunov upheld the principles of realism and civic responsibility. He discussed the problem of the positive hero and national character in literature and criticized the advocates of the theory of art for art's sake.

Shelgunov's funeral on Apr. 15 (27), 1891, turned into a large antigovernment demonstration, in which many thousands of people, including workers, took part.

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SHELGUNOV, VASILII ANDREEVICH. Born Aug. 8 (20), 1867, in the village of Slavkovichi, Pskov Province; died Apr. 2, 1939. One of the earliest participants in the social democratic movement in Russia. Member of the Communist Party from 1898.

The son of a peasant, Shelgunov became a factory worker in St. Petersburg in 1876, but his involvement in the revolutionary movement began in 1866. He belonged to the Social Democratic group of P. V. Tochisskii and later to that of M. I. Brusnev; in 1893 he was a member of the St. Petersburg League of Struggle for the Emancipation of the Working Class. Shelgunov was arrested in December 1895 and exiled to Arkhangel'sk Province. In 1900 he became a member of the Ekaterinoslav committee of the RSDLP, and from 1902 to 1904 he was a member of the Baku committee.

In the fall of 1904, Shelgunov moved to St. Petersburg to receive treatment for a worsening eye disease. In 1905 he performed agitational work on assignment from the St. Petersburg committee of the RSDLP, but in December he was arrested. He completely lost his sight in 1906 while he was in prison. Nevertheless, during the reactionary years of 1908 to 1910 he continued to carry out party work. In 1911, Shelgunov was the official editor of the Bolshevik newspaper *Zvezda*, and in 1912 he helped found *Pravda*. From 1912 to 1916 he was in administrative exile in the Northern Caucasus.

Shelgunov served on the agitational collegium of the St. Petersburg committee of the RSDLP(B) in 1917 and on the agitational collegium of the Moscow committee in 1918. From 1918 to 1920 he carried out underground work in the Kuban'. In 1920 he took up a position in Moscow.

Shelgunov became a personal pensioner in 1924. He was a member of the Presidium of the All-Union Society of Old Bolsheviks. In 1920 Shelgunov took part in the work of the Second Congress of the Comintern.

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SHELGUNOV DEMONSTRATION, a demonstration that took place in St. Petersburg on Apr. 15 (27), 1891, at the funeral of N. V. Shelgunov. Planned as a limited display of antigovernment feeling, it turned into a major political demonstration against tsarism; between 6,000 and 7,000 people, including workers, students, and members of the democratic intelligentsia, took part.

The Brusnev group, one of the earliest Russian Social Democratic organizations, helped plan the demonstration, and approximately 100 of the group's working-class members marched behind Shelgunov's coffin. K. M. Norinskii and S. I. Funtikov carried a wreath sent by the workers of St. Petersburg.

On the following day, the police made arrests, and L. B. Krasin, N. K. Mikhailovskii, P. V. Zasodimskii, and others were exiled from the city. The demonstration was the first public act of working-class Social Democrats and, as such, represents a milestone in the growth of Social Democracy in Russia.

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SHELIKHOV, GRIGORII IVANOVICH (also G. I. Shelekhov). Born 1747 in Ryl'sk, in what is now Kursk Oblast; died July 20 (31), 1795, in Irkutsk. Russian navigator and merchant.

Beginning in 1775, Shelikhov organized voyages of merchant vessels to the Kuril and Aleutian islands. Between 1783 and 1786 he led an expedition to the shores of Russian America; during this period the first Russian settlements were established in the territory. Shelikhov was one of the founders of the Russian-American Company, which was officially formed in 1799, and in 1790 he became governor of the Russian settlements in Russian America. Shelikhov's name was given to a gulf in the Sea of Okhotsk, a strait between the Alaska Peninsula and Kodiak Island, and a city in Irkutsk Oblast.

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[29–1102–3]

SHELIKOF STRAIT, a strait between the Alaska Peninsula and Kodiak Island, connecting Cook (Kenai) Inlet with the Pacific Ocean. Shelikof Strait is approximately 350 km long and ranges in width from 50 to 150 km. In most places, it is between 150 and 200 m deep. It has steep shores and experiences semidiurnal tides. The strait has a strong tidal current with a velocity of up to 15.5 km per hour. [29–1103–2]

SHELIKOV, GULF OF, northeastern extension of the Sea of Okhotsk bounded by the Kamchatka Peninsula. The gulf has a length of 650 km, a maximum width of 300 km, and a width of 130 km at the mouth. In the north, the gulf divides into the Gizhiga and Penzhina bays. The coasts are mainly rugged, except in the southeast, where they are low-lying. Depths range generally from 50 m to 150 m and reach a maximum of 350 m. The tides are diurnal and irregular, with heights of up to 12.9 m in Penzhina Bay. The gulf is covered with ice from December to May. The Gizhiga, Penzhina, and other rivers empty into it. Bird colonies are found on the coastal cliffs. Herring, flounder, navaga, and fish of the Osmeridae family are caught commercially. The gulf is named in honor of G. I. Shelikov. [29–1103–1]

SHELLAC, a natural resin secreted by the lac insect, which parasitizes tropical and subtropical woody plants. Shellac apparently consists mainly of aliphatic polyhydroxy acids. It is freely soluble in alkalies and lower aliphatic alcohols, poorly soluble in benzene, and almost insoluble in gasoline, fats, and oils. Shellac is peeled off the tree bark, processed with hot water, melted, and filtered. It may be dark colored, orange, or light colored. Colorless shellac is obtained by bleaching the colored types with animal

charcoal, bleaching powder, or sodium sulfate. Shellac has limited uses, principally in the manufacture of alcohol varnishes and polishes. [29–1110–4]

SHELLER, ALEKSANDR KONSTANTINOVICH (pen name, A. Mikhailov). Born July 30 (Aug. 11), 1838, in St. Petersburg; died there Nov. 21 (Dec. 4), 1900. Russian writer.

Sheller studied in the department of history and philology at the University of St. Petersburg from 1857 to 1861. He first published his works in 1859. His first novels, *Putrid Swamps* (1864) and *The Life of Shupov, His Relatives, and His Friends* (1865), which were published in *Sovremennik*, dealt with the younger generation's involvement in the social struggle and with the problem of "fathers and sons."

Sheller's many later novels were very popular with young people, including *The Obnoskovs* (1868), *At Sixes and Sevens* (1869), *When Trees Are Felled Chips Fly* (1871), *Bread and Circuses* (1875), *By Hook or by Crook* (1884), and *Difficult Years* (1892). However, Sheller's heroes were politically moderate and interested mainly in spreading culture and education. Their limitations were sharply criticized by M. E. Saltykov-Shchedrin.

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G. M. MIRONOV [29–1111–2]

SHELLEY, MARY WOLLSTONECRAFT. Born Aug. 30, 1797, in London; died there Feb. 1, 1851. English writer. Daughter of W. Godwin; wife of P. B. Shelley.

The hero of Shelley's novel *Frankenstein, or The Modern Prometheus* (1818; Russian translation, 1965) creates a monster that tries to do good, but, embittered by loneliness, kills its creator. A gloomy picture of the coming downfall of mankind through epidemics and starvation is at the center of her novel *The Last Man* (1826). Shelley also wrote the autobiographical novel *Lodore* (1835) and commentaries to a posthumous edition of works by P. B. Shelley (1839).

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SHELLEY, PERCY BYSSHE. Born Aug. 4, 1792, at Field Place, Sussex; died July 8, 1822, in the Gulf of Spezia; buried in Rome. English poet. Son of a baronet.

Shelley studied at the aristocratic school of Eton from 1804 to 1810 and later at Oxford University, from which he was expelled for publishing the treatise *The Necessity of Atheism* (1811, with T. J. Hogg). His marriage to the daughter of an innkeeper in 1811 caused a break with his father. Shelley's sociopolitical views developed under the influence of the ideas of the French Revolution and the works of 18th-century French Enlightenment writers, T. Paine, and especially W. Godwin, with whom Shelley became acquainted in 1813. In 1812 in Ireland, Shelley contributed to the propaganda for the political emancipation of the country from Great Britain (*An Address to the Irish People, Declaration of Rights*). A rebellious mood also characterized Shelley's first works of literature—the anonymously published Gothic novels *Zastrozzi* (1810) and *St. Irvyne* (1811), the collection of poems *Original Poetry by Victor and Cazire* (1810, with his sister Elizabeth), and his early political poems. In 1814, Shelley met Godwin's daughter, Mary, with whom he shared his subsequent destiny. Fleeing from persecution and slander, he lived permanently in Italy after 1818. He was drowned in a storm at sea.

In his first significant poetic work, the philosophical narrative poem *Queen Mab* (1813), Shelley's revolutionary-democratic credo, borrowed largely from Godwin's *An Enquiry Concerning Political Justice*, was set forth in the form of medieval visions. From 1818 to 1822 the poet wrote most of his longer works, including the novella in verse *Rosalind and Helen* (1818, published 1819), with its destructive criticism of the idyllic patriarchal family; the narrative poem *Julian and Maddalo* (1818, published 1824), born out of debates with Lord Byron about the power of the human spirit; the romantic tragedy *The Cenci* (1819), which is set in the Italian Middle Ages and which vindicates violence in the struggle with tyranny; the narrative poem *The Masque of Anarchy* (1819), a reaction to the police's firing on workers at a meeting in Manchester; the dramatic satire *Oedipus Tyrannus, or Swellfoot the Tyrant* (1820); the lyric drama *Hellas* (1821), devoted to a national liberation uprising in Greece; the narrative poem in honor of Keats, *Adonais* (1821); and the narrative poem *The Triumph of Life* (1822).

The main theme of Shelley's philosophical-allegorical narrative poem *The Revolt of Islam* (1818; originally published as *Laon and Cythna*, 1817) and the revolutionary lyric drama *Prometheus Unbound* (1820) is the conflict between despotism and freedom. In these works, as in *Queen Mab*, Shelley declares the inevitability of the victory of good and justice, when the flourishing of the creative forces of nature and of liberated man will reveal to the world a realm of eternal beauty and harmony. A spirit of mythological antiquity runs through such philosophical poems of Shelley's as "Hymn of Apollo," "Hymn of Pan," and "Song of Proserpine."

Scenes of nature in Shelley are combined with a subtlety of observation and a sense of pantheism. Shelley the atheist believed in a spirit of nature; everything that was real for him was living ("Arethusa," 1820, and "Love's Philosophy," 1819). Shelley perceived the political emancipation of mankind as consisting in the overcoming of evil in nature, as in "Ode to the West Wind." The soul of the poet is seen as fused with ever-renewing nature, and it romantically transforms existence ("The Cloud" and "Lines Written Among the Euganean Hills"). Shelley's lyric love poetry, including "A Bridal Song" and "To Jane," is humane and joyous, although it frequently contains a sorrowful, tragic note, as in "A Lament," "To Night," and "The Sensitive Plant."

Essentially close to the ideas of socialism, Shelley, a "great prophet" in the words of F. Engels, left many war and agitation poems, for example "To the People of England" (1819). The social purpose of literature and the mission of the revolutionary poet are the central problem of the aesthetic treatise "A Defence of Poetry" (1822, published 1840).

Vivid imagination, melodiousness of verse, and richness of rhythm impart originality to Shelley's poetry. It has had a vast influence on the poetry of the English-speaking countries and the world. Shelley's works have been translated into many languages, including Russian.

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A. B. GORIANIN [29–1112–1]

SHELL OIL COMPANY, a US oil monopoly. The company engages in petroleum exploration, extraction, and refining; the transportation and distribution of petroleum products; and the production of petrochemical and chemical goods. It is controlled by the Royal Dutch–Shell Group, an Anglo-Dutch monopoly.

The Shell Oil Company was founded in 1922. It extracted petroleum primarily in the United States until the early 1970's, when it became involved in petroleum prospecting and extraction in Canada, Senegal, Cameroon, New Zealand, and the coastal waters of Malaysia. Shell Oil refines petroleum in the United States and conducts research on the use of alternative energy sources, including bituminous sands and solar energy. In 1975 the company did $8.1 billion worth of business, including 60 percent in petroleum products, 20 percent petroleum, and 15 percent petrochemical and chemical products. Its net profit that year was $555 million. Shell Oil employed 32,500 people in 1975 and extracted 232 million tons of petroleum. [29–1110–3]

SHEL'MOVANIE, in Russia from 1716 to 1766, a type of dishonor applied to noblemen who were sentenced to death or permanent exile. *Shel'movanie* was introduced by the Army Regulations (Voinskii Ustav) of Peter I in 1716; it later came into use in civil courts. *Shel'movanie* consisted in breaking a sword over the offender's head or nailing a board with his name on it to the gallows. The person who was humiliated in this way was deprived of legal protection and all civil rights. *Shel'movanie* was later replaced by deprivation of all rights of status. [29–1119–1]

SHELON', a river in Pskov and Novgorod oblasts, RSFSR. The Shelon' measures 248 km in length and drains an area of 9,710 sq km. It flows over the Il'men' lowland and empties into Lake Il'men'. It is fed predominantly by snow. High water is from April through May, and there is flash flooding in autumn. The mean flow rate 59 km from the mouth is 43.6 cu m per sec. The Shelon' freezes in November or December, sometimes as late as March (1925), and the ice breaks up in March or April. It is navigable in the lower course. The cities of Porkhov and Sol'tsy are situated on the river. [29–1117–4]

SHELON', BATTLE OF THE (1471), the decisive battle on the Shelon' River in the war between Moscow and Novgorod in 1471; the war had been provoked by the anti-Moscow policies of the boyar government of Novgorod and its violation of the conditions of the Iazhelbidy Treaty of 1456.

The battle took place on the morning of July 14 on the left bank of the Shelon' River (between the mouth of the Shelon' and the city of Sol'tsy, possibly near the village of Skirino) after an unexpected encounter between the Moscow troops led by Prince D. D. Kholmskii and the Novgorod army. Prince Kholmskii had about 5,000 men, and the Novgorodians had 20,000–40,000. The poorly organized Novgorodians were unable to withstand the forces of the Grand Principality of Moscow. The battle lasted about two hours and ended in victory for Kholmskii's forces. More than 12,000 Novgorodians were killed and about 2,000 captured during the battle and subsequent pursuit. The outcome of the battle of the Shelon' made it inevitable that the Novgorod Feudal Republic would lose its political independence.

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[29–1117–2]

SHELTER-DECK SHIP, an oceangoing vessel with a continuous top deck above the main deck. Shelter-deck ships have covered openings in the top deck, in the transverse bulkheads beneath the top decks, or in the sides above the main deck. Watertight bulkheads extend only from the main deck down. The quarters between the top and main decks do not meet the standards for watertightness set by classification societies, and they are not included in the ship's register tonnage. There are no shelter-deck ships of Soviet registry. [29–1119–2]

SHELUDIAK, FEDOR. Year of birth unknown; died 1672. Don Cossack. One of S. T. Razin's closest associates.

In the spring and summer of 1670, Sheludiak commanded cossack horse detachments in the march from Tsaritsyn to Chernyi Iar and then to Astrakhan. In May and June 1671 he led a large detachment of rebels in a campaign against Simbirsk. After unsuccessful attempts to take the city by assault he returned to Astrakhan and, after the death of Vasilii Us, became the leader of the rebels. Sheludiak was treacherously seized during negotiations and executed. [29–1118–1]

SHEMAKHA, a city and administrative center of Shemakha Raion, Azerbaijan SSR. Located in the southeastern foothills of the Great Caucasus, on the Baku-Tbilisi highway, 122 km west of Baku and 72 km northeast of the Kiurdamir railroad station. Population, 19,000 (1974). The center of a large agricultural region, Shemakha has wine-growing sovkhozes, a winery, a carpet-weaving factory, and a building materials plant. Educational institutions include an agricultural technicum and a pedagogical school. A museum of local lore and the house-museum of the Azerbaijani poet M. A. Sabir are located in the city.

Shemakha is one of the oldest cities of Azerbaijan. Archaeological excavations conducted in the northwestern part of the city have uncovered a settlement dating from the fifth and fourth centuries B.C. It is possible that Ptolemy (second century A.D.) mentioned it as Shemakhiya. From the ninth to 16th centuries, the city was the capital of Shirvan and the residence of the Shirvan shahs.

Shemakha was one of the centers of the Shirvan-Apsheron architectural school and of decorative applied art, including rug making and miniature work. Located at an intersection of caravan routes, it was one of the major trade and artisan centers of the Near East, occupying an important place in the international silk trade. Its traders included Azerbaijani, Iranian, Arabic, Middle Asian, Russian, Indian, and Western European merchants, who had trading posts there; the city had numerous silk-weaving, cotton-spinning, and rug-making workshops. In 1222, after a lengthy siege, Shemakha was destroyed by the Mongol Tatars. In the mid-18th century it was the capital of the Shemakha Khanate. In 1805 it became part of Russia. From 1840 to 1846 it was the administrative center of Caspian Oblast; it then became the administrative center of Shemakha Province, which became Baku Province in 1859. In the early 20th century, the Gummet Social Democratic organization and a local party organization of the RSDLP were active in the city. After February 1917, a soviet of workers', peasants', and soldiers' deputies was organized there. Soviet power was established in 1920.

Shemakha produced a number of outstanding Azerbaijani cultural figures, scholars, poets, and architects, including Khagani Shirvani (12th century), Zeinaddin Shirvani (13th century), Nesimi (late 14th to early 15th centuries), Nishat Shirvani (18th century), Hadji Zeinalabdin Shirvani (18th century), Seid Azim Shirvani (19th century), and M. A. Sabir (late 19th and early 20th centuries). The old buildings of the city, including the Dzhuma (Djuma) Mosque (tenth century), the palace of the Shirvan shahs (12th century), and the shah's and other caravansaries (17th century), were destroyed by earthquakes and are known only from descriptions or partial remains. The city acquired a grid plan after its restoration in the 1820's; a number of mausoleums were preserved, the most interesting of which is the group of octagonal dome mausoleums of Eddi-Giumbez (19th century).

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[29–1120–3]

SHEMAKHA ASTROPHYSICAL OBSERVATORY, a research institution of the Academy of Sciences of the Azerbaijan SSR. The observatory was founded in 1960 on the basis of the academy's astrophysics section, established in 1956. It is situated at an elevation of 1,435 m, 22 km northwest of the city of Shemakha. Its principal instruments are a 2-m reflector telescope, a 700-cm photoelectric telescope, a 35-cm meniscus telescope, a horizontal solar telescope, and a chromospheric-photospheric telescope.

The Shemakha Observatory studies active formations on the sun, nonstable stars of the T Tauri type, magnetic stars, relativistic objects, the atmosphere of the planets, and the structure, evolution, and origin of the ring of asteroids and comets. Since 1971, the observatory has operated a high-mountain station on Mount Batabat, Nakhichevan' ASSR, at an elevation of 2,300 m. The station has a large coronagraph, with a 40-cm mirror, which is used under conditions other than eclipse conditions. The Shemakha Astrophysical Observatory publishes *Soobshcheniia ShAO* (Reports of the Shemakha Astrophysical Observatory) and *Tsirkuliar ShAO* (Circular of the Shemakha Astrophysical Observatory).

G. F. SULTANOV [29–1121–1]

SHEMIAKIN, EVGENII IVANOVICH. Born Dec. 9, 1929, in Novosibirsk. Soviet scientist specializing in the mechanics of rocks. Corresponding member of the Academy of Sciences of the USSR (1976). Member of the CPSU from 1963.

Shemiakin graduated from Leningrad University in 1952. From 1955 to 1960 he worked as a research worker at the Institute of Chemical Physics of the Academy of Sciences of the USSR. From 1960 to 1971 he was head of a laboratory of the Institute of Theoretical and Applied Mechanics of the Siberian Division of the Academy of Sciences of the USSR. In 1971 he was named director of the Mining Institute of the Siberian Division of the Academy of Sciences of the USSR. He is also a professor at the University of Novosibirsk (since 1965).

Shemiakin's main works deal with the study of rocks, the effects of blasting and shock on rocks, and the deformation mechanics of solids. Shemiakin developed a model of a solid medium with frictional properties and used this model to study the process of wave propagation in underground blasts.

Shemiakin has been awarded two orders and a medal.

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SHEMIAKIN, MIKHAIL MIKHAILOVICH. Born July 13 (26), 1908, in Moscow; died June 26, 1970, in Riga. Soviet organic chemist. Academician of the Academy of Sciences of the USSR (1958; corresponding member, 1953). Member of the Presidium of the Academy of Sciences of the USSR (1963). Hero of Socialist Labor (1969). Member of the CPSU from 1951.

Shemiakin graduated from Moscow State University in 1930. From 1930 to 1935 he worked at the Scientific Research Institute of Organic Semiproducts and Dyes, and from 1935 to 1945, at the All-Union Institute of Experimental Medicine. Between 1945 and 1961 he worked at the Institute of Biological and Medical Chemistry of the Academy of Sciences of the USSR; at the same time, from 1957 to 1960, he worked at the Institute of Organic Chemistry of the Academy of Sciences of the USSR. From 1959 to 1970 he was director of the Institute of the Chemistry of Natural Compounds of the Academy of Sciences of the USSR (now the M. M. Shemiakin Institute of Bio-organic Chemistry).

Shemiakin's main works dealt with theoretical organic chemistry and the chemistry of natural compounds. Shemiakin explained the mechanisms of many reactions, such as the pyrolysis of carboxylic acid salts and azoxy coupling. Together with A. E. Braunshtein, he developed (1952) the general theory of pyridoxal enzyme activity. He also synthesized the antibiotic tetracycline.

Shemiakin was a member of the Leopoldina German Academy of Naturalists (1968), the Chemical Society of France (1958), and the European Committee on Peptide Chemistry (1958). Shemiakin was awarded two Orders of Lenin and several medals.

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IU. B. SHVETSOV [29–1123–6]

SHEMIAKIN SUD, a Russian term for an unjust trial. It derives from the title of a Russian satirical novella (*Shemiaka's Verdict*) written in the second half of the 17th century. The novella, which is based on a folktale common among many peoples, exposes corruption and arbitrariness in the courts. [29–1124–1]

SHEM'I-ZADE, ESHREF ABDURAMANOVICH. Born June 8 (21), 1908, in Evpatoriia; died Mar. 11, 1978, in Moscow. Soviet Crimean Tatar poet and literary critic. Honored Cultural Worker of the Uzbek SSR (1968).

Shem'i-zade graduated from the literature and screenwriting department of the Institute of Cinematography in Moscow in 1932. He first published his works in 1926. He is the author of the narrative poem *Dneprel'stan* (1930) and the collections of lyric and narrative poems *The Reed Pipe* (1965) and *The Eagle's Flight* (1969). He published articles on the history of Crimean Tatar literature and the book *Life and Work* (1974).

Shem'i-zade also translated the works of A. S. Pushkin, V. V. Mayakovsky, and A. T. Tvardovskii. His works have been translated into languages of the peoples of the USSR.

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SHEMOGSA CARVED BIRCH BARK, a Russian craft that originated in the mid-19th century in the region near the Shemogsa River, in Kurovo-Navolok, Pogorelovo, Krasavino, Berniatino, and other villages near Velikii Ustiug. In Soviet times a carved birch-bark shop was organized at the Shemogsa Furniture Combine in Vologda Oblast.

The traditional designs of Shemogsa carved birch bark, including plants, birds, animals, and people, are outlined on strips of birch bark with a blunt awl and are cut out with a sharp knife, with the background removed. Colored paper or foil is sometimes placed beneath the openwork, and the carving is supplemented with embossing. Strips of decorated birch bark are glued into recesses on the surface of decorative wooden boxes, dishes, and frames; they may also be made of two layers of birch bark, for example, *tuesa* (a type of round covered bowl).

Outstanding masters of Shemogsa carved birch bark include I. A. Veprev, his son A. I. Veprev, and his pupil N. V. Veprev. In the 1960's and 1970's the traditions of the trade have been continued at several enterprises in Vologda and Kirov oblasts.

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SHEMONAIKHA, a city and administrative center of Shemonaikha Raion, Vostochnyi Kazakhstan Oblast, Kazakh SSR. Shemonaikha is located on the Uba River, a right tributary of the Irtysh, 130 km northwest of Ust'-Kamenogorsk. It has a railroad station on the Lokot'-Leninogorsk line. Enterprises include a furniture factory, a construction combine, a mixed-feed plant, a butter factory, a grain elevator, and shops servicing the railroad industry. [29–1123–1]

SHEMORDAN, an urban-type settlement in Bogatye Saby Raion, Tatar ASSR. Shemordan has a railroad station on the Kazan-Sverdlovsk line. It also has a poultry-packing plant, a combine for the processing of rabbit skins, a brewery, and a branch of the Mekhovshchik Baltasi Association. [29–1123–2]

SHENDRIKOV ORGANIZATION, a Menshevik organization formed by the brothers Lev, Il'ia, and Gleb Shendrikov in Baku in August 1904. Initially called the Organization of Balakhany and Bibi-Eibat Workers, it was renamed the Union of Baku Workers in May 1905.

The organization spread the ideas of economism among politically backward strata of workers, waged a slanderous campaign against the Bolsheviks, and broke up political demonstrations; it employed anarchic and provocative methods of struggle, such as setting fire to oil fields, thus giving the authorities cause for massive repression and the use of armed force against the workers. In late 1904 the Party Council, which was in Menshevik hands, recognized the Shendrikov organization as a party organization.

During the Revolution of 1905–07, the Shendrikov organization obstructed preparations for an armed uprising, exacerbated national differences among the workers, and carried on schis-

matic activities in the Baku soviet of workers' deputies. The Bolsheviks considered the actions of the Shendrikov organization akin to the tsarist government's policy of Zubatovshchina, and the organization's actions later became known as Shendrikovshchina.

L. Shendrikov was brought before a party court on charges of antiparty activity, and in the summer of 1906 he was expelled from the RSDLP. The Shendrikov organization, having lost its influence among the workers, disbanded.

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SHENFER, KLAVDII IPPOLITOVICH. Born May 26 (June 7), 1885, in Radviliškis, in what is now the Lithuanian SSR; died May 18, 1946, in Moscow. Soviet electrical engineer. Academician of the Academy of Sciences of the USSR (1932; corresponding member, 1931).

Shenfer graduated from the Imperial Technical School (now the N. E. Bauman Moscow Higher Technical School) in 1910 and was named a professor there in 1917. He helped organize the electrical engineering department of the Moscow Higher Technical School in 1918 and the All-Union Electrical Engineering Institute in 1921. Shenfer began teaching at the Moscow Power Engineering Institute in 1930.

Shenfer's principal works were devoted to electric machines, commutation in commutator machines, and cascade connection of electric machines. He was the author of a number of textbooks. Shenfer received the State Prize of the USSR in 1943 and was awarded the Order of Lenin, two other orders, and various medals.

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Moskvitin A. I. *Klavdii Ippolitovich Shenfer*. Moscow-Leningrad, 1957. [29–1130–2]

SHENG, a Chinese free-reed mouth organ with speaking pipes. The sheng is played not only in China but in Burma, Tibet, and Laos. It has a bowl-shaped wind-chest with holes in the bottom, a mouthpiece, and 13, 19, or 24 bamboo or reed pipes that are inserted into the wind-chest and arranged along its rim; the lower end of each pipe is fitted with a free copper reed. The player produces a sound by stopping with a finger the opening in the lower end of the appropriate pipe. The modern sheng has a tempered tuning of 12 tones of equal intervals. The instrument is used in ensembles and orchestras.

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A. M. MIREK [29–1561–5]

SHENGAVIT SETTLEMENT, a site of an ancient fortified settlement of the Kura-Araks Aeneolithic culture, situated on the left bank of the Razdan River, within the city limits of Yerevan. Excavations were conducted by E. A. Baiburtian from 1936 to 1938 and S. A. Sardarian from 1958 to 1967. The settlement occupied an area of about 4,000 sq m and had a cultural level measuring 4 m in thickness. It was fortified by a thick stone wall with towers, and an underground passageway led to the river. Excavations uncovered round houses, as much as 7 m in diameter, with adjoining rectangular structures made of mud brick on stone foundations. Other discoveries, including stone saddlequerns, pestles, and mortars, the remains of spikelets of various species of wheat and barley, and the bones of domestic animals, attest to developed land cultivation and stock raising. Bronze objects and various forms of black polished ware were also found. Burials dating from the early Bronze Age were also discovered, some containing gold ornaments.

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SHENGELAIA, DEMNA KONSTANTINOVICH. Born May 9 (21), 1896, in the village of Sachilao, in what is now Samtredia Raion, Georgian SSR; died Dec. 7, 1980, in Tbilisi. Soviet Georgian writer, Academician of the Academy of Sciences of the Georgian SSR (from 1969). Member of the CPSU from 1940.

Shengelaia, the son of a railroad worker, studied in the philology department of the University of Tbilisi and later in the geology department of the Tbilisi Polytechnical Institute. He published his first short stories in 1915–16. His novel *Sanavardo* (1926) depicted the physical and spiritual degradation and downfall of a princely family, symbolizing the doom of the old world. The novels *Bata Kekiia* (1933) and *The Dawn* (published 1940) presented a panorama of the life of the people and the rise of the revolutionary labor movement in Georgia in the early 1890's. The novella *The Hidden Treasure* (1958) exposed vestiges of the past in present-day society. Shengelaia's other works include short stories on contemporary and historical themes, plays, articles on Georgian, Russian, and Western European classical literature, and researches on folklore.

Shengelaia was awarded the Order of Friendship of Peoples.

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SHENGELAIA, NIKOLAI MIKHAILOVICH. Born July 26 (Aug. 8), 1903, in the village of Obudzhi, Mingrelia; died Jan. 4, 1943, in Tbilisi. Soviet motion-picture director and screenwriter. Honored Art Worker of the RSFSR (1935).

Shengelaia wrote poetry as a youth. He became involved in motion pictures in 1924. His first effort as a director was *Giulli* (1927), on which he collaborated with L. F. Push. In the 1920's he attended a lecture course given by L. V. Kuleshov. Shengelaia's film *Eliso* (1928), based on a novella by A. Kazbegi, is an outstanding Soviet silent film combining the poetry of the epic with historical authenticity. The film *The 26 Commissars* (1933), an innovative work of Soviet film-making, is devoted to the glorious and tragic days of the Baku Commune. In 1937, Shengelaia directed *The Golden Valley*. He was the author and coauthor of a number of the screenplays for the films he made.

Shengelaia, a recipient of the State Prize of the USSR in 1941, was also awarded the Order of the Red Banner of Labor.

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SHENKURSK, a city and the administrative center of Shenkursk Raion, Arkhangel'sk Oblast, RSFSR. Shenkursk has a landing on the right bank of the Vaga River, which is a tributary of the Severnaia Dvina. The city is 148 km north of the Vel'sk railroad station on the Konosha-Kotlas line. It has two logging and timber distribution establishments, a timber-chemistry establishment, a fur farm, a butter factory, and a food-processing combine. A people's amateur theater, a museum of local lore, and a sanatorium are located in Shenkursk. [29–1128–3]

SHENKURSK OPERATION OF 1919, an offensive by the Soviet Sixth Army of the Northern Front and partisans from Jan. 19 to 25, 1919, against Anglo-American interventionist forces and White Guards during the Civil War.

In the fall of 1918 the enemy, chiefly American units with 2,800 men and 15 guns, had driven a deep wedge south of Shenkursk, threatening the flank and rear of the Sixth Army (commanded by A. A. Samoilo; members of the Revolutionary Military Council N. N. Kuz'min, A. M. Orekhov, and M. K. Vetoshkin), which was operating on the Arkhangel'sk axis. Soviet troops with 3,100 infantry, 48 machine guns, and 16 field guns, went over to the offensive in January 1919 with the objective of eliminating the Shenkursk salient. Three detachments, from Niandoma, Ust'-Padengskaia, and Kodima, attacked in converging directions. The Soviet forces smashed the interventionist troops at one strongpoint after another and reached the approaches to Shenkursk at the same time on January 24. The partisans took control of the village of Shegovary in the enemy rear by a surprise attack, thus cutting off the interventionists' path of retreat to the north. During the night of January 24, the enemy garrison at Shenkursk, abandoning all its military equipment, fled to the north along forest trails. Soviet troops liberated Shenkursk on January 25, capturing large military supply depots, 15 field guns, 60 machine guns, and 2,000 rifles.

As a result of the Shenkursk operation, the enemy was driven back 90 km to the north and conditions were created for the complete liberation of the North. [29–1128–4]

SHENNIKOV, ALEKSANDR PETROVICH. Born Aug. 29 (Sept. 10), 1888, in the village of Papulovo, Veliko-Ustiugskii District, Vologodskaia Province; died May 24, 1962, in Leningrad. Soviet botanist. Corresponding member of the Academy of Sciences of the USSR (from 1946).

Shennikov graduated from the University of St. Petersburg in 1912. He taught at several institutions of higher education—at the Forestry Institute (now the Leningrad Academy of Timber Technology) from 1912 to 1936, at the Bestuzhev Courses from 1914 to 1919, and at the University of Leningrad from 1919 to 1960 (professor from 1930; department head from 1944). Beginning in 1925, Shennikov was also affiliated with the Central Botanical Garden and the Botanical Institute of the Academy of Sciences of the USSR; he became laboratory director in 1960.

Shennikov's research centered on meadow vegetation, primarily the vegetation of the floodplain meadows of the northern European portion of the USSR and the northern Trans-Volga region. He also studied theoretical problems of meadow management and general phytocoenology. Shennikov was one of the founders of experimental phytocoenology in the USSR. He was also involved in plant classification and geobotanical regionalization. Shennikov was awarded the Order of Lenin and the Order of the Badge of Honor.

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Aleksandr Petrovich Shennikov. Moscow, 1966. (AN SSSR: *Materialy k biobibliografii uchenykh SSSR. Seriia biologicheskikh nauk: Botanika*, issue 8). [29–1129–1]

SHEN-SHIH, part of the ruling class in feudal China, roughly equivalent to the English gentry.

The *shen-shih* were persons who had passed the examinations for an academic degree, which gave them the right to hold official posts at the local and national levels. They supplied the personnel for all levels of the state bureaucracy and for the landowners' local organs of self-government and served as guardians of the official Confucian ideology and traditions; in addition, they directed the rural schools and local courts.

The *shen-shih* did not have to pay the poll tax, were exempt from military service, were not subject to corporal punishment, and wore a special costume.

The *shen-shih* estate developed between the second century B.C. and the tenth century A.D., during which period the examination system for filling most government posts took form. After the system was done away with in 1905, the term *shen-shih* was used to designate part of the ruling class in the countryside. With the victory of the revolution in 1949, the *shen-shih* estate was abolished.

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Chang Chung-li. *The Income of the Chinese Gentry*. Seattle, Wash., 1962. V. N. NIKIFOROV [29–1562–1]

SHENSI, a province in Northwest China. Area, 190,000 sq km. Population, 21.7 million (1975). The capital is the city of Sian.

The northern part of Shensi lies on the Loess Plateau and has an average elevation of approximately 1,500 m; the southern part is occupied by the Tsinling Shan, which rises to an elevation of 3,666 m. The northern and southern parts of the province are separated by the valley of the Wei Ho. Shensi's monsoon climate is temperate north of the Tsinling Shan and subtropical south of it. Annual precipitation ranges from 300 mm in the northwest to 1,000 mm in the southeast. The principal rivers are the Huang Ho, its tributary the Wei Ho, and the Han Shui, a tributary of the Yangtze. Forests occupy less than 9 percent of the province.

Shensi is an ancient agricultural region. Most of the population engages in agriculture, which is dominated by the cultivation of a wide variety of crops. The leading food crop is wheat, most of which is grown in the Wei Ho valley; the considerable plantings of millet are found chiefly on the Loess Plateau. Other crops include rice, kaoliang, and maize. The valleys of the Wei Ho and the Han Shui produce China's finest varieties of cotton, accounting for 7 percent of the country's total output. Oil-bearing plants and sugar beets are also cultivated. Animal husbandry, which is of secondary importance, is devoted to the raising of sheep, goats, cattle, and donkeys.

Industry underwent development after the formation of the People's Republic of China. Coal, small amounts of petroleum, and iron ore are mined. The Weipei coalfield produces more than 4 million tons of coal annually; the Yench'ang oil fields—the oldest in China—began operating in 1906. The main manufacturing centers are Sian and Paochi. Well-developed industries include ferrous metallurgy, the chemical industry, and the machine-building industry, which produces power-engineering equipment, machine tools, locomotives, railroad cars, and machinery for the textile industry and agriculture. There is a cement plant in Yaohsien and petroleum refineries in Yench'ang and Yenan. The cotton industry is represented by large factories in Sian and Hsienyang. I. M. FEDOROV

Traces of the Yangshao Neolithic culture have been found in Shensi. From the sixth to fourth centuries B.C. part of the province belonged to the Ch'in state, whose ruling dynasty unified ancient China at the end of the third century B.C. Between the 11th century B.C. and the tenth century A.D. the capital of China was several times located in Shensi: at Haoching, Hsienyang, and Ch'angan (now Sian). The region was given its present name in the ninth century.

In antiquity, the Middle Ages, and modern times Shensi has witnessed numerous large popular uprisings, notably the peasant rebellion led by Ch'en Sheng and Wu Kuang in 209 and 208 B.C., the peasant wars of 874–901 and 1628–45, the rebellion of the Pai Lien Chiao (White Lotus Sect) of 1796–1805, and the Dungan Rebellion of 1862–77. After the Hsinhai Revolution of 1911–13, Shensi was controlled by the Peiyang (northern) warlords.

Several peasant rebellions led by the Chinese Communists took place between 1928 and 1932, and in 1932 and 1933 two revolutionary bases of the soviet movement—Shensi-Szechwan and Shensi-Kansu—were established at the border of Shensi and two neighboring provinces (*see* SOVIETS IN CHINA). After the main forces of the Chinese Red Army moved from central and southern China between 1934 and 1936, the Shensi-Kansu-Ningsia border area was created from the Shensi-Kansu base. The province

of Shensi was freed from Kuomintang rule by the People's Liberation Army of China in July 1949.

V. P. ILIUSHECHKIN [29–1561–6]

SHEPARD, ALAN. Born Nov. 18, 1923, in East Derry, N.H. American astronaut; rear admiral in the US Navy.

After graduating from the US Naval Academy in 1944, Shepard took part in various military operations conducted by the United States in the Pacific. From 1950 to 1953 and from 1955 to 1957 he worked at the Navy Test Pilot School. In 1958 he graduated from the Naval War College; he also attended a school of civil aviation. In 1959 he became an astronaut with the National Aeronautics and Space Administration.

On May 5, 1961, Shepard became the first American to complete a manned suborbital flight of 15 minutes duration in the Mercury spacecraft (MR 3). From Feb. 1 to Feb. 10, 1971, Shepard, as commander of the Apollo 14 spacecraft, completed a lunar flight with E. Mitchell and S. Roosa. Shepard spent a total of 33 hr 30 min on the moon, including two moon walks, lasting about 9 hr. His time in space during the two flights totaled 216 hr 17 min. Shepard is now directing the training of American astronauts at the Manned Spacecraft Center in Houston. His hometown has been renamed Spacetown. [29–1132–2]

SHEPARD, FRANCIS PARKER. Born May 10, 1897, in Brookline, Mass. American geologist; one of the founders of modern marine geology. Doctor of philosophy (1922).

Shepard graduated from Harvard University in 1919. He became a professor of geology at the University of Illinois in Chicago in 1939. Beginning in 1942, he worked at the Scripps Institution of Oceanography in La Jolla (University of California at San Diego) and at various scientific institutions of the US Navy. Between 1951 and 1958 he directed a long-term study of the sediments of the Gulf of Mexico conducted by the American Petroleum Institute.

Shepard was president of the International Association of Sedimentologists from 1958 to 1963.

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O. K. LEONT'EV [29–1132–3]

SHEPETOVKA, a city (since 1923) under oblast jurisdiction and administrative center of Shepetovka Raion, Khmel'nitskii Oblast, Ukrainian SSR. Railroad junction with lines to Zdolbunov, Ternopol', Khmel'nitskii, Berdichev, and Korosten'. Population, 42,000 (1974). Shepetovka has combines for the manufacture of sugar, meat products, wood products, and packaging materials, a butter factory, and plants producing soft drinks, tractor bushings, metal articles, and asphalt concrete. It also has enterprises of light industry and railroad transportation.

An agricultural bookkeeping technicum and a branch of the Kiev Industrial Technicum are located in Shepetovka. The literary memorial museum of N. A. Ostrovskii, who was a member of the Shepetovka district committee of the Komsomol in 1924, is also in the city. [29–1133–2]

SHERABAD, a city (since 1973) and administrative center of Sherabad Raion, Surkhandar'ia Oblast, Uzbek SSR. Sherabad is situated on the right bank of the Sherabad River, a tributary of the Amu Darya, 42 km from the Naushakhar railroad station on the Kagan-Termez line and 59 km from Termez. It has a cotton-ginning plant, an industrial combine, and a ceramics plant. [29–1134–4]

SHERABAD a river in Surkhandar'ia Oblast, Uzbek SSR; a right tributary of the Amu Darya. The Sherabad, also called the Shirabaddar'ia, is known as the Irgaily at its source, the Machaidar'ia in its upper course, and the Karasu in its lower course. The river measures 177 km in length and drains an area of 2,950 sq km before emerging from the mountains. It rises in the Baisuntau Range. The river is fed by snow and rain. The mean flow rate is 7.5 cu m per sec at the city of Sherabad; below this point the water of the river is diverted by a network of canals for irrigation. The irrigation fan of the Sherabad receives supplementary water from the Surkhandar'ia River. [29–1134–3]

SHER ALI. Born 1825; died Feb. 20, 1879, in Mazar-i-Sharif. Afghan emir from 1863.

Sher Ali, one of the sons of Dost Muhammad, implemented measures that furthered Afghanistan's economic and cultural development. Under Sher Ali, the standing army was increased, roads were improved, and the country's first newspaper, *Shams un-Nahar*, was published (1875). Sher Ali worked to effect an independent foreign policy and to counteract the plans of the British colonizers, who undertook an aggressive war against Afghanistan in 1878. [29–1134–2]

SHERARDIZING, a galvanizing process in which steel items are heated in zinc dust at 340°–400°C to produce a diffusion surface layer. The process is carried out in a rotating or rocking container. It was proposed by the British scientist Sherard Cowper-Coles in 1900. [29–1134–5]

SHERBROOKE, a city in Canada, in the province of Quebec. Population, 86,000 (1975). Sherbrooke is a railroad junction. A center for the textile and knitwear industry, it also produces rolling stock and equipment for mining and the pulp and paper industry. Other enterprises specialize in metalworking and the production of electrical-engineering equipment. [29–1134–6]

SHEREGESH, an urban-type settlement in Kemerovo Oblast, RSFSR, under the jurisdiction of the Tashtagol city soviet. Sheregesh is located 27 km northeast of Tashtagol. Iron ore is mined nearby. [29–1136–2]

SHEREMETEV, in Russia from the 15th to early 20th centuries, a family of boyars (after 1706, counts) descended from the younger line of the family of Andrei Kobyla, who is mentioned in historical sources in 1347. The founder of the family was Andrei Konstantinovich Sheremet, a great-grandson of Fedor Andreevich Koshka. In the mid-16th century five of Sheremet's grandsons received the rank of boyar. The Sheremetevs were the wealthiest landowners in Russia. The most famous members of the family were the following:

Ivan Bol'shoi Vasil'evich Sheremetev. Date of birth unknown; died 1577. Boyar from 1550; *voevoda* (military commander).

In 1555, I. V. Sheremetev led the Russian Army in a campaign against the Crimean Khanate and in the battle of Sudbishchi. He was a member of the Selected Council (Izbrannaia Rada), but during the 1560's he fell out of favor with the tsar several times.

Fedor Ivanovich Sheremetev. Date of birth unknown; died Feb. 17, 1650.

F. I. Sheremetev belonged to anti-Godunov circles in the early 17th century. In 1601 he was exiled to a Siberian *voevodstvo* (territory under a military governor), but under the First False Dmitrii he received the rank of boyar. From 1606 to 1609 he led the Russian Army in its suppression of a popular uprising in the Volga Region (Povolzh'e). From 1633 to 1645, under Tsar Mikhail Fedorovich, Sheremetev was a member of the government, and from April 1642 he was the de facto head of the government.

Boris Petrovich Sheremetev. Date of birth unknown; died 1650. State figure in the 1630's and 1640's; boyar from 1646.

Matvei Vasil'evich Sheremetev. Date of birth unknown; died 1657. Russian *voevoda* in the mid-17th century; participant in the Russo-Polish War of 1654–67 and the Russo-Swedish War of 1656–58.

Vasilii Borisovich Sheremetev. Date of birth unknown; died 1682. Russian state and military figure in the mid-17th century.

V. B. Sheremetev headed several *prikazy* (offices). He also directed the operations of Russian troops and Ukrainian detachments in the Ukraine from 1654 to 1656 and again from 1658 to

1660. After surrendering near Chudnov in 1660, he was turned over to the Crimean khan by the Poles; he spent 21 years in captivity.

Boris Petrovich Sheremetev. Born 1652; died 1719.

Petr Borisovich Sheremetev. Born 1713; died 1788. High chamberlain, general of the infantry, adjutant general, senator, and prominent state figure during the reigns of Elizaveta Petrovna and Catherine the Great.

P. B. Sheremetev directed the construction of various palaces and architectural ensembles (*usad'by*), such as Kuskovo and Ostankino. He supported peasant theaters, choruses, and orchestras, and he amassed an extremely valuable art collection.

Nikolai Petrovich Sheremetev. Born 1751; died 1809. High marshal of the court, active privy councillor, and senator.

N. P. Sheremetev established the Home for Vagrants in Moscow. (The building now houses the N. V. Sklifosovskii Moscow City Scientific Research Institute of Emergency Medical Care.)

Dmitrii Nikolaevich Sheremetev. Born 1803; died 1871. Master of the court; philanthropist, director of the Home for Vagrants in Moscow, art collector, and patron of the arts.

Sergei Dmitrievich Sheremetev. Born 1844; died 1918. Member of the Council of State, chairman of the Archeographic Commission, editor of the journal *Starina i novizna*, and author of a series of works in the history of Russia in the 16th and 17th centuries.

Aleksandr Dmitrievich Sheremetev. Born 1859; died 1919. Musician, composer, founder of the Society of Music History, and director of a court choir.

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Elizarova, N. A. *Teatry Sheremetevykh*. Moscow, 1944. [29–1137–1]

SHEREMETEV, BORIS PETROVICH. Born Apr. 25 (May 5), 1652, in Moscow; died there Feb. 17 (28), 1719; buried in St. Petersburg. Russian military leader and diplomat. General field marshal (1701). Count (1706).

Sheremetev began service in the tsar's court in 1671. Appointed *voevoda* (military governor) of Tambov in 1681, he led operations against the Crimean Tatars. He was named a boyar in 1682. Between 1685 and 1687, Sheremetev helped negotiate and conclude the Eternal Peace of 1686 with the Polish-Lithuanian Commonwealth (Rzeczpospolita) and an alliance treaty with Austria. He assumed command in late 1687 of the troops in Belgorod protecting the southern border and fought in the Crimean campaigns. After Peter I took power in 1689, Sheremetev became one of his associates.

Sheremetev served as an army commander on the Dnieper in operations against the Crimean Tatars in the Azov campaigns of 1695 and 1696. Between 1697 and 1699 he carried out diplomatic missions in Poland, Austria, and Italy and on the island of Malta. During the Northern War of 1700–21, Sheremetev proved himself a capable, although circumspect and extremely conservative, military leader. He commanded a cavalry unit composed of *dvoriane* (nobles) in the battle of Narva in 1700. From 1701 to 1705 he was commander of troops in Livland. He won battles at Erestfehr (1701) and Hummelshof (1702) and took Kopor'e (1703) and Dorpat (1704).

After directing the suppression of the Astrakhan Uprising of 1705–06, Sheremetev returned to a command position in the main body of the army in 1708. In 1709 he commanded the troops in the center of the battle formation at Poltava. His men captured Riga in 1710. In 1711 he commanded the army's main forces in the Prut Campaign. Sheremetev was commander of the southern observation army on the Turkish border in 1712 and 1713 and a corps commander in Pomerania and in Mecklenburg between 1715 and 1717. [29–1136–3]

SHEREMET'EVSKII, an urban-type settlement in Moscow Oblast, RSFSR, under the jurisdiction of the Dolgoprudnyi city soviet. Sheremet'evskii has a railroad station 23 km north of Moscow. A children's sanatorium is located in the settlement. Industry is represented by a brickyard and a factory for the production of theatrical equipment. One of the airports of Moscow, Sheremet'evo, is nearby. [29–1138–1]

SHERESHEVO, an urban-type settlement in Pruzhany Raion, Brest Oblast, Byelorussian SSR. Shereshevo is 32 km from the Oranchitsy railroad station on the Brest–Baranovichi-Polesskie line. The settlement has enterprises for food processing and the manufacture of furniture. [29–1139–2]

SHER-GILL, AMRITA. Born Jan. 30, 1912; died Dec. 5, 1941. Indian artist.

Sher-Gill studied in Paris in 1929. She was influenced by the painting of Ajanta and the works of P. Gauguin. She created poetic genre pictures noted for decorative coloring and musically rhythmic composition, including *The Bride's Toilet*. Sher-Gill laid the foundations of the national school of Indian painting of the 20th century.

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SHERGIN, BORIS VIKTOROVICH. Born July 16 (28), 1896, in Arkhangel'sk; died Oct. 31, 1973, in Moscow. Soviet Russian writer and folklorist.

Shergin grew up in a family of seafarers and shipbuilders. He graduated from the Stroganov Industrial Arts School in 1917. His first short stories were published in 1915. Shergin's books include *Near the City of Arkhangel'sk, Near the Ship's Refuge* (1924), *Arkhangel'sk Stories* (1936), *By Rivers of Song* (1939), and *The Ocean Is a Russian Sea* (1959). These works brilliantly reflect the beauty of the Russian North, the pride and bravery of its people, and the richness of the Russian language.

Shergin was awarded the Order of the Red Banner of Labor.

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SHERIDAN, RICHARD BRINSLEY. Born Oct. 30, 1751, in Dublin; died July 7, 1816, in London. Anglo-Irish dramatist, theatrical and public figure.

Sheridan was educated in the law. From 1780 to 1812 he was a member of Parliament and the leader of the radical wing of the Whigs. From 1776 to 1809 he was the manager of the Drury Lane Theatre. In his comedy *The Rivals* (1775), Sheridan followed the example of O. Goldsmith in opposing sentimentality and obvious edification. His *The School for Scandal* (staged 1777, published 1780) is a satirical comedy of manners in which Sheridan called in question the Enlightenment thesis of moral reason, which he saw as compromised by bourgeois reality. The traditions of English Restoration comedy, as seen in the plays of W. Congreve and G. Farquhar, were enriched in Sheridan's works by the influence of the novels of H. Fielding and other representatives of the Enlightenment. Sheridan also wrote the comedies *A Trip to Scarborough* (1777) and *The Critic* (1779) and the tragedy *Pizarro* (1799, an adaptation of A. F. F. von Kotzebue's drama *Die Spanier in Peru*).

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SHERIF, AZIZ. Born 1904 in Anah, Iraq. Public and political figure of Iraq. A jurist by education and profession.

In 1946, Sherif founded the Party of the People (Hizb al-Shaab), which stood for the true independence and democratization of Iraq's political life; in the same year he established the newspaper *Al-Watan*. The party and the newspaper called for a struggle against British supremacy, and in 1947 both the party and the newspaper were banned. Sherif helped found a peace organization in 1949 and the National Council of Partisans of Peace in 1950. Persecuted by the authorities, Sherif emigrated to Syria in 1954. In 1958, after the Iraqi revolution of the same year, he returned to his homeland and was elected general secretary of the National Council of Partisans of Peace. He became a member of the Bureau of the World Peace Council in 1959. In December 1969, Sherif was appointed minister of justice, and he later became one of the ministers of state; he held the latter post until the end of 1975.

Sherif received the International Lenin Prize for Strengthening Peace Among Nations in 1960, and he was awarded the Order of Friendship of Peoples in 1974. [29–1140–2]

SHERIFF, an executive officer in a county (or sometimes another administrative-territorial unit) in Great Britain, Ireland, and the USA.

The legal status of sheriffs in Great Britain is defined by the norms of common law, by parliamentary statutes (since the 14th century), and, in particular, by the Sheriffs Act of 1877. A sheriff is appointed by a special commission that acts under royal authority and is headed by the lord lieutenant of the county. Sheriffs are chosen from among the landowners of the counties. Poor people, lords, priests, officers in active service, and practicing barristers and solicitors are among those who are not eligible for the office. Sheriffs are invested with administrative and judicial powers, such as the execution of sentences, the holding of elections, the selection of juries, and the supervision of jails.

In the USA, in all states except Rhode Island, a sheriff is elected by the residents of the county. His jurisdiction extends only to rural areas, and he fulfills mainly administrative and police functions. He maintains law and order, supervises jails, makes arrests, and checks the observance of state laws regulating such activities as traffic and the sale of alcohol. [29–1140–3]

SHERIPOV, ASLANBEK DZHEMALDINOVICH. Born 1897 in Groznyi; died Sept. 11, 1919, in the village of Vozdvizhenskoe, Terek Oblast. Participant in the struggle for Soviet power in the Northern Caucasus. Chechen by nationality. Member of the Communist Party from 1919.

Sheripov formed the first soviet in Chechnia. He was a delegate to the Second through Fifth Terek Oblast People's Congresses and a member of the Terek People's Soviet. Sheripov was commander of the Chechen Red Army; from August to November 1918 he helped lead the 100-day defense of Groznyi against the White Guards. After the White Guards seized the Northern Caucasus, he and N. F. Gikalo formed a rebel detachment that attacked the rear of Denikin's forces. Sheripov was killed in a battle with a punitive expedition mounted by Denikin's forces. [29–1140–1]

SHERLOCK HOLMES. A fictional private detective, the hero of short stories and novels by A. Conan Doyle, who chose the surname in honor of the American writer O. W. Holmes. The name "Sherlock" in Russian has acquired the connotation of a common noun. [29–1141–3]

SHERLOVAIA GORA, an urban-type settlement in Borzia Raion, Chita Oblast, RSFSR. Sherlovaia Gora is located on the Chita-Transbaikalia highway, 5.5 km from the Sherlovaia railroad station on the Oloviannaia-Zabaikal'sk line and 23.5 km northwest of Borzia. It has a combine for dressing tin ore. Coal is mined. The settlement has a thermoelectric power plant. [29–1141–2]

SHERMAN, WILLIAM TECUMSEH. Born Feb. 8, 1820, in Lancaster, Ohio; died Feb. 14, 1891, in New York City. US military leader, general of the army (1869).

Sherman graduated from the US Military Academy at West Point in 1840 and was commissioned in the artillery. He served in the US war against Mexico of 1846–48. Sherman retired from the army from 1853 to 1859 and worked as a bank manager and lawyer. In 1859 he was appointed superintendent of a military academy. During the US Civil War (1861–65), Sherman commanded a regiment, a brigade, and a division in the Northern army, achieving the rank of brigadier general in 1861. He took part in the battles of First Bull Run, Vicksburg, and Chattanooga, among others. In March 1864, Sherman was given command of the army that made the successful "march to the sea": starting from Chattanooga, Tenn., the army moved through the state of Georgia, taking Atlanta in September, to the Atlantic coast, taking Savannah in December and defeating the Southern army commanded by General J. E. Johnston. In early 1865, Sherman's army turned north and advanced in the rear of the enemy to join up with the army of General U. S. Grant. After covering more than 1,300 km in a year, Sherman's army joined up with Grant's near Richmond, which led to encirclement of the main Southern forces commanded by General R. Lee and to their surrender in April 1865.

From 1869 to 1883, Sherman was commanding general of the US Army. Sherman's memoirs were published in 1875 and 1972. [29–1141–4]

SHERMAN ANTITRUST ACT, a law adopted in the USA in 1890; named after the initiator of the measure, Senator J. Sherman. It was adopted in response to pressure from an antimonopolistic movement of workers and farmers. The act declared illegal any combination in the form of a trust or otherwise, as well as any agreement aimed at restraint of trade. In practice, however, the act failed to impede the operations of the trusts or even to prevent the formation of new trusts. Of five lawsuits brought against trusts from 1892 to 1896, four were decided in favor of the trusts. At the same time one of the provisions of the act—that providing for legal responsibility for inflicting damage to the property of an organization or individual—was used to persecute trade unions and fight the strike movement. From 1890 to March 1897, the US Supreme Court alone pronounced 12 judgments against workers' unions. [29–1141–6]

SHERMARKE, ABDI RASHID ALI (also Abdulrashid Ali Shermarke). Born Nov. 16, 1919; died Oct. 15, 1969. State and political figure of the Somali Republic.

Shermarke graduated from the School of Politics and Administration and the Higher Institute of Law, Economics, and Social Studies in Mogadishu; he was also a graduate of the law school of the University of Rome. In 1947 he helped found the Somali Youth League, which governed the country from 1960 to 1969. He headed the first national government of Somalia from 1960 to 1964 and became president on June 30, 1967. Shermarke was killed by one of his bodyguards on a trip to northern Somalia. [29–1142–1]

SHERPA, a nationality living in India and eastern Nepal, in the region of Chomolungma (Mount Everest). According to a 1975 estimate, there are approximately 25,000 Sherpa in India and 25,000 in Nepal. Their language belongs to the Tibeto-Burman family. The predominant religion is Buddhism.

The Sherpa are descendants of Tibetans who migrated south of the Great Himalayas in the Middle Ages. Those in Nepal engage in yak raising and the cultivation of potatoes and oats; in the past they were intermediaries in trade between Nepal and Tibet. The Sherpa in India work mainly as merchants or as porters and guides for mountain-climbing expeditions. The Sherpa live in rural communities and are divided into 18 exogamous clans, each of which is known as a *ru*; the small monogamous family is prevalent, but polyandry and, less often, polygyny are still practiced to some extent.

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SHERRINGTON, CHARLES SCOTT. Born Nov. 27, 1859 (1857 or 1861 according to some sources), in London; died Mar. 4, 1952, in Eastbourne. English physiologist. Fellow of the Royal Society of London (1893) and corresponding member of the St. Petersburg Academy of Sciences (1915).

Sherrington graduated from Cambridge University in 1885. From 1895 to 1913 he was a professor at the University of Liverpool, and from 1913 to 1935, at Oxford University. Sherrington's research was primarily in the physiology of the central nervous system. Of particular importance were his studies on the laws of spinal reflex action. Sherrington investigated the relationship between the afferent and efferent pathways in the central nervous system, discovered the mechanisms of motor coordination, and formulated the principles of the convergence of sensory impulses at motor neurons, which form a common path. Sherrington determined the function of synapses (a term that he coined) in the interaction of nerve cells, suggested a physiological explanation for the antagonistic relationship existing between muscle groups in executing movements, and described reciprocal innervation. He also advanced a theory on muscle reception and described the interrelations of the cerebral cortex and the motor centers of the spinal cord that regulate the functions of the skeletal muscles. Sherrington's studies provided new data on the correlation of excitation and inhibition and on the nature and disturbances of muscle tonus. In his theoretical generalizations, Sherrington strove to achieve an understanding of the organism as a whole, and he developed the concept of the integrative action of the nervous system. He assigned to the distant receptors and the brain ("ganglion of the distant receptors") a decisive role in the integration and control of all the processes in animals and man.

Sherrington established a world-famous school of neurophysiologists, which included R. Granit, D. Denney-Brown, H. Cushing, R. Magnus, A. Fessard, E. Adrian, J. Eccles, and J. Fulton. He won a Nobel Prize in 1932 (with E. Adrian).

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SHER SHAH. Born 1472; died 1545. Ruler of Hindustan (North India) from December 1539 to 1545.

Sher Shah was a member of the Afghan feudal clan Sur in Bihar. Originally named Farid, he became the ruler of Bihar in 1533 under the title "Sher Khan." As a result of victories over Humayun at Chausa in 1539 and at Kanauj in 1540, he seized the possessions of the Great Moguls and subjugated Malwa and a number of the Rajput princely states, thus uniting under his rule most of North India. In December 1539 he assumed the title "Sher Shah."

Sher Shah implemented a series of important reforms that were continued and completed by Akbar. During his reign the jagir system of landownership was organized, in which the holder of a benefice was obligated to maintain a hired cavalry detachment. Sher Shah also initiated land measurement and reorganized the collection of taxes. [29–1153–1]

SHERVUD, LEONID VLADIMIROVICH. Born Apr. 16 (28), 1871, in Moscow; died Aug. 23, 1954, in Leningrad. Soviet sculptor. Honored Artist of the RSFSR (1946). Son of architect V. O. Shervud.

Shervud studied with S. I. Ivanov at the Moscow School of Painting, Sculpture, and Architecture from 1886 to 1891. He also attended the St. Petersburg Academy of Arts from 1893 to 1898. In 1899 and 1900 he studied on a stipend from the academy with A. Rodin and E. A. Bourdelle at the Julien Academy in Paris.

Shervud helped implement the Lenin plan of monument propaganda (for example, the monument to A. N. Radishchev, plaster of paris, 1918, Petrograd). Shervud evolved from genre scenes in an impressionistic style (for example, the gravestone for G. I. Uspenskii, bronze and granite, 1904, Volkovo Cemetery, Leningrad) to works noted for monumental strictness of form (for example, the portrait of P. L. Voikov, plaster of paris, 1927, Russian Museum, Leningrad; *The Sentry*, plaster of paris, 1933).

Shervud was awarded the Order of the Red Banner of Labor and various medals.

REFERENCE

[Rogachevskii, V.] *L. V. Shervud*. Moscow, 1955. [29–1135–2]

SHERVUD, VLADIMIR OSIPOVICH. Born 1833; died July 9 (21), 1897, in Moscow. Russian architect, sculptor, and painter. Academician of the St. Petersburg Academy of Arts (1872).

Shervud studied at the Moscow School of Painting, Sculpture, and Architecture. His most famous works, all in Moscow, are the Historical Museum (1875–81, engineer A. A. Semenov) and a temple monument dedicated to the heroes of Pleven (cast iron, opened 1887), in both of which he employed elements of 16th- and 17th-century Russian architecture, as well as a monument to N. I. Pirogov (bronze and granite, unveiled 1897). Shervud also painted portraits and landscapes.

WORKS

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SHESHIAL'GIS, KAZIS KAZE (Kazys Šešelgis). Born Jan. 9 (22), 1915, in the village of Žeimiai, in what is now Rokiškis Raion, Lithuanian SSR. Soviet architect. Honored Engineer of the Lithuanian SSR (1965). Doctor of architecture (1967).

Sheshial'gis studied in the civil engineering department of the University of Kaunas from 1936 to 1943. He was a professor and head of a subdepartment at the polytechnical institute in Kaunas from 1951 to 1971 and has been head of a subdepartment at the civil engineering institute in Vilinius since 1971. He was chairman of the Kaunas branch of the Architects' Union of the Lithuanian SSR from 1954 to 1959.

Sheshial'gis' works include the master plans for Panevėžys (1947–53) and Kėdainiai (1962, with V. Miliukštis) and the reconstruction project for the old towns in Vilnius (1958, with S. Lasavickas and J. Šeibōkas) and Kaunas (1962, with V. Jurkštas and S. Čerškuté).

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SHESHKO, EVGENII FOMICH. Born Mar. 1 (14), 1901, in Chenstokhov (now the city of Częstochowa), Poland; died Jan. 22, 1961, in Moscow. Soviet mining scientist. Doctor of technical sciences (1951). Honored Worker in Science and Technology of the RSFSR (1958).

After graduating from the Moscow Academy of Mines in 1927, Sheshko worked at a scientific research institute of fertilizers. From 1930 to 1961 he worked at the Moscow Mining Institute, where he was the first to organize the training of engineers in the open-pit method of working mineral deposits. He proposed a theory of opening up deposits and developed systems for the open-pit working of mineral deposits.

A recipient of the State Prize of the USSR (1952), Sheshko was awarded the Order of the Red Banner of Labor and various medals.

WORKS

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REFERENCE

Mel'nikov, N. V. *Gornye inzhenery*, 2nd ed. Moscow, 1974.

V. V. RZHEVSKII [29–1169–5]

SHESHKOVSKII, STEPAN IVANOVICH. Born Dec. 21, 1719 (Jan. 1, 1720), in St. Petersburg; died there May 12 (23), 1794. Russian state figure.

Sheshkovskii was the son of a minor civil servant. From 1757 to 1762 he was the secretary of the Secret Chancellery, and in 1762 (officially, in 1767) he became senior secretary of the Secret Office of the Senate. A trusted agent of Empress Catherine the Great, Sheshkovskii carried out investigations for the most important political cases of the second half of the 18th century, including the cases of V. Ia. Mirovich, E. I. Pugachev, A. N. Radishchev, and N. I. Novikov. He personally helped with torture during interrogations. For this reason his contemporaries called Sheshkovskii a whipping Tom (*knutoboi*) and the grand inquisitor of Russia.

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SHESHMA, a river in the Tatar ASSR and (in its upper course) in Kuibyshev Oblast; a left tributary of the Kama. The Sheshma is 259 km long and drains an area of 6,040 sq km. It rises on the Bugul'ma-Belebei Elevation and empties into Kama Gulf of the Kuibyshev Reservoir. The river is fed mainly by snow. High water occurs in April. The mean flow rate 86 km from the mouth is 11.1 cu m per sec. The Sheshma freezes over in November or early December, and the ice breaks up in April. The river is used as a water supply source. [29–1170–2]

SHESHONK I (throne name, Hetch-Kheper-Ra), Egyptian pharaoh from 950 B.C. to 929 B.C.; founder of the 22nd (Libyan) Dynasty.

Sheshonk I was a descendant of Libyan princes or sheiks who had settled in Lower and Central Egypt, become completely Egyptianized, and joined the Egyptian aristocracy. Sheshonk invaded the Kingdom of Israel and Judah but was unable to gain a foothold there.

REFERENCE

Hölscher, W. *Libyer und Ägypter*. Glückstadt, 1937. [29–1170–3]

SHESTAKOV, ANDREI VASIL'EVICH. Born Oct. 24 (Nov. 5), 1877, in the village of Solombala, Arkhangel'sk Province; died June 29, 1941, in Moscow. Soviet historian. Corresponding member of the Academy of Sciences of the USSR (1939). Member of the CPSU from 1903.

The son of a worker, Shestakov joined the revolutionary movement in 1898. In December 1905, under the party pseudonym of Nikodim, he helped lead an armed uprising on the Moscow-Kazan railroad line. At that time he was a member of the Moscow committee of the RSDLP. From 1918 to 1921 he carried out party and soviet work in Moscow, Voronezh, and Riazan'.

After graduating from the Institute of the Red Professors in 1924, Shestakov became head of the subdepartment of Soviet history at the Communist University for Workers of the East, at the Second Moscow State University, and at the V. I. Lenin Moscow State Pedagogical Institute. He was one of the organizers and leaders of the Society of Marxist Historians. His principal works dealt mainly with the agrarian history of Russia in the period from 1861 to 1917. Shestakov headed the team of authors that wrote the textbook *A Brief Course in Soviet History* (1937) for the third and fourth grades of secondary school.

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Lutskii, E. A. "A. V. Shestakov." *Istoriia SSSR*, 1967, no. 3. [29–1153–4]

SHESTAKOVO, an urban-type settlement in Nizhneilimsk Raion, Irkutsk Oblast, RSFSR. Shestakovo is situated on the shore of the Ust'-Ilimsk Reservoir. It is served by the Sredneilimskaia railroad station on the Taishet-Lena line. Shestakovo has a logging and timber distribution establishment. [29–1154–1]

SHESTALOV, IUVAN NIKOLAEVICH (Ivan Nikolaevich Shestalov). Born June 22, 1937, in the village of Kamratka, Berezovo Raion, Khanty-Mansi National Okrug, Tiumen' Oblast. Soviet Mansi writer. Member of the CPSU since 1967.

Shestalov, the son of a kolkhoznik, graduated from the Tiumen' Pedagogical Institute in 1965. He writes in Mansi and Russian. An expert on the folklore and customs of the Mansi, he has made numerous trips through the Tiumen' north.

Shestalov is the author of collections of lyric and narrative poems, short stories, novellas, and essays, as well as children's books. The main themes of his works are the new life of the formerly deprived peoples of the Far North, the labor of the Soviet people, and his native countryside. Shestalov's works have been translated into many languages of the peoples of the USSR and foreign languages.

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Kosikhin, V. "Poeticheskoe kaslanie. Literaturnyi portret." *Moskva*, 1972, no. 12. M. G. VOSKOBOINIKOV [29–1154–2]

SHESTOPER, an ancient Russian weapon used for striking. A type of mace, it is a baton with a head consisting of six metal plates (fins). It was used from the 15th to 17th centuries. The first mention of the weapon in written sources is found in an account from 1502 of a battle between Russians and knights of an order. The *shestoper* also served as a symbol of authority of military leaders. *Shestopery* decorated with silver, gold, and precious stones are preserved in the Armory of the Moscow Kremlin. [29–1166–1]

SHESTOV, LEV (real name Lev Isaakovich Schwarzmann). Born Jan. 31 (Feb. 12), 1866, in Kiev; died Nov. 20, 1938, in Paris. Russian existential philosopher and literary figure.

Shestov graduated from the law school of the University of Kiev in 1889. Between 1895 and 1914 he lived primarily in Switzerland. He moved to Moscow in 1914, to Kiev in 1918, and to Paris in 1920.

Combining Nietzschean and Dostoevskian themes, to which he gave his own distinctive imprint, Shestov anticipated the fundamental ideas of later existentialism. At the turn of the century, as though sensing already the world catastrophes to come, Shestov spoke of the tragic absurdity of human existence and brought forth the image of the doomed "hero" who nevertheless lays claim to his sovereign rights and challenges the entire universe. Shestov undertook a revision of traditional philosophy, demanding that the point of view be shifted from the universe to the subject. He proclaimed the "philosophy of tragedy," which he presented in polemical juxtaposition to the academic style of thinking—the "philosophy of the commonplace" (*Dostoevsky and Nietzsche: The Philosophy of Tragedy*, 1903).

Shestov rebelled against the rule of reason over life experience and against the suppression of the personal and unique by the impersonal and general. But his assertion of the individual's independence from any form of determination, including generally

recognized truths and generally mandatory moral norms, led Shestov to epistemological relativism and immoralism. Although his nonreligious "apotheosis of groundlessness" (1905) was replaced in the early 1910's by an enthusiastic belief in the spirit of Luther's "faith alone" (*sola fide*), Shestov's world view lost neither its absurd element nor its arbitrary character.

Shestov's faith is lacking in meaningful definitions; god, who is unconnected to the concept of the logos, appears as the ideal of omnipotent willfulness "beyond good and evil." On the other hand, hopelessness is now replaced by faith in the divine source of life's foundations in accordance with the spirit of the Old Testament; revelation is proposed by Shestov in contrast to philosophical speculation (*Athens and Jerusalem*, 1951; *Speculation and Revelation*, 1964). In his opposition to reason, Shestov turns to hyperbole when he identifies the cognitive drive with the fall of man—mankind having fallen under the power of "soulless and necessary truths."

As an author, Shestov revealed a temperament that was bound to attract attention to his ideas; a master of philosophical paradox and aphorism, he gained renown in the West with his biting criticism of academic thinking. References to Shestov are found in works by G. Marcel, A. Camus, and D. H. Lawrence.

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R. A. GAL'TSEVA [29–1161–1]

SHESTOVITSY KURGANS, three groups of ancient Russian burial mounds dating from the tenth and early 11th centuries, located on the right bank of the Desna, 16 km southwest of the city of Chernigov, near the village of Shestovitsy. About 150 mounds were excavated by P. I. Smolichev (1925–27), Ia. V. Stankevich (1946), and D. I. Blifel'd (1948, 1956–58). The burials, with cremations or inhumations, yielded weapons, horse harnesses, Arabic and Byzantine coins, and Scandinavian fibulae. Members of the military aristocracy were buried in chambers ("timber-frame" tombs and rectangular pits) together with their female slaves and horses. Located nearby are an ancient Russian fortified settlement and a small village with the remains of semisubterranean dwellings. The Shestovitsy Kurgans resemble other military necropolises of the early feudal period in Rus' (Kiev) and Scandinavia (*see* BIRKA).

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SHETLAND ISLANDS, an archipelago of more than 100 islands in the northeastern part of the Atlantic Ocean. Area, 1,400 sq km. Population, 18,400 (1974). The Shetland Islands belong to Great Britain. The largest islands are Mainland, Yell, Unst, and Fetlar. The rolling plains and plateaus of the islands, which rise to 450 m, are composed primarily of schists and quartzites, with well-preserved traces of glaciation, such as boulder fields and sheepback rocks. Meadows and peat bogs abound. Bird colonies occur on the islands. The inhabitants engage in fishing and stock raising; various grasses are also grown. There is offshore drilling for petroleum. The principal town is Lerwick. [29–1166–3]

SHETPE, an urban-type settlement and administrative center of Mangistau Raion, Mangyshlak Oblast, Kazakh SSR. Railroad station on the Beineu–Novyi Uzen' line, 108 km northeast of Shevchenko. Enterprises include a plant producing nonmetallic building materials. The city has a people's amateur theater. [29–1166–4]

SHEVALIN, VADIM ALEKSANDROVICH. Born Feb. 21 (Mar. 4), 1888, in Kazan; died July 30, 1941, in Leningrad. Soviet scientist in the field of electric traction.

Shevalin graduated from the St. Petersburg Polytechnical Institute in 1911. He taught at the institute, where he became a professor in 1925, until his death. In 1915 he was sent by the government to the United States; he returned to Russia in 1918. Beginning in 1920, Shevalin was involved in various railroad electrification projects, including preliminary work on the electrification of the Leningrad railroad terminal (1925–34). He was also involved in the creation of the Moscow subway and the electrification of Moscow's suburban railroad lines. His research was primarily devoted to the development of the theory of the planning and design of electric railroads and to the technical and economic problems of electric traction.

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SHEVARDINO, a village in what is now Mozhaisk Raion, Moscow Oblast; the scene of a battle between Russian and Napoleonic troops on Aug. 24 (Sept. 5), 1812, on the eve of the battle of Borodino, during the Patriotic War.

Located at Shevardino was a pentagonal redoubt, which initially formed the extreme left-flank fortification of the Russian position; however, after M. I. Kutuzov ordered the left flank to withdraw to the village of Semenovskaia on August 23 (September 4), Shevardino became the forward strongpoint. The redoubt was armed with a 12-gun battery, and its approaches were guarded by eight infantry battalions, three chasseur regiments, and several cavalry regiments, numbering up to 18,000 men, under the command of General A. I. Gorchakov. During the afternoon of August 24 (September 5), the French forces of about 35,000 men, comprising the infantry of Marshal L. Davout, supported by cavalry from General J. Poniatowski's Polish corps, attacked the Russian positions at Shevardino. The Russian forces stubbornly defended the redoubt, and only late in the evening, when ordered by Kutuzov, did they leave the devastated redoubt. The defense of the Shevardino redoubt allowed the Russian command to gain time to complete defensive preparations at the main position. [29–1067–4]

SHEVARNADZE, EDUARD AMVROSIEVICH. Born Jan. 25, 1928, in the village of Mamati, Lanchkhuti Raion, Georgian SSR. Soviet party and state figure. Member of the CPSU since 1948.

The son of a teacher, Shevarnadze graduated from the party school of the Central Committee of the Communist Party of Georgia (CPG) in 1951 and from the department of history at the Kutaisi Pedagogical Institute in 1960. He began performing Komsomol and party work in 1946. He was second secretary of the Central Committee of the Komsomol of Georgia in 1956 and 1957 and first secretary from 1957 to 1961. From 1961 to 1963 he served as first secretary of the Mtskheta raion committee of the CPG, and in 1963 and 1964 he was first secretary of the Pervomaiskii raion (Tbilisi) committee.

Shevarnadze became first deputy minister for the protection of public order in 1964 and minister in 1965. After the administrative reorganization in 1968, he served as minister of internal affairs of the Georgian SSR. In 1972 he became first secretary of the Tbilisi city committee of the CPG, and in September of the same year he became first secretary of the Central Committee of the CPG.

From 1958 to 1962, Shevarnadze was a member of the Central Committee of the All-Union Komsomol, and between 1959 and 1961 he was a candidate member and member of the bureau of the Central Committee. Shevarnadze was a member of the Central Committee of the CPG from 1958 to 1964 and was elected a member again in 1966. In 1972 he was named to the bureau of the Central Committee of the CPG. In 1976, Shevarnadze became a member of the Central Committee of the CPSU. He became a candidate member of the Politburo of the Central Committee of

the CPSU in 1978. He served as a deputy to the ninth convocation of the Supreme Soviet of the USSR.

Shevarnadze has been awarded three Orders of Lenin, the Order of the Red Banner of Labor, and various medals. [29–1067–5]

SHEVCHENKO, FAINA VASIL'EVNA. Born Apr. 5 (17), 1893, in Voronezh; died there May 10, 1971. Soviet Russian actress. People's Artist of the USSR (1948).

In 1909, Shevchenko began her association with the Moscow Art Theater. She studied at the theater's school beginning in 1911 and joined the company in 1914. A talented character actress, she made generous use of the speech and mannerisms encountered in everyday life. She was known for her rich voice, expressive gestures, and satirical wit. Her roles included Vaska in Leonov's *Untilovsk*, Marceline in Beaumarchais's *The Marriage of Figaro*, Dun'ka in Trenev's *Liubov' Iarovaia*, Matrena, Kabanikha, and Glafira Firsovna in A. N. Ostrovskii's *Fiery Heart, The Thunderstorm*, and *The Ultimate Sacrifice*, Vasilisa in Gorky's *The Lower Depths*, Melan'ia in Gorky's *Egor Bulychov and the Others*, and Tabun-Turkovskaia in Leonov's *The Golden Carriage*.

Shevchenko received the State Prize of the USSR in 1943 and 1946. She was awarded the Order of Lenin, two other orders, and several medals. [29–1075–1]

SHEVCHENKO, TARAS GRIGOR'EVICH. Born Feb. 25 (Mar. 9), 1814, in the village of Morintsy, now in Zvenigorodka Raion, Cherkassy Oblast; died Feb. 26 (Mar. 10), 1861, in St. Petersburg. Ukrainian poet, artist, thinker, and revolutionary democrat.

Shevchenko was born a serf; orphaned at an early age, he worked as a shepherd and farm laborer for a priest. At the age of 14 he was employed as a "little cossack," or servant boy, by P. V. Engel'gardt, the lord of the estate who was his master. Shevchenko was taught to read and write by a village *d'iachok* (low-ranking church official). In 1829 he was taken to Vilnius by his master and lived there until early 1831, when he moved with Engel'gardt to St. Petersburg. In 1833 he was apprenticed to "a craft guild master in various forms of painting" named Shiriaev. In the spring of 1838, Shevchenko was bought out of servitude and gained his freedom.

Shevchenko's earliest known works are the ballad *The Mad Woman*, the poems "Dumka" ("To the blue sea the water flows") and "To the Eternal Memory of Kotliarevskii," and the narrative poem *Katerina*. These works have been dated 1837 or 1838. A collection of Shevchenko's poetry entitled *Kobzar'* (The Bard), published in 1840, included several previously unpublished poems—"Songs of Mine," "Perebendia," "Dumka" ("What do my coal-black brows avail me?"), "To Osnov'ianenko," "Ivan Podkova," the ballad *The Poplar*, and the narrative poems *Katerina* and *The Night of Taras*.

As a summing-up of Shevchenko's early work, *Kobzar'* was indicative of the poet's development in the mainstream of romanticism. In the ballads and narrative poems, reality is closely intertwined with the fantastic elements of folk legends and traditions. The plots are based on the unhappiness and tragedy of doomed love. At the same time, a strong realistic strain is already evident in Shevchenko's early work; his heroines' feelings are genuine and sincere, and concrete life circumstances can be discerned behind their suffering. *Katerina*, for example, is a completely realistic narrative poem about the bitter fate, despair, and suicide of a simple peasant girl, deceived by an officer and abandoned by him with her newborn child. In Shevchenko's successive poems, love and the lot of women emerge as increasingly well-defined historical topics. In the narrative poems *The Blind Woman* (1842), *Marina* (1848), and *The Princess* (1847), Shevchenko justifies and sanctifies ruthless revenge against the oppressors' violations of human dignity.

The same movement toward realism can be seen in the treatment of historical subjects. From such early works as *The Night of Taras* (1838) and "Ivan Podkova" (1839), which are imbued with the romance of ancient legends, the poet moved closer to the theme of struggle for national liberation. In his major narrative poem on a historical subject, *The Haidamaks* (1841), Shevchenko depicted the great popular uprising of 1768, known as the Koliivshchina, against the oppressive yoke of the Polish *szlachta*. In addition to being historically accurate, this verse epic is wholly addressed to the poet's contemporaries. By recalling ancestral glories, Shevchenko sought to arouse the oppressed Ukrainian people to the revolutionary struggle for liberation.

In May 1843, Shevchenko journeyed to the Ukraine; he returned to St. Petersburg in February 1844, and in the spring of 1845 he set off once again for the Ukraine, intending to settle in Kiev. What he saw during his travels through the provinces of Kiev, Poltava, Chernigov, and Volyn' (in the capacity of artist for the Archaeographic Commission of Kiev), and particularly his impressions of the hardships endured by the serfs, had a marked effect on Shevchenko and strengthened his revolutionary aspirations. In the course of his travels he wrote protest poems against serfdom, recording them in an album (*Three Years*). He read the poems to friends and allowed them to be copied.

In 1846, Shevchenko joined the secret Society of Cyril and Methodius, in which his position was on the left. In April 1847 he was denounced by a provocateur and arrested; he was then sent to serve as a soldier at the fortress of Orsk, in Orenburg Province, and in 1850 he was transferred to the Novopetrovskoe fortification (site of the modern city of Fort-Shevchenko) on the Mangyshlak Peninsula. Shevchenko's crime, according to his sentence, was that "he wrote poems of the most disgraceful content in the Little Russian [that is, Ukrainian] language." The deportation sentence provided that Shevchenko be placed under "the strictest observation in order to prevent his producing disgraceful compositions of any kind." Confirming the sentence, Nicholas I added his own provision, placing Shevchenko "under the strictest supervision and prohibiting [his] writing and drawing" (quoted from *Taras Shevchenko: Dokumenty i Materialy*, 1963, p. 50).

The narrative poems *The Dream* (1844) and *The Caucasus* (1845) and other verse works for which Shevchenko was persecuted by tsarism marked a new stage in the development of Ukrainian political poetry and satire. In these works Shevchenko raised his own historical and political consciousness to a new level; he angrily stigmatized autocracy, called on all peoples to unite in human brotherhood, and glorified the struggle of the peoples of Russia against colonial oppression. The two narrative poems represented a further step in the development of Shevchenko's realism and revolutionary democratic views. With these and subsequent compositions of Shevchenko's during the 1840's and 1850's, Ukrainian poetry took its rightful place as part of advanced European literature and exercised considerable influence on 19th-century Slavic poetry.

Two poems by Shevchenko that were particularly influential are his "Testament" (1845; "When I die, O let my body"), which openly calls for the overthrow of tsarism and serfdom and envisions the wonderful future in store for the people, and the narrative poem *The Heretic, or Jan Hus* (1845), which is directed against religious obscurantism and political reaction and is permeated with the idea of friendship among peoples.

Shevchenko's deportation lasted from June 1847 to August 1857; he was released after the death of Nicholas I. Exile did not destroy his talent, nor did it break his will or his revolutionary convictions. The poetry inspired by what he called the "enslaved Muse"—that is, the poems written in exile and carefully hidden during searches and arrests—bear the mark of Shevchenko's increasingly revolutionary attitudes; a new power resounds in the cycle of poems *The Tsars* (1848), which proclaims the crowned tyrants' guilt and invokes justice against them. In the cycle *In the Fortress* (1847) the poet pours out his passionate love for the Ukraine and its people—a love sharpened by exile. Elsewhere, Shevchenko expresses his feeling of fraternal love for all oppressed peoples—for example, for the Kazakhs in the poem "The Lord Had an Axe Behind His Door" (1848).

During his exile Shevchenko wrote, in Russian, the realistic novellas *The Princess* (1853), *The Musician* (1854–55), *The Unfortunate Man* (1855), *The Captain's Wife* (1855), *Twins* (1855), and *The Artist* (1856). The novellas *The Servant-Girl* (1844) and *Varnak* (1845) were written before Shevchenko's exile, and *A Pleasant Stroll, Not Without a Moral* (1856–58), after. The author's opposition to serfdom permeates all these works. The central figure in *Varnak, The Musician, The Artist*, and *A Pleasant*

Stroll is that of the educated serf, and his experiences are often autobiographical. The hero's views on art reflect those of the author, who was a confirmed advocate of realism and was close to the "natural school" of Russian literature in both theory and practice.

The road back from exile was long and hard. Shevchenko was stopped on the way, in Novgorod, and forbidden to enter either of the two capitals. Through the efforts of friends, however, he obtained permission to live in St. Petersburg, and he arrived there in the spring of 1858. Here he became associated with the authors writing for the journal *Sovremennik*; those he was especially close to included N. G. Chernyshevskii, N. A. Dobroliubov, N. A. Nekrasov, M. L. Mikhailov, and the Kurochkin brothers. The note of anger in Shevchenko's satire grew sharper, and the poet was once again placed under the strict supervision of the Third Section. During his visit to the Ukraine in the summer of 1859, Shevchenko was arrested near the village of Prokhorovka; he was then forced to leave the Ukraine and return to St. Petersburg.

A new edition of *Kobzar'*—the most complete of the three editions published in his lifetime—appeared in 1860; certain poems, however, such as *The Dream, The Caucasus*, and *The Heretic*, as well as "Testament," were necessarily excluded. Dobroliubov reviewed *Kobzar'* in *Sovremennik*, calling Shevchenko "a true people's poet" (*Sobr. soch.*, vol. 6, 1963, p. 142). A number of the poems not included in *Kobzar'* because of the censorship appeared in the collection *New Poems of Pushkin and Shevchenko*, which friends of Shevchenko's published in Leipzig in 1859.

The works of 1857–61 represent the apex of Shevchenko's poetry; there is now greater wealth and variety in his subjects (social, political, and philosophical), in his attitudes, in the range of colors of his nature poems, in the profound wisdom of his reflections on poetry, as in the triptych made up of "Fortune," "The Muse," and "Fame" (1858), in the rhythm and sophistication of poetic means, and in the skill of artistic imagery. Shevchenko's narrative poems *The Neophytes* (1857), *God's Fool* (1857), and *Mary* (1859), as well as his lyric verse of the 1850's and early 1860's, are among the highest achievements of this period. In *The Neophytes*, revolutionaries and Decembrists are glorified through allegorical images of early Christians; one can easily identify Nicholas I in the figure of Nero, and the nobles and landed gentry in Shevchenko's patricians.

Shevchenko's imitations of psalms and biblical motifs were another means by which he expressed revolutionary democratic ideas, as exemplified by his "Imitation of the 11th Psalm," "Hosea, Chapter XIV," and *Mary*. In his lyric masterpieces "O Blind and Wretched People," "Archimedes and Galileo," "There Is No Joy in Anything," and "Although They Do Not Hit a Man Who Is Down" (all written in 1860), Shevchenko's calls to revolution are issued with the assurance that "punishment will come! for the tsars and tsareviches of this earth." In these and other poems (especially in "Silent Light! Shining Light!"), Shevchenko envisions the future in the light of socialist ideals.

In his poetic writing, Shevchenko was close to the folk tradition; without breaking away from that tradition, his poetry evolved toward increasingly greater originality. The rhythmic intonation of Shevchenko's poetry is based on Ukrainian popular verse, but it is richer in its diversity of forms and rhythms and variety of strophic construction, whether syllabic (with 12- and 11-syllable or 14-syllable strophes) or syllabotonic (with, for example, 28 types of strophes in the poems written in iambic tetrameter alone). Shevchenko's contribution to Ukrainian poetry was unique in that he radically broadened its cultural and intellectual horizons, drawing on the history and contemporary life of various European peoples and incorporating ideas and images from European literature.

Many of Shevchenko's works were put to music by N. V. Lysenko (see his collection *Music to Shevchenko's "Kobzar'"*) and other Ukrainian composers, such as K. G. Stetsenko, Ia. S. Stepovyi, and S. F. Liudkevich, as well as by the Russian composers M. P. Mussorgsky, P. I. Tchaikovsky, and S. V. Rachmaninoff. "Oh Songs, My Songs," "Testament," and the first part of *The Mad Woman* ("The mighty Dnieper roars and groans") were made into folk songs, and "Testament" became one of the songs of the revolutionary movement.

Shevchenko's death was perceived as a great loss for literature and for the liberation movement. His funeral was attended by many literary and public figures, including M. E. Saltykov-Shchedrin, I. S. Turgenev, F. M. Dostoevsky, and N. S. Leskov. N. A. Nekrasov wrote the poem "On Shevchenko's Death," and A. I. Herzen published a moving obituary in *Kolokol* (The Bell).

Shevchenko was also known as an artist. From 1838 to 1845 he studied with K. P. Briullov at the Academy of Arts in St. Petersburg. His early works, such as *Katerina* (1842, T. G. Shevchenko Museum, Kiev) and the series of etchings *Pictures of the Ukraine* (published 1844), were indicative of Shevchenko's orientation toward realism, culminating in the keen accusatory force of the watercolors and drawings done in exile—for example, the series *The Parable of the Prodigal Son* and *Running the Gauntlet* (ink and bister, 1856–57).

After his return from exile, Shevchenko did a great deal of engraving, which he saw as a means of spreading art among the people; in 1860 he was given the title of academician in copper engraving. He produced a series of profound psychological portraits, such as his *Self-portrait* (1840–41, T. G. Shevchenko Museum, Kiev), and affecting landscapes of the Ukraine and Kazakhstan.

Shevchenko was the founder of modern Ukrainian literature as well as a pioneer of critical realism and of the revolutionary democratic current in Ukrainian literature and painting. The best traditions of Ukrainian literature are linked to his creative work. Shevchenko's literary works have been translated into many foreign languages, and their study constitutes a specialized branch of modern literature. There are Shevchenko museums in various cities and villages, including Kiev, Kanev (where Shevchenko is buried), Shevchenko, Morintsy, Leningrad, and Orsk. The University of Kiev and the Institute of Literature of the Academy of Sciences of the Ukrainian SSR are named after Shevchenko, and the Ukrainian republic instituted the Shevchenko Prize. In May 1861, in conformity with the poet's wish, the coffin bearing his remains was taken to the Ukraine and buried on Chernech'ia Gora, which overlooks the Dnieper near Kanev.

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M. N. PARKHOMENKO [29–1070–2]

SHEVCHENKO (until 1964, Aktau), a city and the administrative center of Mangyshlak Oblast, Kazakh SSR. Situated on the Mangyshlak Peninsula, with a port (Aktau) on the Caspian Sea; located 13 km from the Mangyshlak railroad station on the Beineu–Novyi Uzen' line. Population, 111,000 (1977).

Shevchenko was founded as a result of the discovery of oil and gas deposits in the area. The city has a meat-packing plant, a milk plant, a poultry farm, and a garment factory. As of 1978, a plant for the production of plastics was under construction. Shevchenko has an atomic power plant, which is being used by an experimental industrial installation for the desalination of seawater. Cultural institutions include a people's dramatic theater and a museum of local lore.

The general plan for the layout and development of Shevchenko was approved in 1967. Notable features of the city plan are the relationship between the city and seacoast and extensive programs for planting greenery and providing amenities in the midst of the desert. The city was planned and built under the direction of the architect A. V. Korotkov, with the assistance of the architects G. M. Vylegzhanin, M. I. Levin, T. N. Safonova, N. I. Simonov, E. B. Fedorov, and S. S. Tseliaritskii and such engineers as E. A. Durgarian and G. P. Smorodin. The State Prize of the USSR was awarded to them in 1977 for this work. A complex of administrative buildings, the House of Soviets, the Abai House of Culture, and the Aktau Hotel are among the notable buildings in Shevchenko. [29–1075–2]

SHEVCHENKO, an urban-type settlement in Donetsk Oblast, Ukrainian SSR, under the jurisdiction of the Krasnoarmeisk city soviet. Shevchenko is located 8 km southwest of Krasnoarmeisk and 3 km from the Chunishino railroad station. Coal is mined in the settlement. [29–1075–3]

SHEVCHENKOVO, an urban-type settlement and administrative center of Shevchenkovo Raion, Kharkov Oblast, Ukrainian SSR. Shevchenkovo is located 80 km southeast of Kharkov. It has a railroad station (Bulatselovka) on the Kharkov–Kupiansk-Uzlovoi line. Enterprises include a combine for the manufacture of bread products. [29–1075–4]

SHEVCHUK, IVAN PAVLOVICH. Born 1892 in the village of Chaplia, in what is now Letichev Raion, Khmel'nitskii Oblast, Ukrainian SSR; died Oct. 30, 1942, on the Northwestern Front. Partisan leader in the Far East during the Civil War of 1918–20. Major general (1940). Member of the CPSU from March 1917.

The son of a poor peasant, Shevchuk fought in World War I; he was awarded four Crosses of St. George and was promoted to ensign. After the October Revolution of 1917 he helped recruit and train Red Guard detachments in Khabarovsk. In the summer of 1918 he led Red Guard detachments on the Ussuri Front against interventionists and White Guards.

In mid-1919, in accordance with a decision of the Fifth Regional Congress of Soviets of the Far East and the Urul'ga Conference of Party and Soviet Workers, Shevchuk formed and headed the Tungus Partisan Detachment. He fought against the Japanese for Khabarovsk in April 1920 and became one of the commanders of the Second Amur Partisan Army in June of the same year. In February 1922, Shevchuk commanded an enveloping column near Volochaevka.

Shevchuk graduated from advanced courses for command personnel and served as a regimental commander. In 1929 he fought in the Soviet-Chinese conflict on the Chinese Eastern Railway. Shevchuk graduated from the M. V. Frunze Military Academy in 1933. He commanded a rifle division in the Great Patriotic War of 1941–45 and died in combat. Shevchuk was awarded the Order of the Red Banner, the Order of the Red Star, and a medal.

S. N. PUCHKOV [29–1075–5]

SHEVELEV, FIRS ALEKSANDROVICH. Born Dec. 1 (14), 1912, in Moscow. Soviet hydraulics scientist. Doctor of technical sciences (1954); professor (1962). Member of the CPSU from 1940.

Shevelev graduated from the Moscow Construction Engineering Institute in 1937. From 1938 to 1941 and from 1946 to 1954 he worked at VODGEO (All-Union Scientific Research Institute of Water Supply, Sewage, Hydrotechnical Construction, and Engineering Hydrogeology). From 1954 to 1957 he worked in the construction department of the Central Committee of the CPSU. Between 1957 and 1964 he worked at the Academy of Construction and Architecture of the USSR. In 1965 he became director of the K. D. Pamfilov Academy of Municipal Services. Shevelev's main works are devoted to engineering hydraulics, mainly the hydraulics of pipe systems.

Shevelev has been awarded eight orders and several medals.

[29–1068–2]

SHEVIAKOV, LEV DMITRIEVICH. Born Jan 2 (14), 1889, in Vetluga, in what is now Gorky Oblast; died July 3, 1963, in Moscow. Soviet mining expert. Academician of the Academy of Sciences of the USSR (1939).

Sheviakov graduated from the Ekaterinoslav (Dnepropetrovsk) Mining Institute in 1912. In 1913 he began teaching at the institute, becoming a professor in 1920. In 1929 he became a professor at the Siberian Technological Institute, and in 1932, a professor at the Sverdlovsk Mining Institute. From 1944 to 1950 he was a professor at the Moscow Mining Institute. Between 1939 and 1963 he worked at the A. A. Skochinskii Mining Institute (known as the Mining Institute of the Academy of Sciences of the USSR until 1959). Sheviakov was chairman of the Commission for the Study of Natural Productive Forces of the Academy of Sciences of the USSR from 1946 to 1949 and served as a member of the State Planning Committee of the USSR from 1947 to 1957.

Sheviakov's main works dealt with the applications of analytic methods, for example, the establishment of quantitative relationships between the mining geological, mining engineering, and economic parameters of working deposits. Sheviakov developed a technique for calculating support pillars. The founder of a scientific school of mine planning, he devised a classification of underground methods of working mines.

Sheviakov received the State Prize of the USSR in 1942. He was awarded two Orders of Lenin, two other orders, and various medals.

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SHEVRET, chrome-tanned leather made from sheepskin, with a fine, uniform grain. The structure is flocculent, and the face layer separates easily during use; special processes, such as impregnation with polymers, are used to increase the mechanical strength of the leather. *Shevret* is used as an upper leather and in the manufacture of clothing and accessories. [29–1069–3]

SHEVYREV, IVAN IAKOVLEVICH. Born 1859 in Kharkov; died July 7, 1920. Russian entomologist.

Shevyrev graduated from the University of Kharkov in 1883. He worked at the Institute of Forestry in St. Petersburg from 1887 to 1897 and at the Department of Forestry of the Ministry of Agriculture and State Property from 1898 to 1917. His main works deal with forest entomology, primarily bark beetles (Ipidae) and other arboreal pests. Shevyrev initiated the study of insects in man-made steppe forests. He wrote a number of works on parasitic Hymenoptera and proposed a precise method for studying their larvae. Shevyrev originated the use of plant intoxication for the destruction of pests.

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SHEVYREV, PETR IAKOVLEVICH. Born June 23 (July 5), 1863, in Kharkov; died May 8 (20), 1887, in Shlissel'burg Fortress. Russian revolutionary Narodnik (Populist).

The son of a merchant, Shevyrev entered the University of Kharkov in 1883 and later transferred to the University of St. Petersburg. In the winter of 1885–86, he organized an illegal student union known as the League of Zemliachestva (see STUDENT MOVEMENT IN RUSSIA). In late 1886, Shevyrev and A. I. Ul'ianov founded the Terrorist Faction of the People's Will, which plotted to assassinate Emperor Alexander III.

In February 1887, suffering from tuberculosis, Shevyrev left for the Crimea. He was arrested in Yalta on March 7. On April 19, in the Second March 1 trial, he was sentenced to death (*see* PERVOMARTOVTSY). Shevyrev was hanged.

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Iakovenko, E. I. *P. I. Andreiushkin, V. D. Generalov, P. Ia. Shevyrev*. Moscow, 1931. [29–1076–2]

SHEVYREV, STEPAN PETROVICH. Born Oct. 18 (30), 1806, in Saratov; died May 8 (20), 1864, in Paris. Russian literary critic, literary historian, and poet. Academician of the St. Petersburg Academy of Sciences (1847).

Shevyrev became a professor at Moscow University in 1837. He was a member of the Society of Lovers of Wisdom (*see* LIUBOMUDRY), and he took part in the publication of the journal *Moskovskii vestnik*. An opponent of euphonious and smooth but meaningless poetry, he attempted to create a "poetry of thought" in his translations and poems on philosophical and historical themes. In such works as *The History of Poetry* (vol. 1, 1835; vol. 2, 1892, posthumously) and *The Theory of Poetry in the Historical Development of Ancient and Modern Peoples* (parts 1–4, 1836, doctoral dissertation), he treated the development of literature as a reflection of the spiritual experience and history of a people; this approach was praised by A. S. Pushkin (*Poln. sobr. soch.*, vol. 7, 1958, pp. 397–98).

From 1835 to 1837, Shevyrev was the leading critic for *Moskovskii nabliudatel'*. With M. P. Pogodin he headed the journal *Moskvitianin*, which was founded in 1841. In the ideological struggle of the 1840's and 1850's, he supported the official nationality theory formulated by S. S. Uvarov. Shevyrev opposed V. G. Belinskii, the natural school, and the realistic trend in literature.

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Dobroliubov, N. A. "Istoriia russkoi slovesnosti: Lektsii S. Shevyreva." *Sobr. soch.*, vol. 4, Moscow-Leningrad, 1962.
Mann, Iu. V. "Molodoi Shevyrev." In his book *Russkaia filosofskaia estetika*. Moscow, 1969. L. G. FRIZMAN [29–1076–3]

SHEYBANI, ABU-NASR FATHULLAH-KHAN. Born 1830 in Kashan; died 1891 in Tehran. Persian poet.

Sheybani, a follower of Sufism, befriended the poor and reflected their life in his poems. Themes frequently encountered in his poetry include dissatisfaction with life and criticism of the injustice of the rulers and flaws in the social structure. In his "panegyrics" he denounced the shah's indifference to the plight of the country. Sheybani's works heralded social criticism in Persian literature and furthered the birth of critical realism. His poetic style was simple and laconic, also an innovation for Persian literature. Sheybani's poems are collected in two divans.

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Istoriia persidskoi i tadzhikskoi literatury. Moscow, 1970. Pages 321–22. Edited by J. Rypka. [29–1081–2]

SHIASHKOTAN, one of the Kuril Islands, located in the northern part of the chain, between Shiashkotan and Kruzenshtern straits. The island, which belongs to the USSR, has an area of 122 sq km. Shiashkotan is composed of two volcanoes connected by a narrow isthmus with a width of 1 km. In the north is the active volcano Sinarka, which erupted in the 18th century and again in 1846, 1855, and 1872; Sinarka has an elevation of 934 m. In the south is the volcano Kuntomintar, which has an elevation of 828 m and which emits hot gases and vapors. Shiashkotan has oceanic meadows and thickets of dwarf stone pine and prostrate forms of alder. [29–1171–2]

SHIBAEV, ALEKSEI IVANOVICH. Born Feb. 8 (21), 1915, in the village of Maslovka, in what is now Spasskoe Raion, Gorky Oblast. Soviet party and trade union figure. Hero of Socialist Labor (1973). Member of the CPSU since 1940.

The son of a peasant, Shibaev graduated from the University of Gorky in 1940. Between 1940 and 1943 he worked as a design engineer, deputy chief, and chief of a shop at a factory in Gorky. From 1943 to 1947 he was a party organizer of the Central Committee of the ACP(B) at the V. P. Chkalov Plant in Novosibirsk and between 1947 and 1955 he was the director of various factories in Rostov and Saratov oblasts. From 1955 to 1959, Shibaev served as second secretary of the Saratov oblast committee of the CPSU, and in 1959 he became first secretary of the committee. In 1963 and 1964 he was first secretary of the Saratov industrial oblast committee of the CPSU.

In November 1976, Shibaev was named chairman of the All-Union Central Council of Trade Unions. He became a member of the Central Committee of the CPSU in 1961, and he served as a deputy to the sixth through tenth convocations of the Supreme Soviet of the USSR. In December 1977 he became a member of the Presidium of the Supreme Soviet of the USSR.

Shibaev has been awarded four Orders of Lenin, four other orders, and various medals. [29–1171–3]

SHIBANOV, MIKHAIL. Patronymic and date of birth unknown; died after 1789. Russian painter.

Shibanov, the son of serfs, was a "free painter" after 1783. He was a portraitist and the originator of peasant genre painting in Russian art. His pictures, which reveal the strong influence of nature, are painted in a direct manner. They depict peasants in a truly expressive style comparable to portraiture. Notable examples include *Peasant Dinner* (1774) and *Wedding Celebration* (1777), both in the Tret'iakov Gallery.

Shibanov painted portraits of A. G. Spiridov (1772, Tret'iakov Gallery), V. S. Popov (1784–85, Odessa Art Museum), and Catherine II and A. M. Dmitriev-Mamonov (both 1787, Russian Museum, Leningrad). From 1783 to 1786 he painted icons for the Cathedral of St. Catherine in Kherson (now housed in the Kherson Museum of Local Lore).

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Alekseeva, T. V. "Mikhail Shibanov po novym materialam." In her *Issledovaniia i nakhodki*. Moscow, 1976. [29–1172–1]

SHIBANOV, a family of Russian antiquarian booksellers.

Petr Vasil'evich Shibanov. Born circa 1822 in the village of Lava, in Karsun District, Simbirsk Province; died Dec. 22, 1892 (Jan. 3, 1893), in Moscow.

The son of a serf, P. V. Shibanov began selling Russian manuscripts and books in old Russian typeface (*staropechatnye knigi*) in 1840, while in Samara. He became commissioner of the Soci-

ety of Lovers of Ancient Literature in 1877 and the proprietor of a bookstore in Moscow in 1883.

Pavel Petrovich Shibanov. Born 1864 in Samara; died May 1, 1935, in Moscow. Son of P. V. Shibanov.

P. P. Shibanov started out in his father's business and acquired his own bookstore in 1892. The catalogs published by him—*The Antiquarian Book Trade of P. Shibanov* (nos. 1–168, 1885–1916)—are an invaluable source on the history of the Russian book in the 19th and 20th centuries. In 1892, Shibanov published the journal *Bibliograficheskie zapiski*, of which 12 numbers appeared. After the October Revolution of 1917 his store became municipal property, and his collection of books and manuscripts was given to the library of the Rumiantsev Museum, now the Lenin State Library of the USSR.

In November 1918, Shibanov was retained as an expert for the People's Commissariat for Education; he inventoried and oversaw the distribution of nationalized book collections. In 1923 he became head of the antiquarian department of the joint-stock company Mezhdunarodnaia Kniga, under the People's Commissariat of Foreign Trade and the Supreme Council on the National Economy; the company carried on a trade in books in the USSR and abroad. Shibanov helped compile about 300 catalogs of old books.

Shibanov was a member of several bibliographic and bibliophilic societies and wrote on the history of the antiquarian book trade in Russia.

WORKS

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Druz'ia knigi." In the collection *Kniga*, collection 27. Moscow, 1973.

A. V. DOROSHEVICH [29–1172–2]

SHIBLIAK, Mediterranean-type vegetation consisting of drought-resistant thermophile deciduous shrubs and low trees. This type of vegetation developed in the Mediterranean region during the Neogene. Modern *shibliak* has formed mainly in places where drought-resistant forests and open woodlands of the foothills and low mountains have been destroyed by man. The vegetation occurs in the Balkans, the Crimea, Dagestan, Transcaucasia, and the Black Sea Coast of the Caucasus. The floristic composition of *shibliak* varies; the most common trees are oaks (*Quercus pubescens* and Iberian oaks), Christ's thorn, *Carpinus orientalis*, and laburnum. In warmer regions there are admixtures of evergreen plants. [29–1173–6]

SHIDERTY, an urban-type settlement in Ekibastuz Raion, Pavlodar Oblast, Kazakh SSR. Shiderty is situated on the bank of the Shiderty Reservoir, on the Irtysh-Karaganda Canal, on the Pavlodar-Karaganda highway, 50 km west of Ekibastuz. The settlement uses the Chiderty railroad station. A crushing and screening plant that produces stone used in construction is located in Shiderty. [29–1177–3]

SHIDERTY (also Sarapan; in the lower course, Karasu), a river in Karaganda and Pavlodar oblasts, Kazakh SSR. The Shiderty is 506 km long and drains an area of 15,900 sq km. It rises in the central part of the Kazakh Melkosopochnik and empties into Lake Shaganak, which occupies an area of 16.4 sq km; when water levels are high, water from the lake flows into Lake Zhalauly. The river is fed mainly by snow. High water occurs between mid-April and early June. At times the upper and lower courses of the river dry up. The Irtysh-Karaganda Canal passes through the upper and middle courses of the Shiderty. [29–1177–2]

SHIDLOVSKII, ANDREI PETROVICH. Born Nov. 17, 1818, in Voronezh Province; died May 7, 1892, in the village of Karabachkino, in what is now Zhitomir Oblast, Ukrainian SSR. Russian astronomer.

Shidlovskii was a professor of astronomy at the University of Kharkov from 1843 to 1856 and the University of Kiev from 1856 to 1868. He took part in the major arc and angle measurements directed by V. Ia. Struve and in a chronometric expedition to determine the difference in longitude between the Pulkovo and Altona observatories.

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SHIDLOVSKII, SERGEI ILLIODOROVICH. Born 1861; died 1922. Russian political figure; large-scale landowner; Octobrist.

Shidlovskii became a member of the administrative board of the Peasant Land Bank in 1900; in 1905 he was made director of the department of agriculture, but he resigned from the post in 1906. Thereafter, he served in a *zemstvo* (local self-government) institution and engaged in agriculture. Shidlovskii was assistant chairman of the Third State Duma and headed the left wing of the Octobrist Party in the Fourth State Duma. From 1915 to 1917 he was chairman of the bureau of the Progressive Bloc.

During the February Revolution, Shidlovskii served on the Provisional Executive Committee of the State Duma, and in the Provisional Government he was a member of the Central Committee. He took part in the Moscow State Conference of 1917 and served in the Preparliament. He was a member of the counterrevolutionary Council of Public Figures in 1917.

Shidlovskii withdrew from active politics in 1918 and emigrated in 1920. [29–1178–1]

SHIDLOVSKII COMMISSION, a government commission formed in accordance with a ukase issued by Nicholas II on Jan. 29, 1905. The commission was established as a result of the events of January 9 (Bloody Sunday) and the ensuing growth of the revolutionary and strike movement. Its purpose was to "clarify without delay the causes of discontent among the workers of St. Petersburg and its suburbs and eliminate such causes in the future."

Senator N. V. Shidlovskii was appointed to head the commission; its members were to be civil servants, factory owners, and deputies chosen from among the workers of St. Petersburg. Election of the deputies was to be a two-step process. First, electors would be chosen at the enterprises; then they, having formed nine production groups, would elect 50 deputies. On February 2 the St. Petersburg committee of the RSDLP adopted a resolution to strive for the selection of electors who supported the Bolsheviks. The electors would present detailed demands to the leaders of the commission setting forth the conditions for their participation in the commission; if the demands were not met, the electors would refuse to take part in the second stage of the elections and would thereby subvert the work of the commission. Candidates were also run by the Mensheviks, by remnants of G. A. Gapon's Assembly of Russian Factory Workers of St. Petersburg, and by the left wing of the Union of Liberation.

At a meeting of the electors on February 16 and 17, a decision was made under the influence of the Bolsheviks to demand that the government make public the sessions of the commission, grant freedom of speech, restore the 11 branches of Gapon's assembly that had been disbanded, and free arrested comrades. On February 18, Shidlovskii rejected the demands as being outside the competence of the commission. In response, the electors of seven of the production groups refused to send deputies to the Shidlovskii Commission and called on the workers to strike.

On February 20, Shidlovskii submitted to Nicholas II a report acknowledging the failure of the commission. On the same day the Shidlovskii Commission was disbanded by a tsarist ukase.

REFERENCE

Kreidlina, L. M. "Peterburgskii komitet RSDRP i vybory v Kommissiiu Shidlovskogo." *Voprosy istorii KPSS*, 1975, no. 2. [29–1178–2]

SHIDYAQ, AHMAD FARIS AL-. Born 1804 in Ashkot, Lebanon; died 1887 in Constantinople. Arabic educator and writer of Lebanon.

The son of a Maronite Christian, Shidyaq graduated from a religious school in 1828. From 1834 to 1838, after converting to

Protestantism, he did translations into Arabic for an American missionary publishing house in Malta, including a translation of the New Testament. After visiting the court of the Tunisian bey, he converted to Islam in 1855. In 1857, at the invitation of the Turkish sultan, he moved to Constantinople, where he founded the influential semiofficial newspaper *Al-Jawaib* (1857–84).

In his publicist writings, al-Shidyaq advocated pan-Arabism under the aegis of the Turkish sultan; he sharply criticized Egyptian nationalists. In Constantinople, Shidyaq published his own writings on philology and linguistics and edited more than 20 works of medieval Arabic literature. Perhaps his best-known work, which is similar to an adventure novel, is *Tale of Faryaq* (1855). In this novel Shidyaq described, in a Rabelaisian spirit, his own travels around Europe (Faryaq was a cryptonym of Far-[is Shid]yaq). He also criticized the social relations and mores of Eastern society in the work.

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S. A. SHUISKII [29–1177–4]

SHIELD. (1) A type of protective armament used to ward off the blows of cold-steel weapons. Shields were worn on the arm, which was passed through straps or rigid bands. The earliest shields were of various shapes and were made of wood, leather, or plaited twigs. Mesopotamians of the third millennium B.C. used wooden shields that were partially covered with copper plates. Bronze shields appeared in the second millennium B.C. in Assyria. The bronze shields of the kings of Urartu were covered with relief work and cuneiform characters.

The round, wooden—less often, iron—shields used in ancient Greece bore warriors' emblems, such as the dolphin or the lion. The Romans used round, iron shields and four-cornered shields made of wood and leather. Shields in early medieval Europe were also round and had umbones. Almond-shaped shields came into wide use in the 11th century; in the mid-13th century they were supplanted by triangular shields.

Symbols—rudimentary coats of arms—appeared on shields in the 12th century. In the second half of the 14th century and in the 15th century, the warriors of northern Rus' used the *paveza*, a rectangular pavis with rounded corners. The field of the pavis was divided into three parts by a trough, which facilitated defensive movements. The Russian cavalry used round shields from the 14th to early 16th centuries. Shields became smaller with improvements in armor and went out of use when firearms were developed.

The shield served as a symbol of military honor and victory. Pagan warriors took oaths on their shields. In 907, in Tsar'grad (Constantinople), Oleg "hung his shield on the gates as a sign of victory." Shields in Rus' were made by special artisans known as *shchitniki* (shield-makers). There was in Novgorod a street called Shchitnaia (Shield), where, apparently, the shield-makers lived.

(2) An armor plate with slots for gun or machine-gun sights. The shield is used to protect the gun crew and the gun's mechanisms from bullets and shrapnel. On some towed weapons, the shield is mounted forward of the sight and sighting devices.

REFERENCE
Kirpichnikov, A. N. *Drevnerusskoe oruzhie*, issue 3. Leningrad, 1971.

D. A. AVDUSIN [29–1605–5]

SHIELD (geology), the largest positive structure of cratons, contrasted to the platform. Within the shields there are outcrops of strongly metamorphosed Precambrian crystalline rocks (granites, gneisses, and schists), which constitute the basement of the cratons. Shields are irregular, flat uplifts and are usually uplifted segments of the crust. Their outlines show great stability for long periods of time.

The term "shield" was first suggested by E. Suess in 1885 for the extensive outcrops of Precambrian rocks in North America (the Canadian Shield) and Northern Europe (the Baltic Shield). The term "crystalline shield" was proposed by N. S. Shatskii in 1947. [29–1606–2]

SHIELDING (also screening), in electrical engineering and radio engineering, a means of reducing—that is, of suppressing or substantially attenuating—the effect of external stray fields, noise, or pickup. Such phenomena interfere with the operation of, for example, electrical or radio equipment, data transmission equipment, and data-processing equipment.

Shielding is accomplished by means of a grounded metal or metal-plated shield with a high electrical or magnetic conductivity. Either the stray-field or noise source or the equipment or component to be shielded is enclosed in the shield. Depending on the extent of shielding required, either solid shields or screens are used. Solid shields are usually made of sheet steel; screens are woven from copper or steel wire.

In many cases, the metal housing of a device acts as a shield. Complicated or bulky equipment is often installed in a room or chamber that is shielded. [29–1887–1]

SHIELD MINING, a method of mineral extraction in which a mineral is broken up by mechanized means or by drilling and blasting under a special roof shield. The method was proposed in the USSR in 1935 by N. A. Chinakal and others.

When mechanized breaking is employed, shield units are used. A shield unit consists of hydraulic barrier–load-bearing supports (*see* POWERED SUPPORT) and a Loebbe plow, which excavates the mineral and conveys it under the shield to a side chute. Shield units are used in beds with a thickness of 0.7–2.2 m and an angle of dip of more than 45°. They provide for the complete mechanization of operations at the working face.

When coal is broken up by drilling and blasting, flat sectional shields, which are called Chinakal shields in the USSR, are used. Such shields consist of from three to five sections; less often, they are arched and not sectional. A section is a metal frame in which timber flooring is installed in several rows. The flooring is rigidly fastened to the frame, but the sections are flexibly connected. Sectional shields are used in the working of beds with a thickness of 3.6–11 m and an angle of dip of more than 55°. The bed in an excavation area is worked in strips along the dip.

When drilling and blasting is used, a mineral is excavated in two stages. In the first stage, blastholes are drilled and explosives are detonated first in the gallery and then in the pillars that support the shield. In the second stage, the loosened mineral is thrown into the mining excavations driven under the sections and is conveyed to the haulage level, and the shield is advanced 0.8–1.2 m. The cycle of operations is then repeated.

Shield mining is most widely used in the steeply dipping coal seams of the Kuznetsk Coal Basin.

REFERENCE
Shchitovaia sistema razrabotki. Novosibirsk, 1972.

A. P. KILIACHKOV [29–1609–2]

SHIFRIN, NISSON ABRAMOVICH. Born June 16 (28), 1892, in Kiev; died Apr. 3, 1961, in Moscow. Soviet stage designer. People's Artist of the RSFSR (1958). Member of the CPSU from 1942.

Shifrin studied in Kiev, at A. A. Murashko's school of drawing and painting (1912–15), A. A. Ekster's studio (1918–19), and the Ukrainian Academy of Arts (1920–21). He taught in several schools in Moscow, including the Vkhutein (1929–30), the Polygraphic Institute (1931–32), and the A. V. Lunacharskii Institute of Theatrical Arts (1934–36). He became a member of the Society of Easel Painters in 1925.

Shifrin was principal stage designer at the Central Theater of the Soviet Army from 1935 to 1961. Several of his most important designs were for productions of the Moscow Art Theater, including Lavrenev's *The Break* (1950) and Chekhov's *The Seagull* (1960), and of the Malyi Theater, notably Sofronov's *The Moscow Character* (1948). At the Central Theater of the Soviet Army he executed designs for Korneichuk's *The Destruction of the Squadron* (1934), Shakespeare's *The Taming of the Shrew* (1937),

a dramatization of Sholokhov's *Virgin Soil Upturned* (1957), and Salynskii's *The Drummer Girl* (1958).

Shifrin suited his designs to the stage director's conception of each production. He carefully thought out the use of space and integrated painted scenery, including backdrops and borders, into the stage action. He also worked as a painter and illustrated several books, including V. V. Mayakovsky's *Whom Should One Be?* (1929).

Shifrin was awarded the State Prize of the USSR in 1949 and 1951.

WORKS

Khudozhnik v teatre. Leningrad, 1964.

Moia rabota v teatre. [Moscow, 1966.]

REFERENCE

Vystavka proizvedenii narodnogo khudozhnika RSFSR, laureata Gosudarstvennykh premii Nissona Abramovicha Shifrina. 1892–1961. [Catalog.] Introduction article by M. N. Pozharskaia. Moscow, 1962. [29–1241–3]

SHIGAEV, MAKSIM GRIGOR'EVICH. Born 1726; died Jan. 10 (21), 1775, in Moscow. Iaik Cossack. Comrade-in-arms of E. I. Pugachev. One of the leaders of the Iaik Cossack uprising of 1772.

During the Peasant War (1773–75) led by E. I. Pugachev, Shigaev was Pugachev's closest aide, a member of the "war college," and a judge and commander of troops during the siege of Orenburg. On Apr. 7, 1774, he was taken prisoner at Iletskii Gorodok. Shigaev was sentenced to death on Dec. 31, 1774, and was executed together with Pugachev and the other leaders of the uprising.

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Limonov, Iu. A., V. V. Mavrodin, and V. M. Paneiakh. *Pugachev i ego spodvizhniki*. Moscow-Leningrad, 1965. [29–1176–1]

SHIGATSE (also Jihk'atse), a city in China, in the Tibetan Autonomous Region. Situated in the valley of the Tsangpo (Brahmaputra) River, at an elevation of more than 3,800 m. Population, approximately 20,000. Shigatse, a highway junction, is the center of a farming region. The city's cottage industries produce pottery and textiles. [29–1176–2]

SHIGELLA, a genus of microorganisms of the family Enterobacteriaceae. It comprises different species of the causative agent of dysentery in monkeys and humans. They are gram-negative, nonmotile, nonspore-forming rods measuring 2–3 micrometers long and 0.6 micrometer wide. Aerobes and facultative anaerobes are distinguished. Shigellae form delicate semitransparent colonies on agar. They are subdivided into different types according to the colicins they secrete. [29–1176–3]

SHIGIR' CULTURE, an archaeological culture of the Mesolithic and early Neolithic periods (fifth and fourth millennia B.C.) widespread in the Central Urals and the Trans-Ural Region; named after the finds from the Shigir' peat bog. Typical implements included bone arrowheads, harpoons, and spears of various shapes and daggers with flint blades. Wooden anthropomorphic figurines—idols—were also found. The chief occupations of the tribes of the Shigir' culture were fishing and hunting. The similarity between the remains of the Shigir' culture and the ancient remains of Estonia (*see* KUNDA) enabled A. Ia. Briusov to hypothesize that the Baltic Region was settled by people from the Urals Region.

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SHIGIR' PEAT BOG, a peat bog near the city of Nev'iansk, Sverdlovsk Oblast, RSFSR, with the remains of settlements of the fourth to second millennia B.C. Excavations conducted by P. A. Dmitriev, A. Ia. Briusov, and V. M. Raushenbakh unearthed strata of the developed Neolithic period and the Bronze Age (middle of the third millennium B.C. to the end of the second millennium B.C.; Gorbunovo archaeological culture), as well as Mesolithic and early Neolithic strata. (*See* GORBUNOVO PEAT BOG and SHIGIR' CULTURE.) [29–1176–6]

SHIH, a Chinese verse form. The word *shih* originally denoted poetry in general and later referred only to written poetry. It was associated with a specific poetic genre in the Middle Ages. The classical *shih* consists of five or seven monosyllabic words with a strictly prescribed pattern of musical tones of different pitch, as well as a complex melodic pattern. The rhyme is parallel and consistent throughout the poem. Lines are usually rhymed on the "even" tone, which is more melodious.

A variant of the classical *shih*, the *chüeh-chü* ("stop-short"), is a quatrain with one verse, the penultimate, unrhymed. The appearance of dynamic stress and polysyllabic words in Chinese made the classical *shih* archaic. Chinese free verse, which appeared in the 20th century, is also called *shih*. Song has had a great influence on the modern *shih*.

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SHIHAB, a family and dynasty of emirs in Lebanon. The Shihabs, who traced their lineage to the Quraysh tribe of the Hejaz, became the feudal rulers of the region of Anti-Lebanon in the 12th century; from 1697 to 1840 they were the ruling dynasty in the mountainous part of Lebanon. The best known were Bashir I Shihab (ruled 1697–1707), Haidar Shihab (1707–32) and Bashir II Shihab (ruled 1788–1840 or 1789–1840).

Other Lebanese public and state figures from the Shihab family include the historian Haidar Shihab (1760–1835) and General Fuad Shihab (Fouad Chehab), the president of the Lebanese Republic from 1958 to 1964. [29–1242–4]

SHIHCHAISHAN, a burial ground of the Bronze and early Iron ages (fourth century B.C. to first century A.D.), near the village of the same name in Chinning Districts, Yünnan Province, China. Shihchaishan was excavated between 1955 and 1960. The burial inventory included unique articles made of bronze, such as weapons, drums with sculptured images of people and animals, models of dwellings, and implements, as well as Chinese coins and bronze mirrors and seals. Shihchaishan probably belonged to tribes that were known in Chinese written sources under the name of Tien, the ancestors of the contemporary Itsu.

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Its, R. F. *Etnicheskaia istòriia iuga Vostochnoi Azii*. Leningrad, 1972. [29–1243–4]

SHIHCHIACHUANG, a city in North China and the capital of Hopeh Province. Population, 1.5 million (1970). Shihchiachuang is a railroad junction and a center of heavy industry—ferrous metallurgy and machine building. The machine-building industry, which includes railroad repair shops, produces engines, mining and power-engineering equipment, steam locomotives, and railroad cars. The city has an electronics industry, and the textile industry is represented by six large cotton mills. Shihchiachuang has glass and cement plants, and the Hopeh Pharmaceuticals Plant is the largest such enterprise in the People's Republic of China. Near the city coal is mined in the Chinghsing coalfield, and iron ore at the Chienp'ing deposit. [29–1243–3]

SHIH CHING ("Book of Odes," "Classic of Poetry"), an anonymous work of Chinese literature written between the 11th and sixth centuries B.C. The *Shih Ching* contains 305 songs, which tradition claims were selected by Confucius. It was burned along with other Confucian books in 213 B.C. and was restored to approximate its original form in the second century B.C. The work is included on the list "Mao-shih"; it received the name *Shih Ching* in the 12th century. The *Shih Ching* consists of four sections: "Kuo feng" (The Morals of Kingdoms), "Hsiao ya" (Little

Odes), "Ta ya" (Big Odes), and "Sung" (Hymns), each of which is actually a separate book with its own themes, emotions, and means of artistic expression, including musical accompaniment.

The songs of "Kuo feng," which has the greatest literary value of the four sections, focus on man and his relation to nature and his surroundings and the emotional and intellectual world of the farmer, livestock breeder, and hunter. Themes of social protest occur more often in the songs of "Kuo feng" than in the other sections. The lyrical works of the section "Hsiao ya" were written mainly by court poets for various celebrations and extol the virtues and military feats of the rulers. The odes of "Ta ya" are considered models of court poetry. The section "Sung" comprises festive and laudatory songs and religious hymns.

The *Shih Ching*, reflecting the varied phenomena of China's spiritual and social life, is an encyclopedia of Chinese antiquity.

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N. T. FEDORENKO [29–1243–2]

SHIH NAI-AN (also Shih Tzu-an). Born 1296 in Tungtu (present-day Yangchou); died 1370 in Hsinghua, Yangchou District. Chinese writer.

Information about Shih Nai-an is scarce and mostly based on legend. It is known that he was the author of a heroic epic based on folk legends and dramas, *The River Backwaters* (*Shui-hu chuan*), which extolled the peasant uprising led by Sung Chiang in the 12th century. The novel was most widely circulated in a 17th-century version by Chin Sheng-t'an, which was translated into Russian and other European languages. The heroes of Chin Sheng-t'an's version break with society and establish a band of freebooters, a kingdom of equality and brotherhood. Versions consisting of 100 and 120 chapters are apparently closer to the original. Many episodes and scenes, written in a lively, colloquial language, were among the favorite themes of street storytellers. The composition and artistic style reproduce with great precision the techniques of oral folk storytelling.

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Chukoku-no hachi dai shosetsu. Tokyo, 1965. [29–1204–7]

SHIHSANLING (literally, "13 imperial graves"), a necropolis of emperors of the Ming dynasty (15th to 17th centuries), located near Peking. Each of the 13 tombs comprises an underground mausoleum and a surface temple complex. These outstanding examples of palace and temple architecture were partially destroyed after Peking was captured by Manchu troops in 1644, but they were restored and rebuilt in the mid-18th century. In 1956 excavations were undertaken in the Tingling mausoleum (underground palace), the burial site of Emperor Shen-Tsung (1573–1620), which is now a museum.

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[29–1239–4]

SHIH SHEN. A Chinese astronomer of the fourth century B.C. Shih Shen was one of the compilers of the oldest surviving star catalog. The catalog provided data on more than 800 stars.
[29–1252–2]

SHIH TA-K'AI. Born 1830; died June 25, 1863. One of the principal leaders of the Taiping rebellion in China.

The son of a prosperous peasant, Shih commanded the advance forces of the Taipings during their march on Nanking in 1853. He headed the Taiping government from November 1856 to October 1857, when he split from the Taiping movement and began operating on his own in the southwestern provinces. During a march into Szechwan, Shih's forces were routed by government troops in June 1863, and Shih was executed. [29–1177–1]

SHIIAN, ANATOLII IVANOVICH. Born Mar. 23 (Apr. 5), 1906, in the village of Borisovka, in what is now Belgorod Oblast. Soviet Ukrainian writer. Member of the CPSU since 1947.

Shiian graduated from the Kiev Institute of Timber Technology in 1929. He was a member of General A. N. Saburov's partisan unit during the Great Patriotic War of 1941–45. Shiian wrote the novella *Slops* (1930) and the novel *Main Line* (1934). He is also the author of the book of sketches *Partisan Country* (1946) and collections of plays, novellas, and short stories. His most important work, the novel *The Thunderstorm* (1936), deals with the life of a prerevolutionary village and the people's struggle for Soviet power; the film *Thunderstorm Over the Fields* (1959) was based on the novel. Shiian has been awarded three orders and various medals.

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SHIISM, one of the two main branches of Islam, the other being Sunnism.

In the seventh century the Shiites emerged in the Arabian Caliphate as a faction that supported the claim of Ali and the descendants of Ali and Fatima, the daughter of Muhammad, to the imamate and rule over the caliphate. Although the Shiites were defeated in the struggle for supreme political power, Shiism developed into a distinct branch of Islam by the mid-eighth century. The main dogmas of Shiism, as opposed to Sunnism, were the recognition of the sole right of Ali and his descendants—the Alids—to spiritual and secular leadership over the Muslim world, in other words, to the imamate. The Shiites denied the legitimacy of the first caliphs—Abu Bakr, Omar I (Omar ibn al-Khattab), Othman ibn Affan, and the Umayyad and Abbasid caliphs—and believed that the caliph, as the prophet's representative, should not be elected by the people.

As a result of disputes over the number of Imams, Shiism split into several subdivisions between the seventh and ninth centuries: the Kaisanis, the Zaidis, the Ismailians, and the Imamis, also known as the Twelver, or Ithna Ashariyah, Shiites. The Kaisani sect disappeared in the 11th century; the Zaidi sect is the most moderate. The Imamis, one of the leading sects, recognize twelve Imams, the last of whom—Muhammad al-Mahdi al-Hujjah—is believed to have vanished without a trace in infancy. Known as the hidden Imam, Muhammad is considered to be the messiah, or Mahdi, who will return to earth and establish the rule of the just. In the meantime, he guides Shiite Muslims in all aspects of their lives through the higher clergy, or *mujtahid*, whose authority derives from a mystical communion with the hidden Imam.

The doctrine of the Imamis, in combination with Sufism, provided the ideology for several popular movements in Iran and Middle Asia during the Middle Ages, notably the Serbadar rebellion and the Sayyid movement. The Ismailis broke from the Imamis in the mid-eighth century. A fertile ground for the growth of Shiism was Iran, where it was considerably influenced by Zoroastrianism and Nestorianism.

In many respects, Shiism resembles Sunnism. Shiites recognize an altered version of *sunna*, in which only those traditions of the Hadith that emanate from Ali's supporters are accepted; they also recognize the Koran, although they consider the official Sunni text flawed. At the same time, the Shiites have their own sacred tradition, distinct from that of the Sunnis. The cult of the holy martyrs plays a greater role in Shiism than in Sunnism. The Shiites have accepted the Mutazilite doctrine denying predestina-

tion and affirming man's free will. With the exception of the Zaidis and Kaisanis, who never accepted the doctrine, they recognize the infallibility of the Imams. In contrast to the Sunnites, the Shiites make pilgrimages not only to Mecca and Medina, but to the burial places of the Imams and their relatives: Karbala, al-Kazimiyah, Meshed, and Qom.

Shiism is practiced in various forms by most of the population of Iran and the Yemen Arab Republic and in India, Pakistan, Syria, southern Iraq, and some areas of the USSR, mainly in Azerbaijan.

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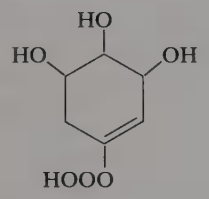
I. P. PETRUSHEVSKII [29–1182–1]

SHIKARPUR, a city in Pakistan, in Sind Province, near the Indus River. Population, 62,500 (1969). Shikarpur has a railroad station. Industry is represented by cotton-ginning, rice-processing, and flour milling enterprises. Handicrafts include the production of silk and cotton fabrics, carpets, pottery, and indigo dyes.
[29–1183–2]

SHIKIMIC ACID, the most important intermediate product of metabolism in microorganisms and higher plants; colorless crystals, with a melting point of 184°C and good solubility in water.



The biochemical role of shikimic acid was elucidated in 1955–58 by the American microbiologist B. Davis while working with mutants of *Bacillus coli*. The formation of the acid is related to carbohydrate metabolism; its closest precursor is 7-phosphate-3-deoxyarabinoheptulose. Shikimic acid takes part in the biosynthesis of aromatic acids, including the amino acids phenylalanine, tyrosine, and tryptophan; phenol compounds, including phenol alkaloids; coumarins; lignin; and flavonoid pigments and other secondary metabolites.

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[29–1183–3]

SHIKIN, IOSIF VASIL'EVICH. Born Aug. 26 (Sept. 8), 1906, in the village of Lychevo, in what is now Gavrilov Posad Raion, Ivanovo Oblast; died July 30, 1973, in Moscow. Soviet military and party figure. Colonel general (1945). Member of the CPSU from 1927.

The son of a peasant, Shikin became a worker. He graduated from the N. K. Krupskaia Communist Higher Educational Institution in 1931 and became the secretary of a raion committee of the party. He entered the Red Army in 1939 and graduated from courses for senior political personnel that same year. Shikin was appointed head of the political department of the Military Electrotechnological Academy in November 1939 and deputy chief of the Directorate of Political Propaganda of the Leningrad Military District in August 1940.

During the Great Patriotic War of 1941–45, Shikin was a member of the Military Council of the Northern Front and chief of the political directorates of the Leningrad and Volkhov fronts. He became deputy chief of the Main Political Directorate of the Red Army in July 1942 and was made a member of the Military Council of the High Command of the Soviet Forces in the Far East in August 1945. Shikin served as chief of the Main Political Directorate of the Armed Forces of the USSR from 1946 to 1949 and head of the V. I. Lenin Military Political Academy in 1949 and 1950.

Shikin took a position in the apparatus of the Central Committee of the CPSU in March 1950. He was the Soviet ambassador to Albania in 1961 and 1962. In late 1962 he was appointed first deputy chairman of the Committee of Party and State Control of the Central Committee of the CPSU and of the Council of Ministers of the USSR. Later he became first deputy chairman of the Committee of the People's Control of the USSR.

Shikin was chosen a member of the Central Auditing Commission of the CPSU in 1956. He was a deputy to the second convocation of the Supreme Soviet of the USSR. Shikin was awarded two Orders of Lenin, the Order of the October Revolution, two Orders of the Red Banner, the Order of Suvorov First Class, the Order of the Red Banner of Labor, the Order of the Red Star, and various medals.
[29–1183–4]

SHIKOTAN (also Sikotan), the largest island in the Lesser Chain of the Kuril Islands of the USSR. Shikotan, which has a rugged coast, covers an area of 182 sq km and rises to an elevation of 412 m. Shikotan is composed of volcanic rocks and sandstones of the Upper Cretaceous and Cenozoic. Groves of Sakhalin fir (*Abies sachalinensis*), Kuril larch, and deciduous trees and low-growing bamboo are found on the slopes, and dwarf junipers grow on the crests. Oceanic meadows are found on the coastal terraces. The populated points Malokuril'skoe and Krabozavodskoe are located on the island. Economic activities include fishing and hunting of sea animals.
[29–1184–1]

SHIL'DA, an urban-type settlement in Adamovka Raion, Orenburg Oblast, RSFSR. Shil'da is a railroad junction for lines to Orsk, Cheliabinsk, and Ozernyi.
[29–1196–1]

SHIL'DER, KARL ANDREEVICH. Born Dec. 27, 1785 (Jan. 7, 1786), in the village of Simanovo, in what is now Nevel' Raion, Pskov Oblast; died June 11 (23), 1854, in Călăraşi, Rumania. Russian military engineer. General of the engineers (1852); adjutant general.

Shil'der graduated from a school for column leaders in 1806 and served in the engineer troops as commander of a sapper company and a battalion and as chief of engineers of a corps and of an army. He fought in the battle of Austerlitz (1805), the defense of Bobruisk (1812), the Russo-Turkish War of 1828–29, and the Crimean War of 1853–56. He distinguished himself in action during the siege of Varna in 1828, the sieges of Silistra and Şumla in 1829, and the forcing of the Danube in 1854. Shil'der died of wounds received at Silistra during the Crimean War of 1853–56.

Shil'der developed a new and more effective system of countermining, using horizontal and inclined passages rather than vertical shafts. He also devised antipersonnel mines, stone fougasses, and canister mines. He produced an original design for a suspended rope bridge in 1828 and a "wineskin bridge" of quickly assembled, portable pontoons made of rubberized canvas in 1836. Between 1832 and 1836, Shil'der and P. L. Shilling developed a method of setting off powder charges electrically. Between 1838 and 1848, Shil'der and B. S. Iakobi built electrochemical and electrochemical-contact naval mines. Shil'der provided the designs for the world's first all-metal submarine, built in 1834, and the *Otvazhnost'*, built in 1846; the world's first steamship armed with artillery and rockets, the *Otvazhnost'* was a prototype of the destroyer. Among Shil'der's students were the talented engineers E. I. Totleben and M. M. Boreskov.

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[29–1196–2]

SHIL'DER, NIKOLAI GUSTAVOVICH. Born 1828; died Mar. 13 (25), 1898, in St. Petersburg. Russian genre painter.

In the 1850's, Shil'der studied under B. P. Villeval'de at the St. Petersburg Academy of Arts, where he became an academician in 1861. Influenced by P. A. Fedotov, he devoted his creative work to the "little man." Shil'der depicted scenes in a straightforward manner rather lacking in subtlety, for example, *The Temptation* (1856 or 1857, Tret'iakov Gallery, Moscow) and *Forced Marriage* (Russian Museum, Leningrad).

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SHIL'DER, NIKOLAI KARLOVICH. Born May 21 (June 2), 1842, in St. Petersburg; died there Apr. 6 (19), 1902. Russian historian. Lieutenant general (1893). Corresponding member of the St. Petersburg Academy of Sciences (1900). Son of K. A. Shil'der.

N. K. Shil'der graduated from the Corps of Pages and the Nikolai Engineering Academy. He took part in the Russo-Turkish War of 1877–78. Shil'der became head of the Nikolai Engineering Academy in 1886 and director of the Public Library in 1899. He was the first to publish a significant number of documents dealing with the political, military, and diplomatic history of Russia. His historical works are rich in factual content. Shil'der defended the view of the monarchy held by the *dvorianstvo* (nobility or gentry).

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SHILEIKA, IONAS VINTSO (Jonas Vincas Šileika). Born June 20 (July 2), 1883, in the village of Jadagonej, in what is now Kaunas Raion, Lithuanian SSR; died Oct. 27, 1960, in Kaunas. Soviet painter. People's Artist of the Lithuanian SSR (1958).

Shileika attended the Catholic University of Valparaiso in Chile (1905–06), the Institute of Art in Chicago (1906–10), and the art school of G. Gröber and the Academy of Arts in Munich (1911–13). He worked in the USA from 1915 until 1921 when he returned to Lithuania. He taught at the Kaunas Institute of Applied and Decorative Art from 1944 to 1951 and at other educational institutions. He was known for his generalized, often symbolic landscapes with appealing color schemes, for example, *The Nemanus River at Bruze* (1914, M. K. Čiurlionis Art Museum, Kaunas). He also painted expressive, highly individualized portraits, mostly of Lithuanian cultural figures, such as J. Naialis (1924, M. K. Čiurlionis Art Museum) and Z. Petravičius (1950, Art Museum of the Lithuanian SSR, Vilnius).

REFERENCE

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SHILEIKO, VOL'DEMAR KAZIMIROVICH. Born Feb. 2 (14), 1891, in St. Petersburg; died Oct. 5, 1930, in Leningrad. Soviet Assyriologist and poet.

Shileiko was a professor at Leningrad State University from 1922 to 1930. He acquainted scholars with many Sumerian, Assyro-Babylonian, Hittite, and other written works from Soviet collections. He also prepared verse translations of several Babylonian works for publication in *Vostok* (1922, books 1, 4).

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SHILIN, AFANASII PETROVICH. Born Sept. 1, 1924, in the village of Petropavlovka, in present-day Novouzensk Raion, Saratov Oblast. Twice Hero of the Soviet Union (Feb. 22, 1944, and Mar. 24, 1945). Lieutenant general (1975). Member of the CPSU from 1944.

Shilin was born into a worker family. He entered the Red Army in 1942 and graduated from the Second Tomsk Artillery School in 1943, the Higher Artillery School for Officers in 1946, the F. E. Dzerzhinskii Artillery Academy in 1952, and the Military Academy of the General Staff in 1966. During the Great Patriotic War (1941–45), Shilin served from 1943 on the Southwestern, Third Ukrainian, and First Byelorussian fronts. He commanded a platoon and was chief of reconnaissance for an artillery battalion in the 132nd Guards Artillery Regiment. He took part in the fighting for the Dnieper and the liberation of the Ukraine, Moldavia, and Poland. After the war, Shilin held important command positions.

Shilin has been awarded the Order of Lenin, the Order of the Red Banner, the Order of the Red Banner of Labor, the Order of the Patriotic War Second Class, and various medals. A bust of Shilin has been erected in the city of Leninsk-Kuznetskii in Kemerovo Oblast. [29–1185–1]

SHILKA, a city (since 1951) and the administrative center of Shilka Raion, Chita Oblast, RSFSR. Shilka is situated in the Shilka River valley, 248 km east of Chita. The city has a station on the Trans-Siberian Railroad. In prerevolutionary Russia, Shilka was a place of political exile, and members of the Petrashevskii circle served sentences of hard labor in the local mines between 1850 and 1856. The city has a butter factory, a confectionary factory, and enterprises serving railroad transportation. [29–1185–5]

SHILKA, a river in Chita Oblast, RSFSR; the left headstream of the Amur. The Shilka is 560 km long and drains an area of 206,000 sq km. It is formed by the confluence of the Onon and Ingoda rivers and flows through a deep valley between the Shilka and Amazar ranges on the north and the Borshchovochnyi Range on the south. It has a rapid current. In places the river divides into separate channels or forms river bars.

The Shilka is fed chiefly by rain. Highwater occurs in July and August, and freshets are common. The mean flow rate 149 km from the river's mouth is 521 cu m per sec. The maximum flow rate on record is 11,400 cu m per sec (July 1958), and the minimum, 0.81 cu m per sec (March 1969). The river freezes over in late October or early November; parts of the upper course freeze completely in some winters. The ice breaks up in late April or the first half of May. The Shilka is navigable. The city of Sretensk is situated on the river. [29–1185–4]

SHILKA, a mountain range in eastern Transbaikalia, in Chita Oblast, RSFSR. Located along the left bank of the Shilka River, the range is approximately 200 km long and reaches an elevation of 1,063 m. It is composed of granites, schists, and sandstones. The range is deeply dissected by the valleys of tributaries of the Shilka River. Larch taiga is found on the slopes. [29–1185–6]

SHILLER, NIKOLAI NIKOLAEVICH. Born Mar. 1 (13), 1848, in Moscow; died Nov. 10 (23), 1910, in St. Petersburg. Russian physicist.

After graduating from Moscow University in 1868, Shiller continued to work there. In 1871 he was sent to Berlin, where he worked under the direction of H. von Helmholtz on the measurement of the dielectric constants ϵ of various substances by a method that he proposed in order to verify Maxwell's relation $\epsilon = n^2$, where n is the refractive index of the medium. In 1876 he became a professor at the University of Kiev. Beginning in 1903, he was director of the Kharkov Technological Institute.

In 1876, Shiller experimentally proved that an electric current always follows a closed path. In 1900 he formulated, as a corollary to the second law of thermodynamics, a principle stating that it is impossible to attain a continuously decreasing or increasing temperature with a closed adiabatic process (a similar formulation was proposed by the German scientist C. Carathéodory in 1909).

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Kosonogov I. "Nikolai Nikolaevich Shiller." *Zhurnal Russkogo Fiziko-khimicheskogo obshchestva: Fizicheskii otdel*, 1911, vol. 43, issue 9. (Contains references.) [29–1190–2]

SHILLING, PAVEL L'VOVICH. Born Apr. 5 (16), 1786, in Tallinn; died July 25 (Aug. 6), 1837, in St. Petersburg. Russian scientist, electrical engineer, and Orientalist.

After graduating from the First Cadet Corps in 1802, Shilling served on the Russian general staff. Between 1806 and 1812, he served on the staff of the Russian embassy in Munich. He distinguished himself in battle in the Patriotic War of 1812. After the war, Shilling served in the Ministry of Foreign Affairs, where he established the first state lithographic shop in Russia. In 1829 he developed a unique lithographic method for reproducing Chinese texts.

While serving as an official in the Department of Eastern Affairs, Shilling studied the languages and history of various Asian peoples. In 1828 he became a corresponding member of the Imperial Academy of Sciences in the area of Oriental literature and antiquities. Between 1830 and 1832, he took part in a scientific expedition to Eastern Siberia and compiled a valuable collection of Tibetan and Mongolian literary monuments.

In 1812, Shilling took up the study of electrical engineering and designed a mine with an electric fuze. In the same year, the first experimental detonation of the mine was carried out in the Neva River in St. Petersburg. Mines designed by Shilling were used in special subunits of the Russian Army.

Shilling's best known work was concerned with electric telegraphy. In 1832, Shilling invented a key-actuated telegraph, which he used to develop an electromagnetic telegraph system. In his electromagnetic system, a special six-unit code, which he also developed, was used to transmit electric signals over an eight-wire line. Later, in 1835 and 1836, Shilling constructed a system that used a single-needle telegraph and a two-wire line; he also developed an original binary code. In 1835, he demonstrated his telegraphic inventions in Bonn at a congress of the German Society of Naturalists and Physicians. In 1836, in accordance with a commission from the Russian government, Shilling laid an underground telegraph line between rooms located at opposite ends of the Admiralty in St. Petersburg.

While he worked on electric mines and telegraphs, Shilling also developed special insulated electrical cables. In 1837 he drew up a design for a submarine electromagnetic telegraph line between Petergof and Kronstadt. However, his sudden death prevented the implementation of his plans.

WORKS
"Opisanie elektromagnitnogo telegrafa P. L. Shillinga." *Voprosy istorii estestvoznaniia i tekhniki*, 1956, issue 1.
REFERENCE
Iarotskii, A. V. *Pavel L'vovich Shilling*. Moscow, 1963.
V. M. RODIONOV [29–1191–2]

SHILLING. (1) A British coin and monetary unit in use until the decimal monetary system was introduced in February 1971; equal to 12 pence, or 1/20 pound sterling. Shillings were minted in silver until 1946 and in a copper-nickel alloy until 1971. They circulated in British colonies and in the countries of the Commonwealth, including Australia, New Zealand, and Ireland, where they constituted 1/20 of the local monetary unit.

(2) The monetary unit of Kenya, Tanzania, and Uganda since 1966 and of Somalia since 1960; equal to 100 cents. According to the rate of exchange set by the State Bank of the USSR in January 1978, 100 Somalian shillings = 11.37 rubles. [29–1192–1]

SHILLINGOVSKII, PAVEL ALEKSANDROVICH. Born Feb. 16 (28), 1881, in Kishinev; died Apr. 5, 1942, in Leningrad. Soviet graphic artist.

Shillingovskii studied at the Odessa Art School from 1895 to 1900 under K. K. Kostandi, G. A. Ladyzhenskii, and A. A. Popov and at the St. Petersburg Academy of Arts from 1901 to 1914 under D. N. Kardovskii and V. V. Mate. He taught at the Academy of Arts in Leningrad from 1921 to 1929 and from 1935 to 1937.

Shillingovskii's etchings and woodcuts, mainly landscapes and portraits, are distinguished for their clarity of line and austerity. They reveal the artist's debt to the heritage of classical engraving. Shillingovskii also worked as a painter and lithographer. His works include the series "Bessarabia" (etching, 1913), "St. Petersburg: Ruins and Resurrection" (woodcut, 1922–23), and "Besieged City" (woodcut, 1941–42), as well as woodcut portraits of T. Zal'kaln (1918), V. I. Lenin (1924), and K. Marx (1933). He also executed illustrations for Homer's *Odyssey* (published 1935).

REFERENCE
P. A. Shillingovskii. [Kazan, 1926.] ("Russian Engravers".)
[29–1192–3]

SHILLING TELEGRAPH, an electromagnetic telegraph that was invented by P. L. Shilling in 1832. In the Shilling telegraph, current pulses—that is, telegraph code units—were formed by opening and closing a battery circuit by means of contact keys. Either an equal-length code or an unequal-length code was used for transmission; both types of code were developed by Shilling. The receiver was a type of moving-magnet magnetometer called a multiplier, that is, a device that contained a magnetized needle and a signal disk, both of which were suspended from a wire near a solenoid. Telegraph signals were indicated by the orientation of the needle in the solenoid field. [29–1192–2]

SHIL'NIKOVSKII, EVSTAFII PAVLOVICH. Born Feb. 14 (26), 1890, in the village of Kuznetsovo, in what is now Vologda Oblast. Soviet artist. Honored Art Worker of the RSFSR (1956).

Shil'nikovskii studied at the St. Petersburg Academy of Arts from 1913 to 1917 under V. V. Mate. He was a leading craftsman of Velikii Ustiug niello work in silver. From 1935 to 1962 he was artistic director of the Severnaia Chern' Artel (later reorganized as a factory) in Velikii Ustiug. His works include spoons with designs on themes from works by A. Pushkin (1937), a service on themes from P. P. Ershov's fairy tale "The Little Humpbacked Horse" (1947), and the box and cup "Moscow" (1956). Articles from these sets, all in niello, are housed in the Russian Museum in Leningrad, the Historical Museum and the Museum of Folk Art of the USSR in Moscow, and other museums of the USSR.

REFERENCE
Razina, T. M. *E. P. Shil'nikovskii—khudozhnik "Severnoi cherni."* Moscow, 1959.
[29–1197–3]

SHILO, NIKOLAI ALEKSEEVICH. Born Mar. 25 (Apr. 7), 1913, in Piatigorsk. Soviet geologist. Academician of the Academy of Sciences of the USSR (1970; corresponding member, 1964). Hero of Socialist Labor (1973). Member of the CPSU from 1941.

After graduating from the Leningrad Institute of Mines in 1937, Shilo worked for various geological institutions in the northeastern part of the USSR. In 1960 he became director of the Northeastern Integrated Scientific Research Institute of the Far East Scientific Center of the Academy of Sciences of the USSR, located in Magadan. He has been chairman of the presidium of the Far East Scientific Center since 1977.

Shilo's main works deal with the study of the geology and geochemistry of mineral deposits, including gold, silver, tin, mercury, tungsten, platinum, and copper. Shilo developed a genetic classification of gold deposits and identified periglacial lithogenesis, revealing the mechanism of rock formation in periglacial zones.

Shilo has been awarded two Orders of Lenin, three other orders, and medals.

WORKS
"Klassifikatsiia rossypei Iano-Kolymskogo zolotonosnogo poiasa." In *Geokhimiia, petrografiia i mineralogiia osadochnykh obrazovanii*. Moscow, 1963.
"Glavneishie cherty zolotogo i zoloto-serebrianogo orudeneniia vostochnoaziatskikh vulkanogennykh poiasov." In *Problemy metallogenii Sovetskogo Dal'nego Vostoka*. Moscow, 1967.

REFERENCE
"N. A. Shilo." *Novye dannye po geologii Severo-Vostoka SSSR: K 60-letiiu akademika Nikolaia Alekseevicha Shilo*. Magadan, 1973. [29–1193–5]

SHILOV, DMITRII SAMOILOVICH. Born Feb. 3 (15), 1893, in the settlement of Zubarevo, in what is now Shilka Raion, Chita Oblast; died Nov. 20, 1952, in Moscow. One of the leaders of the struggle for Soviet power in Siberia and the Far East. Member of the CPSU from March 1917.

The son of a peasant, Shilov joined the revolutionary movement in Transbaikalia in 1910. In 1915 he graduated from the Irkutsk Military School and was sent to the front with the rank of ensign. After the February Revolution of 1917, he served as chairman of regimental and brigade committees and was a member of the Soviet of the Caucasian Front. In 1918 he took part in the struggle for Soviet power in Chita, served as a member of the Central Executive Committee of Siberian Soviets, and helped organize the partisan movement. Between 1920 and 1922 he commanded the Eastern Transbaikalia and Amur fronts and served as chairman of the Constituent Assembly and deputy chairman of the Council of Ministers of the Far Eastern Republic. Beginning in 1923, Shilov held a series of positions in Moscow in the apparatus of the People's Commissariat of the Workers' and Peasants' Inspectorate of the RSFSR and in various cultural institutions. In 1938 he became a personal pensioner.

Shilov was awarded the Order of the Red Banner.

REFERENCE
Gody i liudi. [Chita] 1960. [29–1194–1]

SHILOV, EVGENII ALEKSEEVICH. Born July 29 (Aug. 10), 1893, in Serpukhov; died July 22, 1970, in Kiev. Soviet organic chemist. Academician of the Academy of Sciences of the Ukrainian SSR (1951; corresponding member, 1945). Member of the CPSU from 1943.

Shilov graduated from Moscow University in 1917. From 1919 to 1947 he worked at the Polytechnical Institute (now the Institute of Chemical Technology) in Ivanovo, where he became a professor in 1936. From 1947 to 1970, he worked at the Institute of Organic Chemistry of the Academy of Sciences of the Ukrainian SSR in Kiev.

Shilov's main works are devoted to the study of the mechanism of organic heterolytic reactions, such as halogenation. Shilov is one of the founders of the principle according to which the intermediate stage of a heterolytic reaction is the formation of a trimolecular activated complex, in many cases, a six-membered cyclic complex.

Shilov was awarded the Order of Lenin, two other orders, and several medals.

WORKS
"Kinetika i mekhanizm enolizatsii atsetona v prisutstvii aminokislot." *Doklady AN SSSR*, 1952, vol. 84, no. 2, pp. 297–300. (With A. A. Iasnikov.) [29–1194–2]

SHILOV, NIKOLAI ALEKSANDROVICH. Born June 28 (July 10), 1872, in Moscow; died Aug. 17, 1930, in Gagra, Abkhazian ASSR. Soviet physical chemist.

Shilov graduated from Moscow University in 1895 and began working there in 1899. From 1901 to 1904 he worked at W. Ostwald's laboratory. He was a professor at the Moscow Higher Technical School (now the Bauman Moscow Higher Technical School) from 1910 and the Moscow Commercial Institute (now the Plekhanov Institute of the National Economy) from 1911.

Shilov laid down the foundations of the theory of induced reactions and the modern theory of gas sorption. He elucidated the role of oxygen in the adsorption of electrolytes by carbon. During World War I (1914–18), Shilov was one of the organizers of measures to protect the Russian Army from chemical weapons.

REFERENCE
Ushakova, N. N. *Nikolai Aleksandrovich Shilov*. Moscow, 1966. (Contains references.) [29–1194–3]

SHILOVO, an urban-type settlement and the administrative center of Shilovo Raion, Riazan' Oblast, RSFSR. Shilovo has a landing on the right bank of the Oka River and a railroad station on the Riazan'-Ruzaevka line, 110 km southeast of Riazan'. In addition to a poultry farm, the settlement has food-processing, milk, meat-packing, and industrial building-material combines. There is a people's amateur theater in Shilovo. [29–1195–1]

SHIMANOVSK, a city under oblast jurisdiction and the administrative center of Shimanovsk Raion, Amur Oblast, RSFSR. Shimanovsk is situated on the Bol'shaia Pera River, a right tributary of the Zeia, 251 km north of Blagoveshchensk. The city is served by a railroad station on the Trans-Siberian Railroad. It has construction and prefabricated-housing combines, a plant producing forge and press equipment, and a plant for the repair of road-construction machinery. Other industrial establishments include a ballast plant, a plant for the production of gravel made from *keramzit* (artificial porous filler), a brickyard, a butter factory, and enterprises serving railroad transportation. A complex of enterprises of the construction industry for the Baikal-Amur Main Line was under construction in 1978. [29–1198–4]

SHIMANSKII, IULIAN ALEKSANDROVICH. Born Dec. 5 (17), 1883, in Tashkent; died Apr. 11, 1962, in Leningrad. Soviet specialist in shipbuilding. Academician of the Academy of Sciences of the USSR (1953; corresponding member, 1933).

Shimanskii graduated from the Naval Engineering School in 1905 and the Naval Academy in St. Petersburg in 1910. After working at the Baltiiskii Plant from 1910 to 1912, he lectured at the Naval School in Kronstadt from 1912 to 1916 and at the Naval Academy from 1920 to 1934. He was named a professor in 1938 and was appointed head of the subdepartment of structural mechanics at the Leningrad Shipbuilding Institute in 1945. Beginning in 1925, Shimanskii was also a staff member of a scientific research institute of the shipbuilding industry.

Shimanskii's principal works dealt with the theory and practice of shipbuilding and with the development of underwater vehicles. Shimanskii received the State Prize of the USSR in 1941 and was awarded the Order of Lenin, three other orders, and various medals.

WORKS
Stroitel'naia mekhanika podvodnykh lodok. Leningrad, 1948.
Proektirovanie preryvistykh sviazei sudovogo korpusa. Leningrad, 1949.
Dinamicheskii raschet sudovykh konstruktsii, 3rd ed. Leningrad, 1963.
REFERENCES
Iu. A. Shimanskii. (*AN SSSR: Materialy k bibliografii uchenykh SSSR: Seriia tekhnicheskikh nauk: Mekhanika*, fasc. 8.) Moscow, 1958.
Zhizn', otdannaia sudostroeniiu. Leningrad, 1973. [29–1200–1]

SHIMKEVICH, VLADIMIR MIKHAILOVICH. Born July 28 (Aug. 9), 1858, in Karachevo, Orel Province; died Feb. 23, 1923, in Petrograd. Russian zoologist. Academician of the Russian Academy of Sciences (1920; corresponding member, 1906).

Shimkevich graduated from the University of Moscow in 1881. Beginning in 1889, he was a professor and chairman of the subdepartment of vertebrate zoology at the University of St. Petersburg; in 1921–22 he was the university's rector.

Shimkevich's principal works dealt with the morphology, embryology, and taxonomy of invertebrates. Shimkevich described the germ layers of arthropods, primarily the germ layers of arachnids; he demonstrated the trisegmental structure of Oligomera and Enteropneusta. A number of his works were devoted to the taxonomy and evolution of marine spiders (Pantopoda). Shimkevich advanced broad phylogenetic generalizations about the major paths of evolution in animals, in particular, about the origins of various groups of worms and chordates. He published theoretical articles on evolution, in which he defended and developed Darwin's theory of natural selection. Shimkevich helped popularize biological knowledge. He was an active organizer of science and higher schools and was also interested in problems related to teaching biology in secondary schools. He was the author of text-

books on general biology and comparative anatomy of vertebrates for universities and a textbook of zoology for secondary schools.

WORKS
Biologicheskie osnovy zoologii, 5th ed., vols. 1–2. Moscow-Petrograd-Leningrad, 1923–25.
Kurs sravnitel'noi anatomii pozvonochnykh zhivotnykh, 3rd ed. Moscow-Petrograd, 1922.
Mnogokolenchatye (Pantopoda), fascs. 1–2. Leningrad, 1929–30.
REFERENCES
Deriugin, K. M. "Biografiia i nauchnye trudy V. M. Shimkevicha." *Trudy Leningradskogo obshchestva estestvoispytatelei*, 1926, vol. 56, issue 2. (Contains references.)
Raikov, B. E. "Iz istorii zoologii v Leningradskom gosudarstvennom universitete." *Vestnik LGU: Ser. biologii*, 1953, issue 2, no. 4.
Fedotov, D. M. "Akademik V. M. Shimkevich: K stoletiiu so dnia rozhdeniia." *Ibid.*, 1958, issue 4, no. 21.
Fedotov, D. M. "Vydaiushchiisia russkii zoolog-darvinist." *Priroda*, 1958, no. 11.
Polianskii, Iu. I. "Vydaiushchiisia russkii morfolog-darvinist." *Arkhiv anatomii, gistologii, embriologii*, 1963, vol. 45, no. 12. (Contains references.) IU. I. POLIANSKII [29–1200–2]

SHIMKUS, IONAS (also Jonas Šimkus). Born Aug. 27, 1906, in Riga; died Oct. 28, 1965, in Vilnius. Soviet Lithuanian writer. Member of the CPSU from 1942.

Shimkus joined a group of anti-Fascist writers in the 1930's. In 1940 he became editor of the newspaper *Taribų Lietuvą* (Soviet Lithuania), and from 1954 to 1958 he edited the journal *Pergalė* (Victory). His poetry was first published in 1925. Shimkus was the author of the collections of poems *Behind the Door* (1927) and *Folk Tales of Cement* (1929). In his articles of literary criticism, he supported the principles of socialist realism. His collections *Stories* (1953) and *Tomorrow the Weather Will Be Good* (1962) depicted the life of the Soviet people. Shimkus was chairman of the Writers' Union of Lithuania from 1948 to 1954.

Shimkus was awarded four orders and various medals.

WORKS
Raštai, vols. 1–5. Vilnius, 1968–71.
In Russian translation:
Rasskazy. Vilnius, 1953.
Rasskazy. Moscow, 1959.
REFERENCE
Lietuviu literatūros istorija, vols. 3–4. Vilnius, 1965–68. [29–1201–2]

SHIMKUS, VLADAS (also Vladas Šimkus). Born Oct. 15, 1936, in the village of Jučiai, Kelmė Raion. Soviet Lithuanian poet.

Shimkus graduated from the department of history and philosophy of the University of Vilnius in 1961. His works first appeared in print in 1957. In 1960 he published the poetry collection *The Best Second*, followed in 1963 by *Shorelines* and in 1968 by *Iron and Silver*. His verses are simple in form, but their content can be interpreted on many levels. Shimkus' narrative poems *My Cousin's Library* (1966) and *The Old Grand Piano* (1968) contain philosophical reflections on the meaning of life.

WORKS
In Russian translation:
Zemlia vas liubit. Moscow, 1963.
Ul'i. Moscow, 1973.
REFERENCE
Kubilius, V. *Sovremennaia litovskaia poeziia*. Moscow, 1969. [29–1201–1]

SHIMMY. (1) In motor vehicles, an intense vibrational process that occurs in a vehicle's steered wheels and front suspension. Steered wheels that are connected to a motor vehicle's frame or body by an elastic suspension and a steering linkage are components of a complex vibrating system. Such wheels vibrate when a vehicle travels on a bumpy road, when the vehicle's wheels are improperly aligned, or when the vehicle's suspension and steering gear are kinematically mismatched.

Shimmy impairs road safety, increases the rolling resistance at the tires, and intensifies the wear of the parts of the steering gear and suspension. It also increases tire wear.

To reduce the harmful effects of shimmy, independent front suspension is widely used in present-day passenger cars. In other motor vehicles, the kinematic design of the steering gear and suspension may be improved by moving the centers of wheel vibration closer to the drag links and the hinge points of the springs. Other measures to reduce the effects of shimmy include dynamic wheel balancing and stabilization of the direction in which the wheels move when they encounter road irregularities.

(2) In airplanes, a free vibration of the nose wheel of a tricycle landing gear that occurs during taxiing, takeoff runs, and landing runs. The free vibration is manifested as a yawing of the nose wheel. It may result in the collapse of the shock strut or in an airplane crash.

Shimmy is eliminated by means of shimmy dampers. They prevent the occurrence of free vibration but do not prevent the nose wheel from being steered. [29–1202–3]

SHIMORSKOE, an urban-type settlement in Vyksa Raion, Gorky Oblast, RSFSR. Shimorskoe has a landing on the right bank of the Oka River and is located 36 km southwest of the Navashino railroad station on the Murom-Arzamas line. The settlement has a shipyard and an asphalt plant. A sanatorium for patients suffering from tuberculosis of the bones is located in Shimorskoe. [29–1203–2]

SHINA, a people of northern Pakistan. The Shina inhabit the Gilgit River valley and the adjoining mountain regions. According to a 1975 estimate, they number more than 100,000; 9,900 Shina live in India, according to the 1971 census. The Shina speak one of the Dard languages. The official religion is Islam, but ancient animistic beliefs have survived to a large extent. The Shina engage in farming, fruit growing, transhumant livestock raising, hunting, trade, and handicrafts. Many work as porters and guides.

REFERENCE
Narody Iuzhnoi Azii. Moscow, 1963. [29–1204–4]

SHINAKAN, a member of the main working population of early medieval Armenia.

The *shinakans* were originally legally free. In Armenian sources of the fourth and fifth centuries, they are contrasted to the *azats* (the privileged class). The *shinakans* had smaller fines to pay for violating church rules than did the *azats*, but unlike the *azats* they were subject to corporal punishment. The *shinakans*' elders had the right to attend the state class assemblies of Armenia, and the *shinakans* paid a tax to the ruler.

During the development of feudal relations, most of the *shinakans* were brought under the yoke of the *nakhararq* (princely families). The term *shinakan*, along with the term *ramik*, became a designation for a serf at various stages of feudal dependence.

REFERENCES
Novosel'tsev, A. P., V. T. Pashuto, and L. V. Cherepnin. *Puti razvitiia feodalizma (Zakavkaz'e, Sredniaia Aziia, Rus', Pribaltika)*. Moscow, 1972.
Arutiunian, B. M. "Sotsial'no-ekonomicheskoe polozhenie krest'ian v Armenii XII v. po Sudebniku Mkhitara Gosha." *Voprosy istorii*, 1952, no. 8. [29–1205–1]

SHINGAREV, ANDREI IVANOVICH. Born 1869; died Jan. 7 (20), 1918, in Petrograd. Russian political figure. Member of the Constitutional Democratic Party (Cadets).

Shingarev graduated from the physics and mathematics faculty at Moscow University in 1891 and from the medical faculty in 1894. He became a doctor for a *zemstvo* (body of local self-government) in 1895 and served as head of a *zemstvo* hospital from 1899 to 1903. From 1903 to 1907 he was head of the health department of the Voronezh provincial *zemstvo* board, and from 1905 to 1907 he was the editor of the newspaper *Voronezhskoe slovo*. Shingarev served as a deputy to the Second, Third, and Fourth State Dumas and was deputy chairman of the Cadet faction. He wrote the Cadet agrarian program.

Shingarev was minister of agriculture in the bourgeois Provi-

sional Government in its initial stage (from March to May 1917). In its second stage (May to July) he was minister of finance and head of food supply. After the Cadets left the government on July 2 (15), Shingarev served as the leader of the Cadet faction in the Petrograd municipal duma and as a member of the Preparliament; he was elected to the Constituent Assembly. In November he was arrested for antisoviet activity. Shingarev was killed by anarchist sailors at the Mariinskaia Hospital.

WORKS
Vymiraiushchaia derevnia, 2nd ed. St. Petersburg, 1907. [29–1206–1]

SHINKUBA, BAGRAT VASIL'EVICH. Born Apr. 29 (May 12), 1917, in the village of Chlou, in what is now Ochamchira Raion, Abkhazian ASSR. Soviet Abkhazian writer and state and public figure. People's Poet of Abkhazia (1967). Member of the CPSU from 1946.

Shinkuba graduated from the Sukhumi Pedagogical Institute in 1939. He first published his works in 1935. He is the author of two novels in verse: *My Countrymen* (1950), which is about the postwar life of kolkhozniks, and *Song of the Cliff* (1965; Russian translation, 1967; film version entitled *The White Bashlyk)*, which describes the revolutionary events in Abkhazia from 1905 to 1907. Shinkuba's other works include the novella *Chanta Has Come* (in Russian, 1969) and the historical novel *The Last to Leave* (1974; Russian translation, 1976).

Shinkuba has been a member of the Auditing Commission of the Communist Party of Georgia since 1976. Since 1958 he has been a candidate member of the Central Committee of the Communist Party of Georgia and chairman of the Presidium of the Supreme Soviet of the Abkhazian ASSR. He was a deputy to the fifth convocation of the Supreme Soviet of the USSR. Shinkuba has been awarded the Order of Lenin, three other orders, and several medals.

WORKS
Ialkaau ifymtakua, vols. 1–2. Akua, 1967–68.
In Russian translation:
Izbrannoe. [Introduction by K. Simonov.] Moscow, 1976.
REFERENCE
Tsvinaria, V. L. *Tvorchestvo B. V. Shinkuba*. Tbilisi, 1970. [29–1207–1]

SHIO-MGVIME (also Shiomgvime), a Georgian monastery on the left bank of the Kura River, 10 km west of Mtskheta in the Georgian SSR. Shio-Mgvime was founded in the sixth century A.D. by the monk and preacher Shio, who originally came from Syria. It is surrounded by many caves (in Georgian, *mgvime*). The monastery's buildings include a domed cruciform church (550's–560's) with a stone altar rail (first quarter of the 11th century), a basilica reconstructed in the 18th century from a 12th-century domed church, a refectory (12th-century, reconstructed 17th century), and a bell tower (18th century). A chapel with wall paintings from the 12th and 13th centuries is near the monastery.

REFERENCE
Vol'skaia, A. I. *Rel'efy Shiomgvime*. Tbilisi, 1957. [29–1214–1]

SHIPITSYNO, an urban-type settlement in Kotlas Raion, Arkhangel'sk Oblast, RSFSR. Situated on the left bank of the Severnaia Dvina, Shipitsyno is 6 km from the city of Kotlas. It has a repair and machine shop, a lashing and sorting boom, and a logging and timber distribution establishment. [29–1215–2]

SHIPKA PASS, a pass in Bulgaria, in the Stara Planina (Balkan) Mountains, situated at an elevation of 1,185 m. The highway between the cities of Kazanluk and Gabrovo crosses Shipka Pass. Located near the pass is the Liberty Monument (1928–30; architect A. Donkov, sculptor A. Andreev), commemorating the military cooperation between Russian and Bulgarian soldiers and Bulgaria's liberation from the Turkish yoke in 1877–78. The pass is now a national park.

Shipka Pass was the scene of bitter fighting for its possession during the Russo-Turkish War of 1877–78. On July 7 (19), 1877, after the battles of July 5–6 (17–18), Russian troops took the pass, which afforded the shortest route to Istanbul. The Turkish command, having transferred the army of Suleiman Pasha from Montenegro to the Transbalkan region, decided to launch a counteroffensive with the goal of pushing the Russian troops beyond the Danube. Suleiman's army, comprising 37,500 men, was instructed to take Shipka Pass and link up with the main forces, located in the vicinities of Ruschuk (Ruse), Shumla, and Silistra. Suleiman sent 27,000 men, along with 48 guns, into Shipka Pass against the Russian-Bulgarian detachment of General N. G. Stoletov, which held the pass with 4,800 men (including 2,000 Bulgarians) and 27 guns. On the morning of August 9 (21), the Turkish forces launched heavy frontal attacks from the south and southeast up Mount Saint Nicholas in the southern part of the pass. The Russian-Bulgarian forces commanded by Generals V. F. Derozhinskii and Stoletov, reinforced on August 9 (21) by the arrival of 7,500 reserves and 28 guns, beat back numerous enemy attacks, inflicting heavy losses. On August 10 (22), the Turks regrouped and enveloped the pass in a semicircle from the west, south, and east, then launched an assault from three directions on August 11 (23). Despite extremely difficult conditions—the enemy's great superiority in forces (25,000 men and 34 guns against 7,200 men and 28 guns), a shortage of ammunition, and the intense heat and lack of water—the Russian-Bulgarian forces heroically defended the pass, holding their position despite significant losses (about 1,400 men). On the evening of August 11 (23) and the morning of August 12 (24), reinforcements, comprising about 9,000 men under the command of General M. I. Dragomirov, arrived and swiftly led a counterattack, driving back the enemy, who had approached the pass on the west and east. In the course of bitter fighting that lasted until August 14 (26), the Russian troops tried in vain to capture the height to the west of the pass; they then dug in strongly in Shipka Pass. The Russian losses numbered about 4,000, including more than 500 Bulgarians, while the Turkish losses, according to clearly understated figures, were more than 6,600.

The heroic defense of Shipka Pass disrupted the plans of the Turkish command and prevented the loss of an important strategic position. The Russian troops held Shipka Pass until their offensive in January 1878, driving back new Turkish attacks on September 5 (17) and enduring an exceptionally difficult winter "Shipka camp." [29–1215–3]

SHIPOV, DMITRII NIKOLAEVICH. Born 1851; died 1920. Russian political figure. One of the founders of the Octobrist Party and a leader of the *zemstvo* (local self-government) movement in the late 19th and early 20th centuries.

Shipov was a landowner in Moscow Province. He graduated from the law faculty at the University of St. Petersburg in 1872. He became a *zemstvo* delegate (*glasnyi*) in Volokolamsk District in 1877 and was later a member of the Moscow provincial *zemstvo* assembly. From 1893 to 1904 he was chairman of the Moscow provincial *zemstvo* board. Shipov was chairman of the "private conference of *zemstvo* figures" in November 1904 that called for the introduction of legislative representation of a consultative nature in Russia.

In September 1906, Shipov left the Octobrist Party because of disagreements with A. I. Guchkov and joined the Party of Peaceful Renewal. In 1906 he was named the representative of the Moscow provincial *zemstvo* assembly on the Council of State. Shipov withdrew from public life in 1911. After the October Revolution of 1917 he was the first chairman of the counterrevolutionary National Center. Shipov was arrested by agents of the All-Russian Extraordinary Commission (Cheka) in early 1919 and died in prison. [29–1216–1]

SHIPOV FOREST, a wooded region in Voronezh Oblast, RSFSR. Shipov Forest, situated on the right bank of the Osered' River, has an area of 39,200 hectares (ha). It is the largest insular oak forest on the southeastern border of the forest-steppe, and it is important for water storage and land protection. Unwooded ravines divide the forest into three parts. An area of 35,600 ha is covered by trees, including oak (92 percent), ash (3 percent), and aspen (2 percent); maple, elm, linden, and other species account for 3 percent of the forested area. The oak stands of Shipov Forest produce an abundance of high-quality timber.

In 1709, Peter I had the forest reserved for the use of the shipbuilding industry. In 1908 projects in experimental forestry were begun in the forest. The Central Scientific Research Institute of Forest Genetics and Selection maintains a forest genetics and breeding laboratory in Shipov Forest. [29–1217–1]

SHIPOVNIK, a publishing house that produced books in St. Petersburg (Petrograd) from 1906 to 1918. It was founded by the caricaturist Z. I. Grzhebin and S. Iu. Kopel'man. Its publications were designed by artists of the World of Art. Shipovnik published fiction, notably the works of L. N. Andreev and F. K. Sologub, as well as books by idealist philosophers and articles and papers on modern art. Shipovnik's anthologies of fiction (books 1–26, 1907–17), in which writings of the symbolists predominated, were polemically opposed to Gorky's *Znanie* collections. Beginning in 1910 the Shipovnik anthologies included numerous antirevolutionary works. The *Northern Collections* (books 1–7, 1907–11) acquainted readers with the foreign literature of the time. Collected works by Western European classical authors were published by Shipovnik. [29–1218–1]

SHIPOVO KURGANS, several groups of barrows dating from the first to fourth centuries in the Derkul River basin, west of the city of Ural'sk (Zapadnyi Kazakhstan Oblast), near the station of Shipovo. The Shipovo Kurgans were investigated by P. S. Rykov in 1925. Most of the burials belonged to the Sarmatians, nomads of the first centuries A.D. Buried in one rich barrow was a man in silk clothing, with gold plaques, weapons, and a horse harness. Another rich barrow yielded the burial of a woman, with a glass-encrusted bronze diadem, a pendant edged in gold, earrings, and a mirror. The objects are characteristic of the age of the Great Migration of Peoples in Eastern Europe in the late fourth and fifth centuries and belonged, judging from the funerary ritual, to representatives of the tribal aristocracy of the Alani, descendants of the Sarmatians.

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SHIP STURGEON (*Acipenser nudiventris*), a fish of the family Acipenseridae. The body length reaches 2 m, and the weight, 30 kg or more. A migratory fish, the ship sturgeon is distributed in the basins of the Aral, Caspian, and Black seas. It enters rivers to spawn. There are spring and winter forms. Males attain sexual maturity at six to nine years of age, and females, at 12 to 14 years of age. Spawning is in March to May. Fecundity is 200,000 to 1.290 million eggs. The ship sturgeon feeds on mollusks and other aquatic invertebrates, as well as fish. A valuable commercial species, the ship sturgeon is in need of artificial breeding.

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SHIPULIN, FEDOR KUZ'MICH. Born Nov. 10 (23), 1913, in the village of Abai, in what is now Gorno-Altai Autonomous Oblast; died Aug. 19, 1972, in the settlement of Saranpaul', Tiumen' Oblast; buried in Moscow. Soviet geologist. Corresponding member of the Academy of Sciences of the USSR (1970). Member of the CPSU from 1946.

Shipulin graduated from the Moscow Geological Prospecting Institute in 1939. From 1939 to 1946 he conducted geological explorations in the Mongolian People's Republic. Between 1946 and 1952 he was head of the geology division of the Far East Branch of the Academy of Sciences of the USSR. From 1952 to 1955 he worked at the Geological Institute of the Academy of Sciences of the USSR. In 1955 he began working at the Institute of Geology of Ore Deposits, Petrography, Mineralogy, and Geochemistry of the Academy of Sciences of the USSR, where he became head of the geochemistry division in 1967.

Shipulin's works dealt with geochemistry, petrography, and the theory of ore deposits. Shipulin established the formational independence of small intrusions, the general regularities underlying the crystallization of silicate melts, and the genetic relationship between concentrations of individual groups of chemical elements and different magmatic centers. He developed the fundamentals of the petrological analysis of magmatic processes at the atomic and molecular levels.

Shipulin was awarded the Order of the Badge of Honor and various medals.

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SHIPUNOVO, an urban-type settlement and the administrative center of Shipunovo Raion, Altai Krai, RSFSR. Shipunovo is situated on the left bank of the Alei River, 173 km southwest of Barnaul. It is served by a railroad station on the Barnaul-Semipalatinsk line. Industry is represented by a construction combine. [29–1220–2]

SHIRA, an urban-type settlement and the administrative center of Shira Raion, Khakass Autonomous Oblast, Krasnoiarsk Krai, RSFSR. The settlement is served by a railroad station on the Achinsk-Abakan line. It has a wood-products combine, a canned milk combine, and a grain elevator. [29–1220–4]

SHIRA, a bitter salt lake with no outlet, located in the Khakass Autonomous Oblast, Krasnoiarsk Krai, RSFSR. Situated at an elevation of 352 m in the Minusinsk Basin, Lake Shira covers an area of 32 sq km. The average depth is 11.2 m, and the maximum depth, 21.6 m. The shores are gently sloping, with sandy beaches; the bottom is composed of hydrogen sulfide therapeutic silt. The water level fluctuates within a range of 4.5 m. The lake freezes in November and opens up in late April or May. The Son River empties into Lake Shira. Summers are warm, with a mean July temperature of 18°C, and winters are cold, with a mean January temperature of −19°C. The annual precipitation totals 250 mm.

Located 11 km from the Shira railroad station is a balneological and pelotherapeutic health resort. Therapeutic remedies include the sulfate-chloride sodium-magnesium water of Lake Shira, which is used for drinking (in diluted form) and for baths, and the silty mud of Lake Bol'shoe Utich'e, located 20 km from Lake Shira. Persons with diseases of the organs of the musculoskeletal system, digestive and gynecological disorders, and diseases of the nervous system are treated at the resort, which has a sanatorium and a balneological and mud-bath facility. [29–1220–3]

SHIRAKI STEPPE, an upland in the southeastern part of the interfluve of the Iori and Alazani rivers of the Kura River basin in the eastern part of the Georgian SSR. The steppe has elevations to 865 m. It consists principally of chernozem beard-grass and feather-grass steppes and, in light forests and arid thin forests, secondary beard-grass steppes with cinnamon-colored and mountain cinnamon-colored soils. Livestock is grazed on the steppe in the winter. Grain crops are cultivated. The region has petroleum deposits. [29–1221–2]

SHIRAZ, OVANES TATEVOSOVICH (real surname, Karapetian). Born Apr. 12 (25), 1914, in Aleksandropol', now Leninakan. Soviet Armenian poet.

The son of a peasant, Shiraz studied at the University of Yerevan from 1937 to 1941. He was first published in 1935. He is the author of the lyric verse collections *The Advent of Spring* (1935), *Song of Armenia* (1940), *The Voice of a Poet* (1942), *Book of*

Songs (1942), and *Lyric Poetry* (1946). He also wrote the philosophic narrative poem *Biblical* (1944), which deals with the Great Patriotic War of 1941–45. Shiraz extolled Socialist Armenia in such narrative poems as *Land of Happiness* (1937), *Razdan* (1947), and *The Names of Our Villages* (1950). His poems are characterized by turbulent spontaneity, vividness of imagery, and fidelity to the traditional language of Armenian poetry. Some of Shiraz' works have been translated into other languages of the USSR.

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SHIRAZ, a city in southwestern Iran, on the Bushire-Isfahan highway. Administrative center of the *ostan* (province) of Fars. Population, 370,000 (1975). Shiraz produces textiles, sugar, flour, wine, mineral fertilizers, cement, petroleum and attar of roses. The city is famous for its carpets, mosaics, and silver articles. It is the trade center of an agricultural region that produces roses, grapes, tobacco, and sugar beets. A university is located in the city.

Under the Sassanids a settlement stood on the site of Shiraz. A city was founded there by Arabs in the seventh century. From the tenth to mid-11th centuries, Shiraz was a center of the Buyid state. In the 14th century it was seized twice by Tamerlane. In the 14th and 15th centuries the Shiraz school of miniatures was famous. In the second half of the 18th century, under the Zands, the city was the capital of Persia. Shiraz was the birthplace of Saadi and Hafez. The ruins of Persepolis are located 50 km northeast of the city. Architectural monuments include the fortress walls. The Fars Museum, which houses works of Iranian applied art, is located in Shiraz. The Mausoleum of Saadi (1952, architect A. Godard) is nearby.

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SHIRE (also Chire), a river in eastern Africa, in Malawi and Mozambique; a left tributary of the Zambezi. The Shire, which originates in Lake Nyasa, is 400 km long and drains an area of 32,000 sq km. As the river descends from the Shire Highlands to the low-lying valley of the Zambezi, it forms rapids and waterfalls, including Murchison Falls. Water levels are highest from November through April. The Shire is navigable below Murchison Falls. There are two hydroelectric power plants on the river—one at Nkula Falls (opened 1966; 24 megawatts) and one at Tedzani Falls (opened 1973; 16 megawatts). [29–1223–6]

SHIRE, the oldest breed of heavy draft horse. The breed was developed in Great Britain by improving small local heavy war horses (the medieval Great Horse) and then crossing them with Belgian heavy draft horses. In the 19th century the breed was exported to many countries in Europe, including Russia, and to North and South America. The Shire horse has a massive trunk, a long hook-nosed head, and a broad chest, back, and croup. The coloration is bay, dark bay, black, gray, or red dun with white markings. The average stallion stands 165–175 cm high at the withers; the circumference of the chest is 210–250 cm, and that of the front cannon bone, 28–30 cm. The load-pulling capacity is 18–20 tons and more.

In the USSR the Shire horse was used to develop the Vladimir heavy draft horse.

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SHIRENDYB, BAZARYN. Born May 15, 1912, in Khubsugul Aimak. Mongolian historian; public and state figure of the Mongolian People's Republic. Academician of the Academy of Sciences of the Mongolian People's Republic (1961). Member of the Mongolian People's Revolutionary Party (MPRP) since 1942.

Shirendyb graduated from the Irkutsk Pedagogical Institute in 1941. From 1942 to 1954 he was the rector of the Mongolian State University. He became president of the Academy of Sciences of the Mongolian People's Republic in 1961. He served as secretary of the Central Committee of the MPRP from 1944 to 1948 and as a member of the Politburo of the Central Committee from 1953 to 1957. Shirendyb was first elected a deputy to the Great People's Khural in 1951. From 1954 to 1957 he was first deputy chairman of the Council of Ministers of the Mongolian People's Republic. He became deputy chairman of the Great People's Khural in 1966. Shirendyb is a member of the World Peace Council; he was named a foreign member of the Academy of Sciences of the USSR in 1966.

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Minuia kapitalizm. Ulan Bator, 1967. [29–1224–1]

SHIRIAEV, STEPAN GRIGOR'EVICH (pseudonym, Tekhnik). Born 1856 in the village of Tavolozhka, in what is now Petrovsk Raion, Saratov Oblast; died Aug. 18 (30), 1881, in the Alekseі Ravelin of the Peter and Paul Fortress, St. Petersburg. Russian revolutionary Narodnik (Populist).

Shiriaev, the son of a serf, studied at the Kharkov Veterinary Institute. In 1873 he carried on revolutionary propaganda in Saratov. He lived in London and Paris from 1876 to 1878 and studied electrical engineering under P. N. Iablochkov. In 1878 he joined a Russo-Polish circle of socialist propagandists in Paris that included P. L. Lavrov and T. Uziembło. In 1878 he traveled to Russia as an emissary of the group.

In 1879, Shiriaev became a member of the Narodnik group Liberty or Death and took part in the Lipetsk Congress; he served as a member of the Executive Committee of the People's Will and set up its first workshop for the manufacture of dynamite. On Nov. 19, 1879, Shiriaev, together with S. L. Perovskaia, tried to assassinate Emperor Alexander II near Moscow. Shiriaev was arrested on Dec. 3, 1879, and condemned to death in the Trial of the 16, a sentence that was commuted to life at hard labor.

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SHIRIAEVO, an urban-type settlement and the administrative center of Shiriaevo Raion, Odessa Oblast, Ukrainian SSR. Shiriaevo is located 32 km from the Zatish'e railroad station on the Kotovsk-Razdel'naia line. The settlement has a mixed-feed plant and a poultry hatchery. [29–1239–1]

SHIRIAMOV, ALEKSANDR ALEKSANDROVICH. Born Jan. 21, 1883, in Irkutsk; died June 23, 1955, in Moscow. A leader in the struggle to establish Soviet power in Siberia. Member of the CPSU from 1900.

The son of a petty merchant, Shiriamov became a worker in 1898. He took part in the Revolution of 1905–07 in Irkutsk and Omsk, where he was a member of the RSDLP committee: he was arrested numerous times. In 1913 he undertook party work in the coal mines of Transbaikalia. After the February Revolution of

1917, Shiriamov became chairman of the soviet and of the committee of the RSDLP at the Adagan coal mines, chief of the Red Guard, and a member of the Transbaikal oblast committee of the RSDLP. In late 1917 he became commissar of industry in Chita and chairman of the Transbaikal oblast mining council.

Shiriamov began underground party work in the summer of 1918 and helped organize the partisan movement in Siberia. He became chairman of the Siberian oblast committee of the RCP(B) in late 1919. In 1920 he became chairman of the Irkutsk revolutionary military committee, the Irkutsk soviet, and the Omsk provincial committee of the RCP(B) and a member of the party's Far East Bureau. In 1922 and 1923 he was a member of the Siberian Bureau of the Central Committee of the RCP(B) and a member of the Presidium of the Siberian Bureau of the Supreme Council on the National Economy.

In 1923, Shiriamov moved to Moscow to assume a post in the defense industry. In 1925 he became deputy chairman of Glavpolitprosvet (Central Committee of the Republic for Political Education). Shiriamov later engaged in scholarly work and in 1941 became a personal pensioner. [29–1239–2]

SHIRIN, a city (since 1972) under oblast jurisdiction in Syr Darya Oblast, Uzbek SSR. Situated on the left bank of the Syr Darya River, Shirin is 6 km from the Farkhad railroad station on the Khavast-Kokand line. The Farkhad Hydroelectric Power Plant, which produces 126 megawatts of power, is located in Shirin. Construction of the Syr Darya State Regional Electric Power Plant was under way in Shirin in 1978; the first phase of the plant's operation was begun in 1975, with a capacity of 1,200 megawatts. [29–1224–2]

SHIRINGUSHI, an urban-type settlement in Zubova Poliana Raion, Mordovian ASSR. Shiringushi is situated on the right bank of the Vad River, in the Volga basin, 28 km south of the Zubova Poliana railroad station in the Riazan'-Ruzaevka line. The glove shop of the Zubova Poliana Knitwear Factory and a factory producing felted fabrics are located in Shiringushi. [29–1225–2]

SHIRIN-SAI, a burial ground dating from the second to fourth centuries, located on the left bank of the Syr Darya River, on the Shirin-Sai channel, near the city of Begovat, Tashkent Oblast, Uzbek SSR. Shirin-Sai was excavated by V. F. Gaidukevich in 1943. The burials contained clay vessels covered with white and red engobe, glass beads, bronze ornaments, and a Chinese coin dating from the first century. The burial ground belonged to settled land cultivators, the remains of whose settlement (Munchak-Tepe) are located near Shirin-Sai.

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SHIRINSKII-SHIKHMATOV, PLATON ALEKSANDROVICH. Born Nov. 18 (29), 1790, in the village of Dernovo, Viaz'ma District, Smolensk Province; died May 5 (17), 1853, in St. Petersburg. Russian state figure. Academician of the St. Petersburg Academy of Sciences (1828). Prince.

Shirinskii-Shikhmatov graduated from the Naval Cadet Corps (Naval Cadet School) in 1807. While serving in the navy, he took part in the war against France from 1812 to 1814. He was made head of a division of the Engineering Department of the Ministry of War in 1820. Shirinskii-Shikhmatov became friends with A. S. Shishkov, who appointed him director of an office of the Ministry of Public Education; he became assistant minister of public education in 1842 and minister in 1850. He tried to deny persons of nonnoble origin access to secondary and higher education, and he persecuted progressive professors and students. Under Shirinskii-Shikhmatov, reaction in the area of education reached its apogee. [29–1226–2]

SHIRKAT, in Afghanistan, Turkey, and Iran, a national joint-stock company. *Shirkats* were organized on a wide scale in various sectors of the economy in the 1920's and 1930's, when the development of national capitalism intensified in the countries mentioned. Supported and protected by the government, the *shirkats* contributed greatly to accelerating the accumulation of national capital. [29–1226–3]

SHIRKOV, DMITRII VASIL'EVICH. Born Mar. 3, 1928, in Moscow. Soviet physicist. Corresponding member of the Academy of Sciences of the USSR (from 1960). Member of the CPSU from 1953.

Shirkov graduated from Moscow State University in 1949. From 1950 to 1960 he worked at the V. A. Steklov Institute of Mathematics of the Academy of Sciences of the USSR and at the Joint Institute for Nuclear Research in Dubna. From 1960 to 1969 he worked at the Institute of Mathematics of the Siberian Division of the Academy of Sciences of the USSR; at the same time, beginning in 1961, he was a professor at the University of Novosibirsk.

Shirkov's main works deal with the theory of elementary particles, the theory of superconductivity, and the theory of neutron transport and moderation. In the theory of elementary particles, he developed the renormalization theory, created the method of the renormalization group, and constructed semiphenomenological schemes for the quantitative description of strong interactions at low energies.

Shirkov received the Lenin Prize in 1958. He has been awarded three orders and various medals.

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SHIRMA, GRIGORII ROMANOVICH. Born Jan. 8 (20), 1892, in the village of Shakuny, in what is now Pruzhany Raion, Brest Oblast; died Mar. 23, 1978, in Minsk. Soviet choral conductor, folklorist, and figure in the music world. People's Artist of the USSR (1955); Hero of Socialist Labor (1977). Member of the CPSU since 1959.

Shirma graduated from the Sedlets Teachers' Institute in 1918. He carried out extensive cultural-educational work in Western Byelorussia and was persecuted by the authorities of bourgeois Poland. After the reunification of Western Byelorussia with the Byelorussian SSR, he organized in 1940 the Byelorussian Song and Dance Ensemble (now the State Academic Chorus of the Byelorussian SSR), which he directed until 1970. In 1966 he became chairman of the administrative board of the Composers' Union of Byelorussia. Shirma, who began collecting Byelorussian folk songs in 1910, compiled several folklore collections, including *Byelorussian Folk Songs* (vols. 1–4, 1959–76), and he published two volumes of his choral arrangements of Byelorussian folk songs (1971–73).

Shirma was a deputy to the fourth through ninth convocations of the Supreme Soviet of the Byelorussian SSR. He received the State Prize of the Byelorussian SSR in 1966 and 1974. Shirma was awarded two Orders of Lenin, the Order of the October Revolution, two other orders, and various medals.

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SHIROBOKOV, STEPAN PAVLOVICH. Born Dec. 5 (18), 1912, in the village of Malyi Kazess, in what is now Sharkan Raion, Udmurt ASSR. Soviet Udmurt writer. People's Poet of Udmurtia (1963).

Shirobokov graduated from the Izhevsk Teachers' Institute in 1939. He took part in the Great Patriotic War of 1941–45. Shirobokov is the author of collections of poems and narrative poems; the drama *Every Wolf Has Its Own Path* (1956); the comedy *If There Is No Love* (1962); the first Udmurt comedy in verse, *Hey, Beautiful Girls* (1970); the novella *Songs Find the Road* (1967); books for children; literary sketches, and short stories. Shirobokov writes about modern youth and the people of kolkhozes.

Several of his poems have become folk songs. Shirobokov has been awarded two orders and various medals.

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F. K. ERMAKOV [29–1227–3]

SHIROKAIA RECHKA, an urban-type settlement in Sverdlovsk Oblast, RSFSR, under the jurisdiction of the Verkh-Isetsk raion soviet of the City of Sverdlovsk. Shirokaia Rechka is located 7 km southwest of Sverdlovsk. Peat is extracted near the settlement. [29–1227–4]

SHIROKII, an urban-type settlement in Amur Oblast, RSFSR, under the jurisdiction of the Raichikhinsk city soviet. Shirokii has a railroad station (Kholodnyi Kliuch) on a branch line of the Trans-Siberian Railroad, 12 km east of Raichikhinsk. Coal is mined at Shirokii, and the settlement has a branch of the Raichikhinsk Garment Factory. [29–1228–2]

SHIROKII, an urban-type settlement in Susuman Raion, Magadan Oblast, RSFSR. Shirokii is situated on the left bank of the Berelekh River of the Kolyma river basin, 702 km northwest of Magadan. Gold is mined in the vicinity. [29–1228–3]

SHIROKOE, an urban-type settlement and the administrative center of Shirokoe Raion, Dnepropetrovsk Oblast, Ukrainian SSR. Shirokoe is situated on the left bank of the Ingulets River (a tributary of the Dnieper), 12 km from the Ingulets railroad station. The settlement has a brewery, a food products plant, a mixed-feed plant, and a poultry hatchery. [29–1228–5]

SHIROKOVSKII, an urban-type settlement in Perm' Oblast, RSFSR, under the jurisdiction of the Gubakha city soviet. Shirokovskii is situated on the Kos'va River, in the Kama basin, 22 km from the Polovinka railroad station on the Solikamsk-Chusovskaia line. A hydroelectric power plant and a factory producing biochemical preparations are located in the settlement. [29–1228–4]

SHIRPOTREB CHERNAIA, a variety of cherry developed by I. V. Michurin by crossing the Iubileinaia variety of sour cherry with the Pervenets variety of sweet cherry. The cherries are medium-sized, turnip-shaped, dark red, and shiny. The flesh is juicy, sweet, slightly acidic, and pleasant to the taste. The fruits ripen in mid-July but do not drop from the tree immediately. The cherries are eaten fresh or processed into jam, juice, or syrup. The trees have average growing vigor; the elongate spherical crowns are well developed. Fruit formation begins in the second year. The annual fruit yield from one tree is 5–10 kg. The Shirpotreb Chernaia variety is grown in the central zone of the RSFSR. [29–1237–1]

SHIRSHOV, ANATOLII ILLARIONOVICH. Born Aug. 8, 1921, in the village of Kolyvan', in what is now Novosibirsk Oblast. Soviet mathematician. Corresponding member of the Academy of Sciences of the USSR (1964). Member of the CPSU since 1951.

Shirshov graduated from the Voroshilovgrad Pedagogical Institute in 1949. From 1950 to 1960 he was on the staff of Moscow State University, and in 1960 he became associated with the Institute of Mathematics of the Siberian Division of the Academy of Sciences of the USSR. Shirshov's principal works deal with algebra, in particular, the general theory of nonassociative algebras, alternative rings, and Lie algebras. Shirshov has been awarded two orders and various medals.

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SHIRSHOV, PETR PETROVICH. Born Dec. 12 (25), 1905, in Ekaterinoslav, now Dnepropetrovsk; died Feb. 17, 1953, in Moscow. Soviet oceanographer, hydrobiologist, and polar explorer; state figure. Academician of the Academy of Sciences of the USSR (1939). Hero of the Soviet Union (1938). Member of the CPSU from 1938.

Shirshov graduated from the Odessa Institute of Public Education in 1929. From 1929 to 1932 he was a research worker at the Botanical Garden of the Academy of Sciences of the USSR, and from 1932 to 1936, at the All-Union Arctic Institute. Shirshov was a member of several arctic expeditions, including the expeditions on the vessels *Sibiriakov* (1932) and *Cheliuskin* (1933–34); he was also a member of the first Soviet drifting station, Severnyi Polius–I (1937–38).

Between 1942 and 1948, Shirshov was first people's commissar and then minister of the Soviet merchant marine. The founder of the Institute of Oceanography of the Academy of Sciences of the USSR, he became the institute's director in 1946. From 1946 to 1950 he also served as chairman of the Pacific Ocean Scientific Committee. He was a deputy to the first and second convocations of the Supreme Soviet of the USSR.

Shirshov's chief works dealt with the plankton of the polar seas. Shirshov disproved the hypothesis of the absence of life in the high latitudes of the Arctic Ocean and discovered a number of regularities in the distribution of warm water from the North Atlantic to the Arctic Basin.

Shirshov was awarded three Orders of Lenin, four other orders, and various medals. A bay on Franz Josef Land and an underwater ridge in the Bering Sea have been named after him, as has the Institute of Oceanography of the Academy of Sciences of the USSR.

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E. M. SUZIUMOV [29–1238–2]

SHIRVAN, a historical region in northern Azerbaijan, on the western shore of the Caspian Sea, east of the Kura River. The name "Shirvan" ("Sharvan") came into use during the Sassanid era (226–651) as a designation for part of ancient Caucasian Albania, later known as Aran. Shirvan was occupied by the Arabs in 654 and eventually became a hereditary possession of Arab governors. From 799 to 1538, Shirvan was ruled by a succession of dynasties of *shirvanshahs* (shahs of Shirvan), under whom it encompassed all the territory from the Kura River to the city of Derbent; the capital was at Shemakha.

During the Seljuk conquest, Shirvan was a center of the struggle for Azerbaijani independence. In the mid-15th century it was a center of land cultivation and the production of silk and other fabrics; it also played an important role in trade, exporting such goods as oil and cotton. Relations between Shirvan and Moscow were established in 1465 and 1466, and in 1499 an ambassador from Shirvan conducted negotiations toward a treaty "on friendship and concord." A major cultural center, Shirvan produced such writers as Khaqani and Feleki Shirvani. As the Safavid state became more powerful, Shirvan fell under its sway, becoming a province of the Safavid state in 1538. In 1748 the independent Shirvan Khanate was formed in Shirvan.

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SHIRVAN KHANATE, a feudal state in northern Azerbaijan, in the Shemakha region, that existed from 1748 to 1820. The Shirvan Khanate, which was formed in 1748 after the area had been liberated from the yoke of the Iranian Nadir Shah, became one of the largest and richest khanates in northern Azerbaijan. The population engaged chiefly in land cultivation, the production of silk and other fabrics, trade, and handicrafts. The incorporation of the khanate into Russia in 1805 was affirmed by the Treaty of Gulistan in 1813. In 1820 the khan's government was abolished and replaced with a Russian administration. Shirvan Subprovince was formed on the territory of the khanate; in 1840 the subprovince became part of Caspian Oblast, which became Shemakha Province in 1846 and Baku Province in 1849. Today the territory of the Shirvan Khanate is part of the Azerbaijan SSR. [29–1223–2]

SHIRVAN PLAIN (also Shirvan Steppe), part of the plainlike area of the Kura-Araks Lowland in the Azerbaijan SSR. The Shirvan Plain lies along the left bank of the Kura River at elevations of 16–100 m; about half its area is below sea level. Wormwoods, saltworts, and liman meadows are found on sierozem-meadow and sierozem soils. The Upper Shirvan Canal carries water from the Mingechaur Reservoir for irrigation. Livestock are grazed on winter pastureland, and on irrigated land the local population engages in viticulture and the cultivation of cotton and grains. [29–1223–1]

SHIRVANSHAHS' PALACE, an architectural ensemble in Baku, consisting mainly of structures of the 15th century. The palace of the Shirvanshahs is an outstanding monument of medieval Azerbaijani architecture. The two-story palace building itself, architecturally simple, is probably the earliest of the structures. The divan-khan (court of law) has a hall enclosed on five of its eight sides by a gallery with an arcade. Also of note is the rectangular tomb (1435), with its cruciform prayer hall and richly ornamented portal. The other structures are a two-domed mosque with an elegant minaret (1442), the small eight-sided mausoleum of Said Yahya Bakuvi, the Eastern Gate (1585), an *ovdan* (underground reservoir) and a bathhouse.

The palace of the Shirvanshahs, although it comprises structures erected at different times, is artistically integrated by unity of scale and architectural technique. The severe, geometrically precise mass of the buildings is set off by the spare but expressive decorative details. The palace is now a museum.

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SHIRVANZADE, ALEKSANDR MINASOVICH (pen name of A. M. Movsisian). Born Apr. 7 (19), 1858, in Shemakha, Azerbaijan; died Aug. 7, 1935, in Kislovodsk; buried in Yerevan. Soviet Armenian writer. People's Writer of Armenia and Azerbaijan (1930).

The son of an artisan, Shirvanzade graduated from a Russian district school in 1873. He lived in Baku until 1883 and changed professions many times. In the early 1880's, Shirvanzade wrote publicist articles about the exploitation of workers in Baku's oil refineries. This was also the theme of his first works of fiction, the short stories "The Fire at the Refineries" and "A Shop Assistant's Diary" (both 1883). In 1883, Shirvanzade moved to Tbilisi and devoted himself to writing fiction. From 1886 to 1891 he worked for the weekly newspaper *Ekho* (*Ardzagank*), in which he published short stories, sketches, and novellas.

Shirvanzade lived in Paris from 1905 to 1910 and in Tbilisi from 1910 until 1919, when he went abroad again. The writer welcomed the October Revolution of 1917 and was delighted with the achievements of Soviet Armenia. In 1926 he returned to his homeland and became one of the creators of Soviet Armenian literature. He spoke at the First Congress of Soviet Writers.

From the beginning of his writing career, Shirvanzade dealt with the lives of various strata of society—merchants, artisans, businessmen, the bourgeois intelligentsia, and performing artists. He depicted the world of the patriarchal provinces in the novel *Honor* (1885) and the novella *The Evil Spirit* (1894, separate edition 1897), pointing out the infiltration of bourgeois mores and narrating the dramatic fates of his heroes with psychological accuracy.

In the novel *Chaos* (1898), his most significant work, Shirvanzade described life in an industrial city and the chaos of the capitalist world. He based the plot on fundamental social problems, mainly the struggle of social classes and groups, the exploitation of workers, and the moral disintegration of the bourgeois family, for whom the craving for money snuffs out all emotions. The heroes of several of his works fall victim to profiteerism and man's inhumanity to man, notably the gifted and idealistic musician in the novella *The Artist* (1903) and the innocent, ingenuous daughter of a "hero of easy profit" in the drama *For the Sake of Honor* (1905).

In his prose and plays, Shirvanzade introduced a number of innovations to Armenian literature. His works' psychological depth, passion, and accurate satirical exposure of the purveyors of social vices have accounted for their popularity over the years. In Soviet Armenia, Shirvanzade published many articles, short stories, and sketches, as well as the political comedy *Kum Morgana* (1926), which caustically ridiculed those who vainly hoped of returning the old order to Russia. He was the author of a screenplay about oil refineries, *The Last Fountain* (1934), and the memoirs *In the Crucible of Life*. His works have been translated into many languages of the world.

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G. S. TAMRAZIAN [29–1221–5]

SHISH, a river in Omsk Oblast, RSFSR; a right tributary of the Irtysh. The river measures 378 km in length and drains an area of 5,270 sq km. It rises on the Vasiugan Plain and is fed mainly by snow. The mean flow rate 149 km from the mouth is 14.8 cu m per sec. It freezes in late October or early November, and the ice breaks up in the second half of April or the first half of May. The Shish is used to float timber. [29–1244–1]

SHISHAK, a type of Russian helmet decorated with an upwardly tapering cone with a knob at the point. The *shishak* had earpieces on the sides, a visor and nasal in front, and a camail in back. [29–1244–2]

SHISHAKI, an urban-type settlement and administrative center of Shishaki Raion, Poltava Oblast, Ukrainian SSR. Shishaki is situated on the Psel River, a tributary of the Dnieper. It is 12 km from the Iares'ki railroad station on the Romodan-Poltava line. The settlement has a mixed-feed plant, a brickyard, and a cheese factory. A mineral-water plant is located nearby. [29–1244–3]

SHISHAKLI, ADIB AL-. Born 1909, in Hamah; died Sept. 27, 1964, in Ceres, Brazil. Syrian state figure.

A career army officer, Shishakli carried out a military coup in December 1949 and became chief of the General Staff of the Syrian Army. Between Nov. 29 and Dec. 2, 1951, he staged a coup

d'etat. While president of Syria in 1953 and 1954, Shishakli established a military dictatorship. Overthrown in February 1954, he fled from Syria. He settled in Brazil in 1958. Shishakli was killed by a Druze named Ghazali, who was taking revenge for violence committed against his clan in 1954. [29–1244–5]

SHISHIGIN, FIRS EFIMOVICH. Born Aug. 17 (30), 1908, in the village of Borok-Gorodok, Arkhangel'sk Oblast. Soviet stage director. People's Artist of the USSR (1964). Member of the CPSU since 1940.

Shishigin graduated from the Leningrad Technicum of Theater Arts in 1929. From 1928 to 1933 he worked at the Theater of Classical Miniatures and the Theater of Working Youth (TRAM), and from 1933 to 1946 he was artistic director of theaters in Ussuriisk, Spassk, and Vladivostok. In 1946–47 he was principal stage director of the Stavropol' Theater, and from 1947 to 1950 he worked at the Moscow Theater of Drama and Comedy. Shishigin was principal stage director of the Volgograd Theater from 1950 to 1956 and of the Voronezh Theater from 1956 to 1960. In 1960 he became artistic director and principal stage director of the F. G. Volkov Yaroslavl Theater.

Shishigin, a master of the epic, monumental panorama, has been attracted mainly to heroic and romantic drama and folk tragedy. He has devoted particular attention to detailed mass scenes and to the class-related psychology of his heroes. His best productions include a dramatization of Fadeev's *The Rout* (1933), Kocherga's *The Watchmaker and the Hen* (1935), Simonov's *A Lad From Our Town* (1942), Gorky's *The Old Man* (1946), Chepurin's *Conscience* (1950), Gorky's *The Lower Depths* (1952), *Port Arthur* by Stepanov and Popov (1954), *Virineia* by Seifullina and Pravdukhin (1957), Korablinova's *Aleksei Kol'tsov* (1958), Pogodin's *Third Pathétique* (1959), Gorky's *Children of the Sun* (1962), Nazarov's *The Panfilovites* (1965), Dangulov's *The Ambassador's Diary* (1970), Chepurin's *The Snows* (1971), and Ankilov's *The Soldier's Widow* (1972).

Shishigin received the State Prize of the USSR in 1951 and the State Prize of the RSFSR in 1971. He has been awarded the Order of Lenin, the Order of the Red Banner of Labor, and various medals.

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SHISHKIN, BORIS KONSTANTINOVICH. Born Apr. 7 (19), 1886, in Kukarka, now Sovetsk, Kirov Oblast; died Mar. 21, 1963, in Leningrad. Soviet botanist. Corresponding member of the Academy of Sciences of the USSR (from 1943).

Shishkin graduated from the medical faculty of the University of Tomsk in 1911; he taught there from 1913 to 1915. From 1915 to 1918 he was a military doctor, and from 1918 and 1925 he was the director of the botany department of the Museum of the Caucasus. Between 1925 and 1930 he was a professor at the University of Tomsk. In 1930, Shishkin joined the staff of the Botanical Institute of the Academy of Sciences of the USSR, serving as its director between 1938 and 1949. From 1945 to 1958 he was a professor at the University of Leningrad. Between 1946 and 1963 he was the vice-president of the All-Union Botanical Society.

Shishkin's main works deal with the taxonomy of flowering plants (including Caryophyllaceae, Umbelliferae, and Compositae) and botanical geography (Siberia, Transcaucasia). He was the organizer and editor of many collective works, for example, *The Flora of the USSR*, *The Flora of the Byelorussian SSR*, *The Flora of Leningrad Oblast*, and *The Flora of Turkmenia*. A recipient of the State Prize of the USSR in 1952, Shishkin was also awarded the Order of Lenin and two other orders.

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SHISHKIN, IVAN IVANOVICH. Born Jan. 13 (25), 1832, in Elabuga, in what is now Tatar ASSR; died Mar. 8 (20), 1898, in St. Petersburg. Russian painter; one of the most outstanding masters of realistic landscape painting.

Shishkin studied at the Moscow School of Painting, Sculpture, and Architecture from 1852 to 1856 under A. N. Mokritskii and at the St. Petersburg Academy of Arts from 1856 to 1865 under S. M. Vorob'ev. From 1862 to 1865 he received a stipend to study at the academies of arts in Munich, Prague, and Düsseldorf. In 1865 he became an academician of the St. Petersburg Academy of Arts where he served as a professor from 1873 and director of the landscape studio in 1894 and 1895. Shishkin was a founding member of the *peredvizhniki* (the Society of Wandering Art Exhibitions).

At the beginning of his career, Shishkin worked in the traditional manner of romantic landscape painting common in the mid-19th century, for example, *View of Valaam Island* (1858, Kiev Museum of Russian Art). In the 1860's he transcended the conventions of color and light effects and turned to what might be considered a more objective representation of Russian forest landscape, which was to be the main theme of his works. Shishkin strove for an accurate rendering of the endless variety of forms in the plant world. He abandoned the descriptive and elaborate style evident in *Forest Felling* (1867, Tret'iakov Gallery, Moscow) and created truly integral images of Russian nature, revealing through composition the majestic beauty of his native land and the unique quality of its forests and fields. Prominent examples include *Rye* (1878) and *Expanses of the Forests* (1884), both of which are housed in the Tret'iakov Gallery.

Continually working on studies from nature, Shishkin perfected the use of chiaroscuro effects and achieved unity of painting style and tonality. In several works he depicted the changing moods of nature, as in *Sunlit Pines* (1886, Tret'iakov Gallery). He revealed typically expressive and poetic features of the Russian land, introducing elements of genre painting in such works as *Morning in a Pine Forest* (1889, bears painted by K. A. Savitskii, Tret'iakov Gallery), and *Oak Grove* (1887, Kiev Museum of Russian Art).

Shishkin's vital, monumental images of his native land reflect the democratic concepts common to the historical paintings, scenes of everyday life, and portraits of the *peredvizhniki*. His best works generalize and glorify the heroic character of Russian nature, for example, *Ship-timber Grove* (1898, Russian Museum, Leningrad).

Studying nature intently, Shishkin devoted a great deal of attention to the graphic arts. His etchings, which are similar to his paintings in content and style, furthered the rebirth of the genre in Russia. His realistic landscapes, which became widely popular, were important in the struggle to establish the national Russian character in the arts, a major trend in the cultural life of the 1870's to 1890's.

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SHISHKIN, VASILII AFANAS'EVICH. Born Dec. 29, 1893 (Jan. 10, 1894), in the village of Skopsino, in what is now Khalturin Raion, Kirov Oblast; died Oct. 18, 1966, in Samarkand. Soviet archaeologist and orientalist. Corresponding member of the Academy of Sciences of the Uzbek SSR (1966).

Shishkin conducted archaeological excavations in Middle Asia at Ulug Beg's Observatory, Varakhsha, and Afrasiab.

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SHISHKO, LEONID EMMANUILOVICH (pseudonyms include P. B., P. Batin, and Blagoveshchenskii). Born May 19 (31), 1852, in Podol'sk; died Jan. 20, 1910, in Paris. Russian revolutionary, publicist, and historian.

The son of a forester, Shishko graduated from the Mikhail Artillery School in St. Petersburg in 1871, and in 1871 and the first part of 1872 he studied at the St. Petersburg Technological Institute. In 1872 he joined the Chaikovskii circle in St. Petersburg and began conducting propaganda among the military cadets (*iunkera*) and working people. Shishko took part in the "going to the people" movement and was the author of the pamphlet *Something, Brothers*, which contained a revolutionary proclamation. Shishko was arrested in Moscow on Aug. 14, 1874, and was sentenced at the Trial of the 193 to nine years' hard labor. He escaped from exile in 1890, however, and fled abroad.

Shishko helped establish the Foundation of the Free Russian Press. He joined the Socialist Revolutionaries in 1902 and became a member of the party committee abroad and the editorial board of the newspaper *Revoliutsionnaia Rossiia*. He translated A. Thun's *History of the Revolutionary Movement in Russia*, which was the first work on the subject. Shishko's own writings on the agrarian issue and the history of the social movement in Russia are typical of Narodnik (Populist) historiography.

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SHISHKO, SERGEI FEDOROVICH. Born June 12 (25), 1911, in Nosovka, in what is now Chernigov Oblast, Ukrainian SSR. Soviet painter. People's Artist of the USSR (1974). Member of the CPSU from 1952.

Shishko attended the Kiev Art Institute from 1929 to 1933 and the Leningrad Academy of Arts from 1936 to 1943. He paints lyrical landscapes, mostly devoted to Kiev. Notable examples are *Vladimir Hill* (1946, Kharkov Art Museum), *The Dnieper: View of the Podol* (1950, Museum of Ukrainian Fine Arts of the Ukrainian SSR, Kiev), *The Dnieper in the Morning* (1953, Museum of Ukrainian Fine Arts), *The New Kiev* (1960, Voroshilovgrad Artem Art Museum), and *The Vistas of Kiev* (1974).

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SHISHKOV, ALEKSANDR SEMENOVICH. Born Mar. 9 (20), 1754; died Apr. 9 (21), 1841, in St. Petersburg. Russian state figure and writer.

Shishkov graduated from the Naval Cadet Corps (Naval Cadet School) in 1771. He later served as an admiral, as secretary of state (*stats-sekretar'*) to Alexander I, as a member of the Council of State, and, from 1824 to 1828, as minister of public education. Shishkov became a member of the Russian Academy in 1796 and was its president from 1813 to 1841; he became an honorary member of the St. Petersburg Academy of Sciences in 1800. He served on the court that tried the Decembrists and was one of the initiators of the censorship statute of 1826.

Shishkov headed the Society of the Lovers of the Russian Word. He opposed sentimentalism and attacked N. M. Karamzin and Karamzin's followers in his book *Treatise on the Old and New Styles of the Russian Language* (1803). Shishkov believed that literature should be oriented toward Old Church Slavonic and toward folklore; he stressed the importance of church books and of *The Tale of Igor's Campaign*. He was the author of an original work on the poetics of Russian folklore entitled *Conversations About Philology* (1811). Shishkov wrote plays, odes, occasional verse, and adaptations of psalms.

Politically, Shishkov was a conservative. A rabid opponent of the influence of the French Revolution and the Enlightenment in Russia, he vigorously attacked arguments for the abolition of serfdom. At the same time, his literary theories contributed to the lofty style of Decembrist political poetry, as seen in the works of F. N. Glinka and W. K. Küchelbecker. Shishkov's linguistic ideas exerted some influence on A. S. Griboedov and I. A. Krylov.

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M. G. AL'TSHULLER [29–1248–1]

SHISHKOV, ALEKSANDR VASIL'EVICH. Born Nov. 3 (15), 1883, in Moscow; died July 8, 1920, in the village of Dubrovino, in present-day Novosibirsk Oblast. Participant in the revolutionary movement in Russia. Member of the Communist Party from 1904.

Shishkov was born into a worker family. He passed the test as an extramural student to receive the title public school teacher (*narodnyi uchitel'*). During the Revolution of 1905–07, he carried on party work among the railroad workers of Moscow. In 1908, Shishkov became a member of the Moscow Committee of the RSDLP and then worked in Sevastopol' and Nizhny Novgorod (now Gorky). Shishkov was arrested numerous times and exiled in 1914.

In 1917, Shishkov participated in the struggle to establish Soviet power in the city of Tomsk and Tomsk Province. He worked in the People's Commissariat for Internal Affairs of the RSFSR in 1918 and served as chairman of the Vladimir provincial executive committee. In 1919 he became a member of the All-Ukrainian Central Executive Committee and a member of the Revolutionary Tribunal of the Ukrainian SSR; he also served as deputy chairman of the All-Ukrainian Extraordinary Commission, chairman of the Vladimir and Tomsk provincial extraordinary commissions, and head of the military department of the Siberian Revolutionary Committee.

A monument to the memory of Shishkov has been erected in Tomsk (1953; sculptor, G. Shemberg).

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SHISHKOV, LEON NIKOLAEVICH. Born Feb. 23 (Mar. 7), 1830, in the village of Speshnevo, in what is now Lipetsk Oblast; died there Dec. 31, 1908 (Jan. 13, 1909). Russian chemist.

Shishkov graduated in 1851 from the Mikhail Artillery School in St. Petersburg, where he later taught. In 1860 he became a professor at the Mikhail Artillery Academy, where in 1861 he established a chemistry laboratory considered exemplary for its time. He retired from teaching in 1865 and moved to the country, where he continued his research. Shishkov's main works were devoted to the chemistry of explosives. Shishkov studied the physicochemistry involved in the combustion of gunpowder. He also studied the composition and structure of fulminic acid and its salts (fulminates). He was the first to synthesize and describe a number of nitro compounds, such as tetranitromethane and trinitromethane (or nitroform).

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SHISHKOV, MATVEI ANDREEVICH. Born 1832 in Moscow; died June 15 (27), 1897, in La Seyne-sur-Mer, near Toulon. Russian stage designer.

Shishkov studied in the Stroganov School and under the stage designer Kh. Shen'ian in Moscow. He first worked under the direction of A. A. Roller in St. Petersburg in 1852. In 1869 he became an academician of the St. Petersburg Academy of Arts, and in 1884 he became a professor.

Shishkov introduced historical authenticity into Russian stage design by using details of everyday life; however, the productions he worked on were often excessively naturalistic and overburdened with props. Shishkov's best designs were for A. K. Tolstoy's *The Death of Ivan the Terrible* (1867, Aleksandrinskii Theater, in collaboration with V. G. Shvarts and G. G. Gagarin) and Tchaikovsky's *Vakula the Smith* (1877, Mariinskii Theater, in collaboration with M. I. Bocharov).

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SHISHKOV, VIACHESLAV IAKOVLEVICH. Born Sept. 21 (Oct. 3), 1873, in the city of Bezhetsk, in what is now Kalinin Oblast; died Mar. 6, 1945, in Moscow. Soviet Russian writer.

Shishkov, the son of a merchant, graduated from the Vyshnii Volochek Technical School in 1891. His works first appeared in print in 1908. His sketches and short stories, topical in theme and pervaded with compassion for the people's difficult life, continued the democratic traditions of progressive Russian literature.

In 1916, M. Gorky published Shishkov's novella *The Taiga* in the magazine *Letopis'*. His novel *The Crowd* (1923) and the novellas *Lake Peipus* (1924) and *The Wanderers* (1931) depicted the life and heroic struggle of the young Soviet republic. In the novel *The River Ugrium* (vols. 1–2, 1933), Shishkov dealt with the rise and fall of Russian capitalism and with the working class' struggle against its oppressors and its growing revolutionary consciousness. Shishkov's most significant work was the historical epic *Emel'ian Pugachev* (books 1–3, 1938–45; State Prize of the USSR, 1946), which made a major contribution to the development of the historical genre in Soviet literature. Based on many years of study of historical documents, the epic describes the past from the standpoint of modern historiography. Colorful language, skillfully molded characters, and effective descriptions of nature are typical of Shishkov's style.

Shishkov was awarded the Order of Lenin and the Order of the Badge of Honor.

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Russkie sovetskie pisateli-prozaiki: Biobibliograficheskii ukazatel', vol. 6, part 1. Moscow, 1969. V. A. BORISOVA [29–1248–3]

SHISHKOV, VLADIMIR PETROVICH. Born May 24, 1927, in Odoev, Raion, Tula Oblast. Soviet veterinarian. Academician of the V. I. Lenin All-Union Academy of Agricultural Sciences (1973). Member of the CPSU since 1951.

Shishkov graduated from the Moscow Veterinary Academy in 1951. Beginning in 1956, he worked at the academy, where he became rector in 1967. He has been academician-secretary of the veterinary division of the V. I. Lenin All-Union Academy of Agricultural Sciences since 1973. Shishkov's work has dealt mainly with metabolic diseases of highly productive animals, diseases of young animals, leukosis, developmental physiology, geographic pathology, and veterinary aspects of stock raising.

Shishkov has been awarded the Order of the Red Banner of Labor and several medals. [29–1248–2]

SHISHMANOV, IVAN DMITROV. Born June 22, 1862, in Svishtov; died June 22, 1928, in Oslo, Norway; buried in Sofia. Bulgarian literary scholar, folklorist, and cultural historian. Member of the Bulgarian Literary Society (1902; now the Bulgarian Academy of Sciences).

In 1884, Shishmanov went abroad to study, attending over the years the universities of Jena, Geneva, and Leipzig. He became a professor at the University of Sofia in 1894. From 1903 to 1907 he served as Bulgaria's minister of education. Shishmanov was the first Bulgarian scholar to study literature from the point of view of culture and social history. He did considerable research on writers and cultural figures of the Bulgarian national renaissance of the period 1750 to 1878. His works include writings on Bulgaria's literary ties with Russia and the Ukraine and a series of lectures on comparative Western European literatures in the 18th century.

Shishmanov was the author of the fundamental work *I. Vazov: Memoirs and Documents* (1930). He undertook the publication of the series *Sbornik za narodni umotvoreniia, nauka, i knizhina* (from 1889) and served as its first editor; the series, which was later published under the auspices of the Academy of Sciences, was devoted to the folklore, science, and literature of the Bulgarian people.

Shishmanov's works marked the beginning of Bulgarian folklore studies and ethnography.

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SHISHMAREV, GLEB SEMENOVICH. Born 1781; died Oct. 22 (Nov. 3), 1835, in St. Petersburg. Russian navigator; rear admiral.

In the period 1815–18, Shishmarev circumnavigated the globe on the brig *Riurik*, under the command of O. E. Kotsebu (Kotzebue). He conducted hydrographic investigations in the Pacific Ocean. Between 1819 and 1822 he commanded the sloop *Blagonamerennyi*, which, as part of M. N. Vasiliev's expedition to circumnavigate the globe, attempted to find a sea route from the Bering Strait to the Atlantic Ocean along the shores of Siberia or America. A bay (Shishimaref Inlet) in Alaska, a passage near the Marshall Islands, islands in the Kara Sea, and a peak in Antarctica are named after Shishmarev.

REFERENCE
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SHISHMAREV, VLADIMIR FEDOROVICH. Born Mar. 13 (25), 1875, in St. Petersburg; died Nov. 21, 1957, in Leningrad. Soviet philologist. Academician of the Academy of Sciences of the USSR (1946).

Shishmarev graduated from the University of St. Petersburg in 1897. He pursued graduate study in Romance philology in France and Italy from 1899 to 1903. He became a professor at Petrograd (later Leningrad) University in 1918. Shishmarev organized the First Workers' and Peasants' University in Kostroma and served as the dean of its faculty of humanities in 1918 and 1919. He was the director of the Institute of World Literature from 1944 to 1947 and engaged in scholarly work at the Institute of Linguistics of the Academy of Sciences of the USSR from 1950 to 1957.

Shishmarev, whose principal works dealt with Romance philology, studied the poetry of the later Middle Ages in France, notably in *Guillaume de Machaut: Lyric Poetry* (vols. 1–2, 1909; Prix Saintour of the Académie Française, 1909) and *Lyric Poetry and Lyric Poets of the Later Middle Ages: Essays in the History of the Poetry of France and Provence* (1911). He also studied the French and Italian Renaissance and conducted research on the paleography, textual criticism, and theory and history of music.

In the 1930's, Shishmarev investigated general problems of philology and linguistics in such works as *The Historical Morphology of the French Language* (1952), *Readings in the History of the French Language: Ninth to 15th Centuries* (1955), and *Dictionary of Old French: For Use with "Readings in the History of the French Language"* (1955, with M. A. Borodina and M. V. Gordina). Shishmarev was awarded the Order of Lenin and three other orders.

WORKS
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R. A. AGEEVA [29–1251–1]

SHITIKOV, ALEKSEI PAVLOVICH. Born Mar. 1 (14), 1912, in the village of Gorka, in what is now Kologriv Raion, Kostroma Oblast. Soviet state and party figure. Member of the CPSU since 1939.

The son of a peasant, Shitikov graduated from the Gorky Agricultural Institute in 1936 and from the Higher Party School Under the Central Committee of the ACP(B) in 1941. In 1936 he began working as an animal specialist for the raion department of agriculture and became first secretary of the Ardatov raion committee of the Komsomol in Gorky Oblast. Shitikov served in the Soviet Army and fought in the Great Patriotic War of 1941–45. From 1945 to 1948 and again from 1950 to 1952 he held a position in the apparatus of the Khabarovsk Krai Committee of the ACP(B). From 1948 to 1950 he was secretary of the Kamchatka oblast committee of the ACP(B), and from 1952 to 1955 he served as first secretary of the oblast committee of the CPSU in the Jewish Autonomous Oblast. Between 1955 and 1957, Shitikov was secretary and second secretary of the Khabarovsk Krai Committee of the CPSU, and from 1957 to 1970 he served as first secretary of the committee.

In 1970, Shitikov became chairman of the Soviet of the Union, one of the chambers of the Supreme Soviet of the USSR. In 1961 he was elected a member of the Central Committee of the CPSU. Shitikov served as a deputy to the fourth through tenth convocations of the Supreme Soviet of the USSR. He became chairman of the Parliamentary Group of the USSR in 1970 and chairman of the Soviet Committee for European Security and Cooperation in 1971.

Shitikov has been awarded three Orders of Lenin, three other orders, and various medals. [29–1240–2]

SHITKINO, an urban-type settlement in Taishet Raion, Irkutsk Oblast, RSFSR. Shitkino is situated on the left bank of the Biriusa River, in the Enisei basin, 61 km northeast of the Taishet railroad station on the Trans-Siberian Railroad. The Taishet Logging and Timber Distribution Establishment and a combine that manufactures wood products are located in Shitkino. [29–1240–3]

SHITT, PETR GENRIKHOVICH. Born Aug. 1 (13), 1875, in Kitrysh, Bel'tsy District, Bessarabia Province; died Jan. 31, 1950, in Moscow. Soviet specialist in fruit growing. Honored scientist of the RSFSR (1946). Member of the CPSU from 1947.

Shitt graduated from Novorossiia University in Odessa in 1908. In 1920 he became head of the department of fruit growing at the K. A. Timiriazev Moscow Agricultural Academy. He investigated the growth and developmental patterns of fruit plants and studied different varieties. He established the cyclical alternation of the skeletal and overgrowing parts in the crown, the tiered quality of branch arrangement, and the morphological parallelism between fruit and berry plants. Shitt received the State Prize of the USSR in 1950.

WORKS
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Petr Genrikhovich Shitt (biobibliographical guide). Moscow, 1955. (*Uchenye Timiriazevskoi akademii.*) [29–1240–4]

SHIVANDA, a balneological health resort in Shilka Raion, Chita Oblast, RSFSR; situated at an elevation of 800 m in the Shivanda River valley, 205 km from Chita and 15 km from the Razmakhnino railroad station. Summers are warm, with an average July temperature of 20°C, and winters are cold, with an average January temperature of −27°C. Shivanda receives 290 mm of precipitation a year. The therapeutic waters used in the resort come from carbonic ferruginous hydrocarbonate calcium-magnesium springs and are used for bathing and drinking. The resort offers treatment for disorders of the cardiovascular system, digestive organs, and respiratory organs; it does not treat tuberculosis, however. Shivanda has a sanatorium. [29–1175–3]

SHIVAZA, IASYR DZHUMAZOVICH (pen name, Shchianma). Born May 5 (18), 1906, in the village of Aleksandrovka, in what is now Moscow Raion, Kirghiz SSR. Soviet Dungan writer. People's Poet of Kirghizia. Member of the CPSU from 1940. Candidate member of the Central Committee of the Kirghiz Communist Party (1958-65).

Shivaza graduated from the G. Tukai Tatar Institute of Education in Tashkent in 1930 and later served in the Great Patriotic War (1941–45). From 1957 to 1964 he was editor of the Dungan-language newspaper *Shyiuedi Chi* (Banner of October), which is circulated in several republics of the USSR.

Shivaza's works, which first appeared in print in 1929, include the poetry collections *Morning Star* (1931), *The Wave of Revolution* (1932), *Selected Verses* (1958), and *Hello, Spring* (1966). He is the author of novellas and the novel *Faithful Friends* (1958). A major theme in Shivaza's works is friendship among peoples.

Shivaza was a secretary of the Kirghiz Writers' Union from 1938 to 1942 and from 1946 to 1954. He has been awarded five orders and several medals.

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[29–1175–1]

SHIVELUCH, an active volcano on Kamchatka. Shiveluch has an elevation of 3,283 m and is composed of andesites and basalts. A Pelée-type volcano, it discharges very hot clouds of gas and ash together with lava fragments. Eruptions have occurred in 1790, 1854, 1879–83, 1896–98, 1905, 1927–29, 1944–50, and 1964. Up to an elevation of 750 m, the slopes of Shiveluch are covered with forests and thickets of dwarf stone pine; at higher elevations, meadows and lava-ash surfaces are found. [29–1175–4]

SHKADOV, IVAN NIKOLAEVICH. Born Apr. 19 (May 2), 1913, in the village of Naumovo, in what is now Spas-Demensk Raion, Kaluga Oblast. Soviet military leader; general of the army (1975). Hero of the Soviet Union (Feb. 21, 1978). Member of the CPSU since 1938.

The son of a peasant, Shkadov joined the Red Army in 1935. He graduated from the Kharkov Armored School in 1938, advanced training courses for officers at the Military Academy for Armored and Mechanized Troops in 1953, and the Military Academy of the General Staff in 1959. In 1938, Shkadov commanded a tank platoon in fighting near Lake Khasan.

During the Great Patriotic War, Shkadov was assistant chief of staff of a tank regiment and commander of a tank battalion in 1941 and 1942 and commander of a separate tank regiment and a separate tank brigade between 1942 and 1945. He fought at Moscow and Stalingrad, in the Iaşi-Kishinev Operation, and in the liberation of Rumania, Bulgaria, and Yugoslavia.

After the war, Shkadov continued to serve in command positions. He was named deputy commander of the Carpathian Military District in March 1961. From 1964 to 1967 he headed a group of Soviet military specialists in the Republic of Cuba. Shkadov was appointed commander of the Northern Group of Forces in May 1967, first deputy director of the Military Academy of the General Staff in December 1968, and chief of the Main Director-

ate of Military Educational Institutions of the Ministry of Defense in July 1969. Shkadov became chief of the Main Directorate of Personnel of the Ministry of Defense of the USSR in August 1972.

Shkadov was a deputy to the ninth convocation of the Supreme Soviet of the USSR. He has been awarded the Order of Lenin, the Order of the October Revolution, five Orders of the Red Banner, the Order of Suvorov Third Class, two Orders of the Red Star, and various medals. Shkadov has also received foreign orders and medals. [29–1252–4]

SHKETAN, M. (also Iakov Pavlovich Maiorov). Born Oct. 17 (29), 1898, in what is now the M. Shketan Kolkhoz, Orshanka Raion, Mari ASSR; died there May 16, 1937. Soviet Mari writer.

The son of a peasant, Shketan returned to his native village in 1929 and took part in the construction of a kolkhoz. He was first published in 1923. In such plays as *Hey, Parents!* (1928) and *An Aftertaste of Dregs* (1932), Shketan vividly portrayed the search of the Mari working people for a path to a new life. He also wrote short stories (including humorous stories), literary sketches, and publicist articles. Shketan's principal work was the novel *Erenger* (1933), which depicts the socialist reconstruction of the Mari countryside.

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SHKHARA, the highest mountain of the Vodorazdel'nyi Range (also known as the Glavnyi Range) in the Greater Caucasus; situated in the central part of the range. The mountain has an elevation of 5,068 m. It is composed of granites and schists. The Bezengi Glacier is on the northern face of the mountain, and the Shkhara Glacier on the southern face. Soviet mountaineers first climbed Shkhara in 1933. [29–1560–2]

SHKHEL'DA, a massif in the central part of the Greater Caucasus, southeast of Mount Elbrus; located in the basin of the Adylsu River, a right tributary of the Baksan. The massif has five peaks, with elevations ranging from 4,2000 m to 4,322 m. It is composed mainly of granites. The Shkhel'da Glacier, which has a length of approximately 9.8 km, is located on the northern slope. Soviet mountaineers first climbed the massif in 1936. [29–1560–3]

SHKIRIATOV, MATVEI FEDOROVICH. Born Aug. 3 (15), 1883, in the village of Vishniakovo, Tula Province; died Jan. 18, 1954, in Moscow. Soviet party figure. Member of the CPSU from 1906.

The son of a peasant, Shkiriatov was a worker. He carried out party work in Moscow, Rostov-on-Don, and Tula and was arrested several times. In 1915 he was conscripted into the army, where he carried on revolutionary propaganda among the soldiers. After the February Revolution of 1917, Shkiriatov served on the executive committee of the Moscow soviet of soldiers' deputies, the military bureau of the Moscow committee of the RSDLP(B), the executive committee of the Tula soviet, and the Tula revolutionary military committee. From 1918 to 1920 he was secretary of the central committee of the garment workers' union and a member of the Moscow oblast and city committees of the party.

In 1921, Shkiriatov began serving in the apparatus of the Central Committee of the RCP(B); he was named chairman of the Central Commission for Review and Purge of the Party's Ranks. In 1923 he became a member of the Central Control Commission of the party, and from 1927 to 1934 he was a member of the collegium of the People's Commissariat of the Workers' and Peasants' Inspectorate of the USSR. In 1934 he became a member of the Commission of Party Control of the Central Committee of the ACP(B), and from 1935 to 1952 he was deputy chairman of the commission. In 1952 he was named chairman of the body, which was reorganized in the same year and renamed the Committee of Party Control of the Central Committee of the CPSU.

Shkiriatov was a delegate to the Eighth through Nineteenth Party Congresses. He was elected a member of the Central Control Commission at the Eleventh through Sixteenth Congresses and a member of the Central Committee at the Eighteenth and Nineteenth Congresses. In 1952 and 1953 he served on the Presidium of the Central Committee of the CPSU. Shkiriatov was a delegate to the Seventh Congress of the Comintern. He served as a member of the All-Russian Central Executive Committee and the Central Executive Committee of the USSR and as a deputy to the first through third convocations of the Supreme Soviet of the USSR.

Shkiriatov, who was awarded three Orders of Lenin and various medals, is buried on Red Square by the Kremlin wall. [29–1255–2]

SHKLO, an urban-type settlement in Iavorov Raion, L'vov Oblast, Ukrainian SSR. Shklo is 4 km from the Shklo-Starzhiska railroad station. The Iavorov Mining and Chemical Plant and a plant producing *keramzit* (artificial porous filler), a plant manufacturing reinforced-concrete components, and a branch of the L'vovpribor plant are located in the settlement. [29–1256–1]

SHKLOV, a city and the administrative center of Shklov Raion, Mogilev Oblast, Byelorussian SSR. Situated on the Dnieper River, 30 km north of Mogilev, Shklov has a railroad station on the Orsha-Mogilev line. Shklov has a paper mill, a furniture factory, a plant for preprocessing flax, a mixed-feed plant, a building-materials plant, and enterprises of the food-processing industry. [29–1256–2]

SHKLOVSKII, IOSIF SAMUILOVICH. Born June 18 (July 1), 1916, in Glukhov, in what is now Sumy Oblast, Ukrainian SSR. Soviet astrophysicist. Corresponding member of the Academy of Sciences of the USSR (1966).

After graduating from Moscow University in 1938, Shklovskii began working at the Shternberg State Astronomical Institute. In 1968 he began working at the Institute for Space Research of the Academy of Sciences of the USSR. Shklovskii's main works deal with the theory of the solar corona, radio astronomy, and X-ray astronomy. In 1948 he investigated the presence of the 21-cm line in the radiation of neutral interstellar hydrogen. In 1953 he explained the properties of the Crab Nebula in terms of the radiation of relativistic electrons in a magnetic field. In 1965 he proposed a new concept of planetary nebulas, linking them to the end of the evolution of red giants and the birth of white dwarfs. In the 1970's, Shklovskii turned to the study of the nature of galactic and extragalactic X-ray sources.

Shklovskii is a foreign member of the US National Academy of Sciences and a member of the Royal Astronomical Society of Great Britain. Shklovskii received the Lenin Prize in 1960. He has been awarded the Order of the Badge of Honor and various medals.

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SHKLOVSKII, VIKTOR BORISOVICH. Born Jan. 12 (24), 1893, in St. Petersburg. Soviet Russian writer, literary scholar, and critic.

The son of a teacher, Shklovskii studied in the philological faculty at the University of St. Petersburg. His first scholarly work on literature was published in 1914. Shklovskii was close to the

futurists and was a member of the Society for the Study of Poetic Language (OPOIAZ). He was a founder and a theorist of the formalist school of literary scholarship (*see* FORMAL METHOD). Shklovskii's most important works from these years were collected in *On the Theory of Prose* (1925).

Shklovskii became aware of the limitations of the formalist school in the 1930's. He began dealing with literature from a broad sociohistorical viewpoint in his article "Monument to a Scholarly Error" (1930). Beginning in the 1930's, Shklovskii investigated the historical relations between literature and the social reality and dominant ideas of the age. His books and articles dealing with this problem include *Artistic Prose: Reflections and Analyses* (1959; 2nd ed., 1961), *Stories About Prose* (vols. 1–2, 1966), and *The Bowstring: On the Dissimilarity of the Similar* (1970).

Shklovskii also wrote memoirs and lyric epistolary books of an autobiographical nature, such as *A Sentimental Journey* (parts 1–2, 1923), *Zoo: Letters Not About Love, or The Third Héloise* (1923), *Hamburg Account* (1928), and *Once Upon a Time* (1962). Much of Shklovskii's work deals with the Russian classics. In particular, he was the author of a series of works on L. N. Tolstoy, beginning with *Material and Style in Leo Tolstoy's Novel "War and Peace"* (1928) and ending with the detailed biography *Leo Tolstoy* (1963; 2nd ed., 1967; both editions part of the series *Zhizn' zamechatel'nykh liudei* [Lives of Outstanding People]). He also wrote works on film theory; literary portraits of S. M. Eisenstein, L. V. Kuleshov, Dziga Vertov, and A. P. Dovzhenko; and screenplays.

Shklovskii was awarded the Order of the Red Banner of Labor.

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T. IU. KHMEL'NITSKAIA [29–1256–3]

SHKODËR, a city in Albania, on Lake Scutari. Administrative center of the *rrethi* (district) of Shkodër. Population, more than 60,000 (1975). A landing on Lake Scutari, Shkodër is linked by highway with the cities of Tirana and Durrës and with Titograd, Yugoslavia. Shkodër's industry includes ferrous metallurgy, food processing, and tobacco production as well as the manufacture of cement, wood products, paper, textiles, and leather products. The ruins of the 14th-century citadel of Rozafat are located in Shkodër. [29–1258–2]

SHKOLA I PROIZVODSTVO (School and Industry), a monthly scientific and methodological journal of the Ministry of Education of the USSR. Founded in Moscow in 1957, the journal was published until 1960 under the title *Politekhnicheskoe obuchenie* (Polytechnical Training). *Shkola i proizvodstvo* is intended for teachers at vocational and industrial training schools, workers at interschool industrial training centers and school workshops, teachers of drafting and drawing, workers in public education, and students in pedagogical institutes. Circulation, 134,500 (1978). [29–1263–2]

SHKOLA I ZHIZN' (School and Life), a weekly pedagogical newspaper of a liberal orientation. The newspaper, which was published in St. Petersburg from November 1910 through 1917, was edited by G. A. Fal'bork, a progressive Russian figure in public education. It dealt with such matters as preschool upbringing; elementary, secondary, and higher education; educational work among adults; the activities of teachers' organizations; and congresses on public education. Prominent Russian pedagogues, such as V. P. Vakhterov, K. N. Venttsel', E. A. Zviagintsev, and N. V. Chekhov, contributed to the newspaper. On occasion, special monographs on the upbringing of children were included with the newspaper as supplements. [29–1263–1]

SHKOL'NIKOV, ALEKSEI MIKHAILOVICH. Born Jan. 2 (15), 1914, in the city of Egor'evsk, Moscow Oblast. Soviet state and party figure. Member of the CPSU since 1940.

The son of a peasant, Shkol'nikov graduated from the Podol'sk Industrial Technicum in 1933. In 1937 he completed three correspondence courses at the Industrial Academy, and in 1952 he graduated from the Higher Party School Under the Central Committee of the ACP(B). Beginning in 1933, Shkol'nikov engaged in engineering and technical work in Perm', where he was a senior foreman, shop head, and chief power engineer of a plant. In 1943 he turned to party work. From 1945 to 1947, Shkol'nikov was a commissioner of the Party Control Commission of the Central Committee of the ACP(B) for Vladimir and Voronezh oblasts. From 1947 to 1949 he was second secretary of the Kaluga oblast party committee. He served as first secretary of the Tambov oblast committee of the CPSU from 1952 to 1955, first secretary of the Voronezh oblast committee from 1955 to 1960, and first secretary of the Volgograd oblast committee from 1960 to 1965; in addition, he served as first secretary of the Volgograd oblast rural committee of the CPSU in 1963 and 1964.

Shkol'nikov became first deputy chairman of the Council of Ministers of the USSR in 1965, and in 1974 he became chairman of the Committee of People's Control of the USSR. He was elected a candidate member of the Central Committee of the CPSU in 1952 and a member in 1956. He served as a deputy to the fourth through tenth convocations of the Supreme Soviet of the USSR.

Shkol'nikov has been awarded four Orders of Lenin, the Order of the Red Banner of Labor, and various medals. [29–1269–2]

SHKOTOVO, an urban-type settlement in Shkotovo Raion, Primor'e Krai, RSFSR. Situated on the shore of Ussuri Bay, on the Sea of Japan, Shkotovo has a railroad station on the Uglovaia-Nakhodka line. The settlement has an automotive-repair plant, a cannery, a building-materials combine, a beekeeping sovkhoz, and a sovkhoz for raising vegetables and dairy animals. Coal is mined in the area. [29–1270–1]

SHKURO, ANDREI GRIGOR'EVICH (also A. G. Shkura). Born Jan. 7 (19), 1887; died Jan. 17, 1947. White Guards lieutenant general (1919).

Shkuro was the son of a cossack officer in Kuban' Oblast. He graduated from the Nicholas Cavalry School in 1907 and served in the Kuban' Cossack Host. He served in World War I as commander of a special partisan detachment with the rank of colonel. In the spring of 1918 he formed a counterrevolutionary cossack detachment in the Batalpashinsk region and during May and June raided Stavropol', Essentuki, and Kislovodsk. He later commanded a Kuban' Cossack brigade and a division in Denikin's army; in May 1919 he took command of a cavalry corps. The troops under Shkuro's command were known for their unusual cruelty and lack of discipline, which displeased even the White Guards command. After the White Guards were crushed, Shkuro emigrated and carried on anti-Soviet activities.

In the period 1939–45, Shkuro cooperated with the Nazis and, on their orders, took part in the formation of anti-Soviet cossack units made up of traitors and White émigrés. In 1945, Shkuro was detained by British troops in Austria and was turned over to the Soviet command. Shkuro was executed in conformity with a sentence by the Supreme Court of the USSR. [29–1271–2]

SHLATTER, IVAN ANDREEVICH. Born Feb. 19 (Mar. 1), 1708, in Berlin; died Jan. 23 (Feb. 3), 1768, in St. Petersburg. Russian scientist and state figure.

Shlatter joined the staff of the assay laboratory of the Berg-Kollegiia in 1722. He took a position at the mint in St. Petersburg in 1724 and was appointed director in 1754. From 1760 to 1768, Shlatter was president of the Berg-Kollegiia.

Shlatter improved the methods used in coining and in the smelting of precious metals. He also proposed a refining method in which gold and silver are separated pyrometallurgically and the extracted argentous gold is treated hydrometallurgically. Shlatter's principal works dealt with mining, metallurgy, assaying, and hydraulic and steam power systems. They were used as textbooks at metallurgical schools, the Mining School, and, later, the Cadet School of Mining.

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SHLEISNER, OL'GA ALEKSANDROVNA (married name, Natanson). Born circa 1850 in Kursk Province; died Mar. 16 (28), 1881, in St. Petersburg. Russian revolutionary Narodnik (Populist). Wife of M. A. Natanson.

The daughter of a *dvorianin* (nobleman), Shleisner joined the revolutionary movement in 1870 and helped establish the Chaikovskii circle. She helped found Land and Liberty in 1876 and became a member of its governing body, the Grand Council. She was also an organizer of Narodnik settlements in Saratov Province.

In October 1878, Shleisner was imprisoned in the Peter and Paul Fortress. In May 1880 the St. Petersburg Military District Court gave her a sentence of six years' hard labor, which was commuted to exile in Siberia. Since she was terminally ill, she was kept in St. Petersburg and was released in February 1881, with a sponsor taking responsibility for her actions. Shleisner died shortly thereafter.

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SHLIAKHETSTVO, a term borrowed from Polish (*szlachectwo*) and used in 18th-century Russia to designate the nobility. The adjectival derivatives are *shliakhetnyi* and *shliakhetskii*. [29–1308–3]

SHLIKHTER, ALEKSANDR GRIGOR'EVICH. Born Aug. 20 (Sept. 1), 1868, in the city of Lubny, in what is now Poltava Oblast; died Dec. 2, 1940, in Kiev. Soviet state and party figure. Academician of the Academy of Sciences of the Ukrainian SSR (1929) and the Academy of Sciences of the Byelorussian SSR (1934). Doctor of economic sciences (1935). Member of the Communist Party from 1891.

The son of a carpenter, Shlikhter joined the revolutionary movement in 1887. Between 1889 and 1891 he studied at the universities of Kharkov and Bern. Over a period beginning in 1891 he carried out work for the Social Democratic Party in the Ukraine, the Urals, and Samara. He was exiled to Vologda Province in 1895. Shlikhter served on committees of the RSDLP in Tula (1901–02), Kiev (1902–04), and Moscow (1907–08). From 1905 to 1907 he helped lead the revolutionary struggle in Kiev, St. Petersburg, and Finland. Shlikhter served as a delegate to the Fifth Congress of the RSDLP. In 1909 he was exiled to Eastern Siberia.

After the February Revolution of 1917, Shlikhter became a member of the executive committee of the Krasnoiarsk soviet and the Central Siberian oblast bureau of the RSDLP. He was a delegate to the Sixth Congress of the RSDLP(B) and a member of the Moscow committee of the RSDLP(B). During the October Days of 1917, he served as commissar for foodstuffs for the Moscow military revolutionary committee, and between 1917 and 1919 he was people's commissar of agriculture, people's commissar for foodstuffs of the RSFSR, and people's commissar for foodstuffs of the Ukraine. In 1920 and 1921, Shlikhter was chairman of the Tambov provincial executive committee. In 1921 he undertook diplomatic work and became a member of the collegium of the People's Commissariat of Foreign Affairs of the USSR and the People's Commissariat for Foreign Trade of the USSR. From 1927 to 1929 he was people's commissar of agriculture of the Ukrainian SSR.

From 1931 to 1938, Shlikhter was vice-president of the Academy of Sciences of the Ukrainian SSR, and from 1930 to 1933 he also served as director of the Ukrainian Institute of Marxism-Leninism. He was also a delegate to the Fourteenth through Seventeenth Congresses of the ACP(B). In 1924, Shlikhter became a member of the Central Committee of the Communist Party of the Ukraine (Bolshevik), and from 1926 to 1937 he was a candidate member of the Politburo of the Central Committee. In 1924 he served as a delegate to the Fifth Congress of the Comintern. He was a member of the All-Russian Central Executive Committee and the Presidium of the Central Executive Committee of the USSR. In 1923, Shlikhter was named a member of the Presidium of the Central Executive Committee of the Ukrainian SSR.

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SHLINO (also Shlino Reservoir), a lake on the border between Kalinin and Novgorod oblasts, RSFSR, in the northern Valdai Hills. The lake occupies an area of 34 sq km and has an elevation of 199 m. The Shlina River, which empties into the Vyshnii Volok Reservoir, originates at the lake. The water flow at the head of the Shlina River is regulated by the Shlina Dam. Water from Lake Vel'e (Pola River basin) flows into Lake Shlino via the Vel'e Canal. [29–1290–2]

SHLISSEL'BURG FORTRESS, a fortress on Orekhovoi Island, at the place where the Neva River flows from Lake Ladoga. The fortress was known as Oreshek until 1611 and as Noteborg from 1611 to 1702; it was called Shlissel'burg Fortress from 1702 to 1944, when it was renamed Petrokrepost'.

Shlissel'burg Fortress was erected by the Novgorodians in 1323; a stone wall was built around the structure in 1353. Archaeologists have uncovered the remains of the wall, along with canals and a man-made harbor (15th–16th centuries) within the fortress, into which ships could enter through a special passage in the wall. The fortress, which was rebuilt numerous times, forms an irregular triangle; five of its original seven towers have been preserved. The walls were up to 6.5 m thick. A specially fortified structure, or citadel, stood in the northeast corner of the fortress, which in the early 18th century was strengthened with seven bastions.

After Kronstadt was built in 1703, Shlissel'burg lost its military importance and was converted into a political prison. Initially, the barracks, the citadel, the Old Prison (built 1798), and the casemates in the walls and towers were used as places of imprisonment. In the 18th and early 19th centuries they held members of the royal family, including the Emperor Ivan VI Antonovich; courtiers who had fallen out of favor; *raskol'niki* (schismatics); runaway serfs; and the Enlightenment writers F. V. Krechetov, N. I. Novikov, and V. N. Karazin.

In the period from 1826 to 1870, Shlissel'burg Fortress held 96 prisoners, including the Decembrists A. P. Bariatinskii, I. I. Gorbachevskii, W. K. Küchelbecker, and I. I. Pushchin; the Polish rebels W. Łukasiński and B. Szwarce; and the Russian revolutionaries M. A. Bakunin and N. A. Ishutin. Beginning in 1872, correctional labor companies made up of arrested military personnel were stationed at the fortress, followed by a disciplinary battalion in 1879. Between 1881 and 1884 the New Prison was

built, in which unusually strict conditions prevailed; a gendarme section directly subordinate to the chief of the gendarmes was established.

In the period from 1884 to 1906, the fortress held 69 revolutionaries, including such Narodniki (Populists) of the 1870's as A. V. Dolgushin and I. N. Myshkin; the members of the Polish party Proletariat L. Waryński and L. Janowicz; the People's Will members M. Iu. Ashenbrenner, G. A. Lopatin, N. A. Morozov, V. N. Figner, and M. F. Frolenko; and, beginning in 1902, the Socialist Revolutionaries (SR's) S. V. Balmashev, G. A. Gershuni, and E. S. Sozonov. Fifteen were executed (including members of the Terrorist Faction of the People's Will, notably A. I. Ul'ianov, on May 8, 1887), three committed suicide, 16 died, and eight went insane.

The fortress temporarily ceased to function as a prison on Jan. 8, 1906, during the Revolution of 1905–07. After the defeat of the revolution, however, a central prison with a hard-labor regime was erected, and the Old Prison and the former barracks (the Zoo) were rebuilt; a new, four-story wing for 600 prisoners was added in 1911. By 1912 the central prison could accommodate 1,700 prisoners.

More than 530 political prisoners passed through Shlissel'burg Fortress between 1907 and 1917, including more than 130 Social Democrats, among them G. K. Ordzhonikidze, F. N. Petrov, and M. A. Trilisser; other prisoners included about 150 SR's, 40 anarchists, and 16 members of the Polish Socialist Party, as well as nonparty participants in such rebellions as the soldiers' and sailors' uprisings of 1905–12 and the agrarian disturbances of 1905–07. The political prisoners engaged in self-education. They responded to harsh conditions with collective protests in 1908 and 1912, and they maintained communication with the Social Democratic faction of the Fourth State Duma through the illegal Group to Aid the Political Prisoners of Shlissel'burg.

On Feb. 28 and Mar. 1, 1917, all the prisoners in the fortress were freed by the insurgent workers of the Shlissel'burg Plant. On Jan. 23, 1919, a monument was erected on a spit on the eastern part of the island to honor all who had died within the fortress walls between 1884 and 1906 (sculptor I. Ia. Gintsburg).

The Shlissel'burg Fortress, which was destroyed during the Great Patriotic War of 1941–45, is today being restored as a branch of the State Museum of History of Leningrad.

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Vasin, M. "Interv'iu v 'Gosudarevoi temnitse.' " In *Belye nochi*. Leningrad, 1974. Pages 219–66. [29–1291–3]

SHLOMIN, MITROFAN IVANOVICH. Born Nov. 24, 1896, in the village of Iznoskovo, Maloiaroslavets District, Kaluga Province; died Oct. 27 (Nov. 9), 1917, in Moscow. Fought in the struggle to establish Soviet power in Moscow. Member of the Communist Party from the summer of 1917.

The son of a peasant, Shlomin became a worker in Moscow in 1911. In 1917 he was a member of the Dorogomilovo military revolutionary committee and commander of a Red Guard detachment. During the fighting in October, while transporting weapons from the Moscow soviet, Shlomin was captured by military school cadets (*iunkery*) and was killed.

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Kondrat'ev, V. *Oni zhili dlia tebia*. Moscow 1964, pp. 190–200. [29–1301–6]

SHLONSKY, ABRAHAM. Born 1900 in the village of Kriukovo, in what is now Kremenchug Raion, Poltava Oblast, Ukrainian SSR; died May 18, 1973, in Tel Aviv. Israeli poet who wrote in Hebrew.

Shlonsky emigrated to Palestine in 1920. From 1928 to 1933 he published collections under the title *Notes*, which were extremely popular among the avant-garde political youth. Themes recurring in his works of the 1930's are the struggle against the desert and praise of the fruitful earth, for example, in *Stumbling Blocks* (1932) and *Poems of Collapse and Appeasement* (1938). Also of note is his poem "Stalingrad" (1943). Shlonsky translated the works of A. S. Pushkin and M. A. Sholokhov into Hebrew.

Shlonsky was a member of the World Peace Council.

WORKS
In Russian translation:
[Stikhi.] In the collection *Poety Izrailia*. Moscow, 1963. [29–1287–2]

SHLUH (also Chleuch), a Berber people inhabiting the western part of the High Atlas and the Anti Atlas in Morocco. The Shluh live in the valleys of the Sous and Tensift rivers along with the Arab population. They number about 2 million (1975, estimate).

The Shluh are subdivided into separate groups, including the Aghbar, Fruga, Glawa, Ksima, Menaba, and Mtuga. They speak a language of the Berber group, and some also speak Arabic. The religion is Islam. The main occupations are mountain farming and transhumant livestock breeding of sheep and goats. [29–1288–2]

SHLYK, ALEKSANDR ARKAD'EVICH. Born Nov. 1, 1928, in Minsk. Soviet plant physiologist and biochemist. Corresponding member of the Academy of Sciences of the USSR (1966). Member of the CPSU since 1948.

Upon graduation from the Byelorussian University in 1950, Shlyk worked in the Institute of Biology of the Byelorussian Academy of Sciences. In 1957 he became head of the academy's Laboratory of Biophysics and Isotopes. Since 1973 Shlyk has been director of the Institute of Photobiology, which evolved from the Laboratory of Biophysics and Isotopes.

Shlyk's research has been directed at the development of the photosynthetic apparatus. He and his colleagues demonstrated the existence of a chlorophyll renewal process and elucidated its main mechanisms. Shlyk showed that chlorophyll b is synthesized from labile chlorophyll-a molecules and studied the metabolism of the precursors of chlorophyll-a molecules in green plants. Shlyk has been awarded the Order of the Red Banner of Labor and a medal.

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"Tsentry biosinteza khlorofilla i regulirovanie protsessa formirovaniia pigmentnogo apparata fotosinteza." [With coauthors.] *Izv. AN SSSR: Ser. biologicheskaia*, 1976, no. 1. [29–1302–1]

SHMAKOV, FEDOR IVANOVICH. Born Feb. 16 (Mar. 1), 1917, in Petrograd. Soviet Byelorussian actor. People's Artist of the USSR (1975). Member of the CPSU from 1948.

In 1939, Shmakov graduated from the Leningrad Theatrical Institute and joined the company of the Russian Theater of the Byelorussian SSR in Mogilev. In 1941 he began working at the Byelorussian Second State Theater in Vitebsk (now the Ia. Kolas Byelorussian Drama Theater). Shmakov appeared in the role of V. I. Lenin in Popov's *The Family*, D. Zorin's *The Eternal Source*, Shatrov's *The Sixth of July*, and Pogodin's *The Third Pathétique*. His other major parts have included Akim in Tolstoy's *The Power of Darkness*, Prisypkin in Mayakovsky's *The Bedbug*, Vaskov in Vasil'ev's *And Dawns Are Quiet Here*, and the title role in Vol'skii's *Nesterka*. He has also appeared in motion pictures, notably as Iusalov in *Immortal Song* (1958), Rubin in *Kochubei* (1958), and Andrei Razmetnov in *Virgin Soil Upturned* (1960–61).

Shmakov, a recipient of the State Prize of the Byelorussian SSR in 1968, has been awarded two orders and several medals. [29–1309–1]

SHMAKOV, PAVEL VASIL'EVICH. Born Dec. 15 (27), 1885, in the village of Snovitsy, Vladimir Province. Soviet specialist in television and electronics. Doctor of technical sciences; professor (1937). Honored Worker in Science and Technology of the RSFSR (1948). Hero of Socialist Labor (1966).

Shmakov graduated from Moscow University in 1912. He taught at the Plekhanov Moscow Institute of the National Economy from 1921 to 1930, at the Moscow Higher Technical School from 1924 to 1930, and at the Moscow Power Engineering Institute from 1930 to 1932. He headed a laboratory at the All-Union Scientific Research Institute of Television in Leningrad from 1935 to 1937 and was director of the institute from 1946 to 1948. Shmakov was named head of the subdepartment of television at the Leningrad Electrical Engineering Institute of Communications in 1937.

Shmakov is credited with several inventions, including a television camera tube with image transfer, called the image iconoscope, which he and P. V. Timofeev developed in 1933. Shmakov's principal works are devoted to facsimile and to color and stereoscopic television. Shmakov received the State Prize of the USSR in 1973 and has been awarded two Orders of Lenin, the Order of the Red Banner of Labor, and various medals.

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Pavel Vasil'evich Shmakov. Leningrad, 1975. [29–1308–5]

SHMAKOVKA, a balneological health resort in Primor'e Krai, RSFSR, 38 km from the Shmakovka railroad station and 340 km from Vladivostok. Summers are warm, with an average July temperature of 21°C, and winters are cold, with an average January temperature of −22°C; precipitation totals 610 mm annually. Therapeutic waters used in the resort come from carbonic hydrocarbonate calcium-magnesium springs and are used for bathing and drinking. Disorders of the digestive organs and the cardiovascular and nervous systems are treated. Shmakovka has a sanatorium and bathhouses. [29–1309–2]

SHMAL'GAUZEN, IVAN FEDOROVICH. Born Apr. 3 (15), 1849, in St. Petersburg; died Apr. 7 (19), 1894, in Kiev. Russian botanist. Corresponding member of the St. Petersburg Academy of Sciences (1893). Father of I. I. Shmal'gauzen.

I. F. Shmal'gauzen graduated from the University of St. Petersburg in 1871. He was a professor at the University of Kiev from 1879. His main works dealt with paleobotany and floristics. Shmal'gauzen was the author of *Flora of Southwestern Russia* (1886), *Flora of Middle and Southern Russia, the Crimea, and the Northern Caucasus* (vols. 1–2, 1895–97), and a number of monographs devoted to fossil plants of the Devonian, Carboniferous, Permian, Jurassic, and Tertiary periods. These works played a major role in the development of Russian paleobotany.

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SHMAL'GAUZEN, IVAN IVANOVICH (also Schmalhauzen). Born Apr. 11 (23), 1884, in Kiev; died Oct. 7, 1963, in Moscow. Soviet biologist, zoologist, and theorist on evolution. Academician of the Academy of Sciences of the USSR (1935) and the Academy of Sciences of the Ukrainian SSR (1922). Honored Scientist of the Ukrainian SSR (1935). Son of I. F. Shmal'gauzen.

Shmal'gauzen graduated from the University of Kiev (1907), where he was a student of A. N. Severtsov. He was a professor at the universities of Voronezh (from 1918) and Kiev (from 1921). From 1939 to 1948 he was a professor at Moscow University, where he was also chairman (1939–48) of the subdepartment of Darwinism that he had organized. Between 1930 and 1941 he was director of the Institute of Zoology and Biology of the Academy of Sciences of the Ukrainian SSR, and between 1936 and 1948, director of the Institute of Evolutionary Morphology of the Academy of Sciences of the USSR (now the A. N. Severtsov Institute of Evolutionary Morphology and Animal Ecology of the Academy of Sciences of the USSR). From 1948 to 1955 he was a senior research worker at the Zoological Institute of the Academy of Sciences of the USSR; from 1955 to 1963 he was head of the institute's embryology laboratory.

Shmal'gauzen's works (descriptive, experimental, and theoretical) dealt primarily with comparative anatomy and embryology; evolutionary morphology; the origin of land vertebrates; growth processes of organisms; phenogenetics; morphogenesis; factors, pathways, and patterns of evolution; and biocybernetics. In the period 1920–30 he formulated a universal law of growth based on quantitative analysis and devised a methodology for determining growth constants that proved to be of great practical value. At the same time, he studied the development of qualitative characters in ontogeny and demonstrated the overall complexity and genotypic dependence of their morphogenetic interrelations. Beginning in the 1930's, Shmal'gauzen devoted himself to general biological problems, which he unswervingly interpreted from the dialectical-materialist standpoint. He supplemented Darwin's materialist theory of evolution by showing the integral nature of the organism in its individual and historical development, by introducing the theory of stabilizing selection (*see* STABILIZING SELECTION), and by investigating the mechanisms of both the evolutionary process and individual development as self-regulating systems. He thus anticipated several concepts of cybernetics on the basis of which he advanced his theory of evolution (1950–60). Shmal'gauzen's research exerted and continues to exert considerable influence on the development of biology.

Shmal'gauzen was awarded the Order of the Red Banner of Labor, the E. Metchnikoff Gold Medal of the Academy of Sciences of the USSR, and the Darwin Medal of the Leopoldina German Academy of Naturalists.

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Evoliutsionnye vzgliady I. I. Shmal'gauzena (*K 90-letiu so dnia rozhdeniia*). Leningrad, 1974. I. M. MEDVEDEVA [29–1309–4]

SHMARINOV, DEMENTII ALEKSEEVICH. Born Apr. 29 (May 12), 1907, in Kazan. Soviet graphic artist. Member of the Academy of Arts of the USSR (1953). People's Artist of the USSR (1967).

Shmarinov studied at N. A. Prakhov's studio in Kiev from 1919 to 1922 and under D. N. Kardovskii in Moscow from 1923 to 1928. He was chairman of the administrative board of the Moscow organization of the Artists' Union of the RSFSR from 1959 to 1961, from 1966 to 1968, and in 1972. He became secretary of the administrative board of the Artists' Union of the USSR in 1968.

Shmarinov works chiefly as an illustrator. He gives realistically precise graphic interpretations of literary works and conveys dramatic situations and the psychosocial characteristics of his heroes in a highly convincing manner. His works include illustrations for Dostoevsky's *Crime and Punishment* (charcoal, black watercolor, 1935–36), A. N. Tolstoy's *Peter the Great* (charcoal, black watercolor, 1940–45), and L. N. Tolstoy's *War and Peace* (black watercolor, 1953–55), all of which are housed at the Tret'iakov Gallery in Moscow. He also illustrated Lermontov's *A Hero of Our Time* (1941, Tret'iakov Gallery; Russian Museum, Leningrad) and Pushkin's *The Captain's Daughter* (1974) and *The Queen of Spades* (1976), all in charcoal and black watercolor.

During the Great Patriotic War (1941–45), Shmarinov designed a number of political posters. He also executed a cycle of easel works entitled *We Won't Forget, We Won't Forgive!* (charcoal, black watercolor, 1942, Tret'iakov Gallery). This angry, impassioned series, which was awarded the State Prize of the USSR in 1943, vividly describes the suffering and courage of the Soviet people in their struggle against the enemy. Shmarinov has also produced a number of paintings.

Shmarinov has been awarded the Order of Lenin, two other orders, and several medals.

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SHMELEV, IVAN SERGEEVICH. Born Sept. 21 (Oct. 3), 1873, in Moscow; died June 24, 1950, in Paris. Russian writer.

Shmelev was born into a merchant family. He graduated from the law faculty of Moscow University in 1898. His works first appeared in print in 1895. Shmelev's best prerevolutionary prose works showed a profound knowledge of city life and popular language; they employed the narrative technique of oral folktales. The novellas *Collapse* (1907), *Citizen Ukleikin* (1908), and *The Man From the Restaurant* (1911), which was the most significant of the three, were written in the traditional style of critical realism.

Shmelev emigrated in 1922 and later published anti-Soviet stories and books filled with nostalgia for the prerevolutionary past, for example, *The Lord's Summer* (1933).

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SHMEL'KOV, PETR MIKHAILOVICH. Born June 12 (24), 1819, in Orenburg; died Oct. 9 (21), 1890, in Moscow. Russian graphic artist and watercolorist.

Shmel'kov, the son of serfs, studied at the Moscow School of Painting, Sculpture, and Architecture under V. S. Dobrovol'skii from about 1842 to 1847. He was influenced by P. A. Fedotov. Many of his works criticized contemporary society in a satirical and humorous vein. They include genre scenes, as well as various drawings and watercolors intended for journals. With an intensity bordering on the grotesque, Shmel'kov depicted everyday situations and social types, anticipating the works of V. G. Perov and the other Moscow artists of the 1860's. Shmel'kov's works are also noteworthy for their well-conceived and expressive design and subtle use of color.

Shmel'kov also depicted scenes from literature and history and produced several lithographs. His best works include the watercolors "At the Pawnshop" (1850's), "In a Restaurant," and "Merchant at the Photographer's" (the last two 1860's, Tret'iakov Gallery, Moscow) and the lithograph series "Sketches of Factory Life" (published 1861).

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SHMIDT, ALEKSANDR ALEKSANDROVICH (also Alexander Schmidt). Born May 15 (27), 1831, on the island of Mukhu; died Apr. 10 (22), 1894, in the city of Iur'ev, now Tartu. Russian physiologist.

Shmidt graduated from the University of Dorpat in 1858 and began teaching there in 1862, becoming a professor of physiology in 1869. From 1876 to 1879 he served as dean of the university's medical faculty and from 1885 to 1890, as the university's rector. Shmidt's works dealt mainly with hematology, for example, respiratory functions of the blood and oxidative processes. Shmidt devoted considerable attention to blood coagulation and formulated the enzymatic theory of blood coagulation, investigating the function of leukocytes, cellular proteins, and other substances involved in the process. He isolated thrombin from blood serum.

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SHMIDT, ALEKSANDR ALEKSANDROVICH (in Latvian, Aleksandrs Šmidts). Born Mar. 6 (18), 1892, in Zebrene District, in what is now Dobele Raion, Latvian SSR. Soviet biochemist. Academician of the Latvian Academy of Sciences (1946) and corresponding member of the Academy of Medical Sciences of the USSR (1960). Member of the CPSU from 1950.

Shmidt graduated from the Petrograd Military Medical Academy in 1922 and was an assistant there from 1925 to 1935. From 1936 to 1945 he was a professor and chairman of the biochemistry department of the Second Leningrad Medical Institute and, at the same time, served as director of the All-Union Scientific Research Vitamin Institute. From 1945 to 1950 he was a professor at the Latvian University, and from 1950 to 1972, at the Riga Medical Institute. From 1946 to 1952 he served as academician-secretary of the division of agricultural, biological, and medical sciences of the Academy of Sciences of the Latvian SSR. From 1952 to 1954 he was chief of the metabolism and nutrition section of the Institute of Experimental Medicine of the Academy of Sciences of the Latvian SSR. In 1972 he became head of a department in the Riga Medical Institute.

Shmidt has worked mainly on the biochemistry and technology of protein and vitamin concentrates, insulin, and various vitamins, including ascorbic acid, and on the biochemistry of parenteral feeding in humans.

Shmidt received the State Prize of the USSR in 1951. He has been awarded three Orders of Lenin, three other orders, and various medals.

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SHMIDT, ALEKSANDR EDUARDOVICH. Born Mar. 12, 1871, in Astrakhan; died Aug. 9 or 15, 1939, in Tashkent. Soviet Arabist and Islamic scholar. Corresponding member of the Academy of Sciences of the USSR (1925).

Shmidt graduated from the department of Eastern languages of the University of St. Petersburg in 1894 and taught Arabic literature there for more than 20 years, becoming a professor in 1917. From 1920 to 1924 he was rector of the Turkestan Oriental Institute in Tashkent. In 1924, after the institute was reorganized into the Oriental department of the University of Tashkent, he became dean of the department. His main works were on the history of Islam.

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SHMIDT, EVGENII VLADIMIROVICH. Born Dec. 7 (20), 1905, in St. Petersburg. Soviet neuropathologist. Academician of the Academy of Medical Sciences of the USSR (1963). Hero of Socialist Labor (1975).

Shmidt graduated from the medical faculty of Moscow University in 1929 and then worked in E. K. Sepp's clinic. He became deputy director of the Scientific Research Institute of Neurology of the Academy of Medical Sciences of the USSR in 1949 and the institute's director in 1967. His principal works deal primarily with vascular diseases of the nervous system (origin, mechanisms of development, diagnosis, and treatment of cerebrovascular disorders involving the major arteries of the head), neuro-oncology, and neurotraumatology. He founded a school of angioneurologists.

Shmidt is honorary chairman of the All-Union Society of Neuropathologists and Psychiatrists (from 1975). He is an honorary member of medical societies in Bulgaria, Poland, Czechoslovakia, the United States, and France. He received the State Prize of the USSR in 1971. He has been awarded two orders of Lenin, three other orders, and several medals.

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SHMIDT, OTTO IUL'EVICH (also Schmidt). Born Sept. 18 (30), 1891, in Mogilev; died Sept. 7, 1956, in Moscow. Soviet mathematician, astronomer, geophysicist, and state and public figure. Academician of the Academy of Sciences of the USSR (1935; corresponding member, 1933) and academician of the Academy of Sciences of the Ukrainian SSR (1934). Hero of the Soviet Union (June 27, 1937). Member of the CPSU from 1918.

Shmidt graduated from the University of Kiev in 1913, where he became a privatdocent in 1916. After the October Revolution of 1917, he was a board member of several people's commissariats, including the People's Commissariat of Food (1918–20) and the People's Commissariat of Finance (1921–22). One of the organizers of higher education and science, he worked in the People's Commissariat of Education, on the State Scientific Council of the Council of People's Commissars, and in the Communist Academy. He was also one of the organizers of publishing; from 1921 to 1924 he was head of the State Publishing House, and from 1924 to 1941, editor in chief of the *Great Soviet Encyclopedia*. From 1923 to 1956, Shmidt was a professor at Moscow State University. During the same period, he was also director of the Arctic Institute (1930–32), head of the Main Northern Sea Route Administration (1932–39), and vice-president of the Academy of Sciences of the USSR (1939–42). In 1937, Shmidt helped found the Institute of Theoretical Geophysics of the Academy of Sciences of the USSR, of which he was director until 1949.

Shmidt's main works in mathematics deal with algebra; his monograph *Abstract Group Theory* (1916; 2nd ed., 1933) exerted a considerable influence on the development of group theory. Shmidt was the founder of the Moscow school of algebra, which he headed for many years.

In the mid-1940's, Shmidt proposed a new cosmogonic hypothesis about the formation of the earth and the planets of the solar system, the development of which he continued with a group of Soviet scientists until his death.

Shmidt was also one of the leading explorers of the Soviet arctic. In 1929–30 he headed expeditions aboard the icebreaker *Georgii Sedov*, which established the first scientific research station on Franz Josef Land, explored the northeastern part of the Kara Sea and the western coast of Severnaia Zemlia, and discovered a number of islands. In 1932 the expedition aboard the icebreaker *Sibiriakov*, headed by Shmidt, completed the first nonstop voyage from Arkhangel'sk to the Pacific Ocean. In 1933–34, Shmidt headed a sailing expedition aboard the *Cheliuskin* along the Northern Sea Route. In 1937 he led an air expedition to establish the drifting station Severnyi Polius-1, and in 1938 he supervised operations to remove station personnel from the iceberg.

Shmidt was a member of the Central Executive Committee of the USSR and a deputy to the first convocation of the Supreme Soviet of the USSR. He was awarded three Orders of Lenin, three other orders, and several medals. A number of natural features are named in honor of Shmidt, including an island in the Kara Sea and a cape on the coast of the Chukchi Sea, as well as a raion in the Chukchi Autonomous Okrug (Magadan Oblast) and the Institute of Earth Physics of the Academy of Sciences of the USSR.

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SHMIDT, PETR IUL'EVICH. Born Dec. 23, 1872, in St. Petersburg; died Nov. 25, 1949, in Leningrad. Soviet zoologist.

Shmidt graduated from the University of St. Petersburg in 1895. Between 1906 and 1930 he was a professor at the Agricultural Institute in St. Petersburg (Leningrad). At the same time, he lectured on ichthyology at the university and worked in the Zoological Museum of the Academy of Sciences of the USSR (1914–31). Between 1930 and 1949 he was scientific secretary of the Pacific Ocean Committee of the Academy of Sciences of the USSR.

Shmidt began his ichthyological work, specifically the study of the ichthyofauna of the Pacific Ocean, in 1900. He participated in a number of major expeditions, during which he gathered a rich collection of fish. He was the first to outline the ichthyofauna of Russian territorial waters in the Far East and to propose a number of theories concerning its distribution and origin. He wrote the first major work on the marine mammals of southern Sakhalin and a number of surveys of many groups of fish found in the Pacific Ocean. He also published works on general biology, including *Anabiosis* (1948) and *Fish Migration* (1936). The *Small Biological Encyclopedia* (1924) was published under his guidance.

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SHMIDT, PETR PETROVICH. Born Feb. 5 (17), 1867, in Odessa; died Mar. 6 (19), 1906. Russian revolutionary democrat. One of the leaders of the Sevastopol' mutiny of 1905.

Shmidt came from a family of naval officers. His father was a naval officer and a member of the *dvorianstvo* (nobility). Shmidt graduated from the Naval School in St. Petersburg in 1886 and served on the Baltic and in the Pacific. He entered the reserves in 1898 as a lieutenant and sailed on merchant marine vessels.

Recalled to active duty in 1904, Shmidt was named commander of the destroyer No. 253 of the Black Sea Fleet in January 1905. During the first stage of the Revolution of 1905–07, he organized in Sevastopol' the Union of Officer-friends of the People and then helped form the Odessa Mutual Aid Society for Merchant Seamen, one of the first labor organizations in maritime shipping.

On Oct. 20 (Nov. 2), 1905, Shmidt was arrested for speaking at meetings of sailors, workers, and soldiers, for taking part in a political demonstration, and "for an 'insolent' speech about defending, arms in hand, the liberties promised by the Manifesto of October 17" (V. I. Lenin, *Poln. sobr. soch.*, 5th ed., vol. 12, p. 111). The workers elected Shmidt a deputy for life in the Sevastopol' soviet of workers' deputies. They achieved his release from prison on November 3 (16), and he was granted retirement with the rank of captain second class on November 7 (20).

When the Sevastopol' mutiny began, the military organization of the Social Democrats proposed that Shmidt be the military leader of the uprising. Although Shmidt held no firm political views, the organization considered him a sincere revolutionary; he was knowledgeable in military affairs and was respected and liked by the sailors.

Shmidt went aboard the cruiser *Ochakov* on November 14 (27), and the red flag and the pennant of the fleet commander were raised. He was arrested on November 15 (28). After a trial that lasted from Feb. 7 to Feb. 18 (Feb. 20–Mar. 2), 1906, Shmidt was sentenced to death. He and the other leaders of the mutiny were shot on the island of Berezan'.

Shmidt was named an honorary member of the Sevastopol' soviet of working people's deputies in 1926. A museum named in his honor was opened in Ochakov in 1962, and a monument was erected on Berezan' in 1972.

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Samolis, G. V. *Muzei Shmidta v Ochakove*. Odessa, 1968.

G. V. SAMOLIS [29–1319–1]

SHMIDT, SIGURD OTTOVICH. Born Apr. 15, 1922, in Moscow. Soviet historian. Doctor of historical sciences (1965). Member of the CPSU since 1947. Son of O. Iu. Shmidt.

S. O. Shmidt graduated from the department of history at Moscow University in 1944. He became chairman of the Archaeographic Commission of the Academy of Sciences of the USSR in 1968. He joined the staff of the Moscow Institute for Historian-Archivists in 1949 and became a professor in 1970. Shmidt's principal works deal with historiography, archaeography, archive management, the sociopolitical history of Russian feudalism (particularly that of the 16th century), the history of culture, the study of historical sources, and methods of studying and teaching history.

WORKS

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[29–1320–2]

SHMIDT, VASILII VLADIMIROVICH. Born Dec. 29, 1886, in St. Petersburg; died Aug. 21, 1940. Soviet party and state figure. Member of the Communist Party from 1905.

The son of a worker, Shmidt was a metalworker by trade. After taking part in the Revolution of 1905–07, he emigrated to Germany in 1907 and returned to St. Petersburg in 1911. Between 1912 and 1914 he was secretary of the Union of Metalworkers of Vyborg District, secretary of the St. Petersburg Union of Metalworkers, and a member of the St. Petersburg committee of the RSDLP. He did party work in Ekaterinoslav. Shmidt served as the secretary of the St. Petersburg committee of the RSDLP in 1915 and 1916 and was arrested several times.

After the February Revolution of 1917, Shmidt was the secretary of the St. Petersburg committee of the RSDLP(B) and of the Petrograd Council of Trade Unions. He was a delegate to the Seventh (April) All-Russian Conference and the Sixth Congress of the RSDLP(B). He became a member of the Presidium of the All-Russian Central Council of Trade Unions and people's commissar of labor in 1918 and held both positions until 1928.

Shmidt served as deputy chairman of the Council of People's Commissars of the USSR and of the Council of Labor and Defense from 1928 to 1930. For a brief period he supported the right-wing deviation in the ACP(B). He served as deputy people's commissar of agriculture of the USSR and chief arbitrator of the Council of People's Commissars of the USSR from 1930 to 1932. In 1933, Shmidt took an administrative position in the Far East.

Shmidt was a delegate to the Seventh through Sixteenth Party Congresses. He was elected a member of the Central Committee at the Seventh, Fourteenth, and Fifteenth Congresses and a candidate member at the Eighth, Tenth, Eleventh, Thirteenth, and Sixteenth Congresses. He was a candidate member of the Organizational Bureau of the Central Committee in 1921 and 1922 and from 1926 to 1930. Shmidt also served as a member of the Central Executive Committee of the USSR.

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[29–1316–2]

SHMIDT, CAPE, a cape in northeast Asia, on the coast of the Chukchi Sea, at 68°56′N lat and 179°30′W long. In 1932 a polar station was established on the cape, which was named for O. Iu. Shmidt. [29–1321–3]

SHMIDT HYPOTHESIS (Schmidt hypothesis), in astronomy, a cosmogonic hypothesis the main part of which is the assumption that the planets were formed through the accretion of cold solid bodies of different sizes revolving around the sun. The hypothesis was proposed in 1943 by O. Iu. Shmidt (Schmidt) on the basis of a critical study of the history of planetary cosmogony and an analysis of the regularities underlying planetary motions.

Shmidt was the first to explain the causes of the direct axial rotation of planets (that is, rotation in the same direction as the revolution around the sun) and to pave the way for an explanation of the regularity underlying the distances of the planets from the sun. The assumption that the earth and related planets were formed through the accumulation of solid bodies leads to the conclusion that they originally were in a relatively cold state. This conclusion necessitated a reexamination of many concepts of the geophysical, geological, and geochemical history of the earth. Many aspects of the process of the accumulation and further development of the planets have been studied by Shmidt's colleagues and proponents on the basis of his hypothesis.

To explain the distribution of angular momentum between the sun and planets, Shmidt advanced the hypothesis that the swarm of bodies from which the planets accumulated was captured by the sun from interstellar space. However, after the 1950 studies of L. E. Gurevich and A. I. Lebedinskii, who showed that the bodies from which the planets accumulated must have been formed in the vicinity of the sun, the idea of the capture of a cluster was replaced by the hypothesis that the sun trapped part of the gas-dust matter of an interstellar nebula.

The part of the Shmidt hypothesis that pertains to the accumulation of planets from cold solid bodies, which has won broad recognition, is often called Shmidt's theory; in this case, the term "Shmidt hypothesis" is reserved for the assumption that the sun captured matter to construct the planets, an assumption that has yet to be proved and that is rejected by many investigators.

B. IU. LEVIN [29–1320–3]

SHMIDT ISLAND, the northwesternmost island in the Severnaia Zemlia archipelago, in the Kara Sea. Part of Krasnoiarsk Krai, RSFSR, Shmidt Island has an area of 430 sq km and rises to an elevation of 325 m. It is almost entirely covered by glacial ice, with outcrops of rock only at the shore. The island was discovered in 1930 by an expedition led by O. Iu. Shmidt aboard the steamship *Georgii Sedov*. [29–1321–4]

SHMIDT PENINSULA, the northern tip of the island of Sakhalin. Joined to the island by the narrow Okha Isthmus, Shmidt Peninsula is approximately 50 km long. Its principal mountain ranges, the Eastern (Vostochnyi) and Western (Zapadnyi) ranges, have elevations that reach a maximum of 623 m at the Tri Brata Massif. Larch and spruce forests predominate on the peninsula, which was named for the Russian geologist F. B. Shmidt. [29–1322–1]

SHMIDT SUBGLACIAL BASIN, a vast subglacial depression in East Antarctica, located south of 70° S lat., between the Gamburtsev and Golitsyn mountains on the west and the Eastern Plain on the east. Most of the Shmidt Subglacial Basin is below sea level, hidden beneath a thick ice sheet, which is more than 3,000 m thick almost everywhere except the central part, where it exceeds 4,000 m. The basin was discovered by the Soviet antarctic expedition of 1957–59 by means of seismic sounding. Its position and elevations were determined more precisely in 1962, during the Australian expedition's journey from Wilkes Station to Vostok Station. The basin was named in honor of the Russian scientist O. Iu. Shmidt (Schmidt). [29–1321–1]

SHMIT, NIKOLAI PAVLOVICH. Born Dec. 10 (22), 1883, in Moscow; died there Feb. 13 (26), 1907. Participant in the Revolution of 1905–07. Bolshevik and a member of the RSDLP.

The son of the owner of a furniture factory in Presnia, Shmit studied at Moscow University. On May 1, 1905, having assumed ownership of the factory, Shmit reduced the working day from 11½ hours to nine, raised wages, and opened an outpatient clinic and a special general-education school on the premises. In 1905 he gave 20,000 rubles to the Moscow committee of the RSDLP for the purpose of arming the workers. He willed his estate to the Bolshevik Party.

Shmit was arrested on Dec. 17, 1905. His factory was destroyed that month during the suppression of the armed uprising. Shmit was killed in his solitary-confinement cell at Butyrka Prison in the early morning hours of Feb. 13, 1907. His funeral developed into a political demonstration.

REFERENCE

Andrikanis, E. N. *Khoziain "Chertova gnezda"*, 3rd ed. Moscow, 1975. [29–1323–2]

SHMUK, ALEKSANDR ALEKSANDROVICH. Born Oct. 28 (Nov. 9), 1886, in Moscow; died there Jan. 22, 1945. Soviet biochemist. Academician of the V. I. Lenin All-Union Academy of Agricultural Sciences (1935).

Shmuk graduated from the Moscow Agricultural Institute (now the K. A. Timiriazev Moscow Agricultural Academy) in 1913. From 1923 to 1937 he worked at the All-Union Institute of Tobacco and Makhorka in Krasnodar, serving as the institute's director from 1924 to 1928. At the same time, he was a professor at the Kuban' Agricultural Institute. In 1937 he became head of a laboratory of the Institute of Genetics of the Academy of Sciences of the USSR. From 1939 to 1945 he was head of a laboratory of the Institute of Biochemistry of the Academy of Sciences of the USSR.

Shmuk's main work dealt with the chemical composition of tobacco, soil chemistry, and various methods of agricultural chemical investigations. Shmuk devised ways of obtaining nicotine and citric and malic acids from raw makhorka (Indian tobacco).

Shmuk received the State Prize of the USSR in 1942. He was awarded the Order of the Red Banner of Labor.

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SHMYGA, TAT'IANA IVANOVNA. Born Dec. 31, 1928, in Moscow. Soviet Russian operetta performer. People's Artist of the USSR (1978).

In 1953, Shmyga graduated from the A. V. Lunacharskii State Institute of Theatrical Arts, where she studied voice under D. B. Beliavskaia and acting under I. M. Tumanov. She became a soloist at the Moscow Operetta Theater the same year. Shmyga masterfully combines the skills of a singer, actress, and dancer. Her roles include Violette and Ninon in Kálmán's *The Violet of Montmartre*, Chanita and Gloria Rosetti in Miliutin's *Chanita's Kiss* and *The Circus Show Is Up*, Tonia in Dunaevskii's *White Acacia*, Eliza Doolittle in Loewe's *My Fair Lady*, Verochka in Eshpai's *There's Nobody Happier Than I*, and Liubov' Iarovaia in V. Il'in's *Comrade Liubov'*.

Shmyga has toured abroad. A recipient of the M. I. Glinka State Prize of the RSFSR in 1974, she has been awarded the Order of the Badge of Honor and several medals.

REFERENCE

Fal'kovich, E. *Tat'iana Shmyga*. Moscow, 1973.

V. I. ZARUBIN [29–1325–3]

SHMYREV, MINAI FILIPPOVICH. Born Dec. 11 (23), 1891, in the village of Punishcha, Velizh District, Vitebsk Province; died Sept. 3, 1964, in Vitebsk. One of the organizers of the partisan movement in Byelorussia during the Great Patriotic War of 1941–45. Hero of the Soviet Union (Aug. 15, 1944). Member of the CPSU from 1920.

The son of a peasant, Shmyrev was drafted into the army in 1913; he fought in World War I. After joining the Red Army in 1918, he fought against the White Guard troops of generals Krasnov and Iudenich during the Civil War of 1918–20. From 1921 to 1923 he was commander of a detachment charged with controlling banditry in the Vitebsk region.

In 1923, Shmyrev became the head of the agrarian department of a *volost* (small rural district) in Vitebsk Oblast. He remained in the oblast and later worked as chairman of a kolkhoz, director of a paperboard factory, and director of a plant for the initial processing of flax.

Shmyrev organized a partisan detachment of factory workers in 1941. In the following year he commanded the 1st Byelorussian Partisan Brigade in Vitebsk Oblast from April through October and became a member of the Central Staff of the Partisan Movement.

After the war, Shmyrev engaged in soviet work in Vitebsk. He was awarded the Order of Lenin, the Order of the Red Banner, the Order of the Patriotic War First Class, and various medals. A museum devoted to Shmyrev has been opened in Vitebsk. [29–1325–4]

SHNEIDEROV, VLADIMIR ADOL'FOVICH. Born July 15 (28), 1900, in Moscow; died there Jan. 4, 1973. Soviet motion-picture director. People's Artist of the RSFSR (1969). Member of the CPSU from 1926.

Shneiderov began working in the cinema in 1924. He was one of the first Soviet motion-picture directors to make adventure and travelogue films. He took part in a number of expeditions, which he used as the themes of popular science films. These works include *The Great Flight* (1925), which is about the international group flight of six Soviet airplanes from Moscow to Peking; *At the Foothills of Death* (1928), a film about unexplored areas of the Pamirs; and *Two Oceans* (1933), which records a voyage on the icebreaker *Sibiriakov*. Shneiderov also directed the feature films *Dzhul'bars* (1936) and *Gorge of the Alamas* (1937).

In 1963, Shneiderov became artistic director of a professional association for the shooting of travelogues at the Tsentrnauchfil'm Studio. He organized and headed the television series "Travelogue Club" from 1960 to 1973.

Shneiderov was awarded the Order of Lenin. [29–1326–2]

SHNIREL'MAN, LEV GENRIKHOVICH. Born Jan. 2 (15), 1905, in Gomel'; died Sept. 24, 1938, in Moscow. Soviet mathematician. Corresponding member of the Academy of Sciences of the USSR (1933).

Shnirel'man graduated from Moscow University in 1925. From 1934 to 1938 he was a staff member of the Steklov Institute of Mathematics of the Academy of Sciences of the USSR. In a series of papers coauthored by L. A. Liusternik, Shnirel'man developed topological methods of the calculus of variations and, in particular, solved the problem of three geodesics. In number theory he proposed general metric methods and introduced the concept of density of sequence for the natural numbers. Shnirel'man was consequently able to prove that any number can be represented as the sum of a limited number of primes.

REFERENCE

Matematika v SSSR za 30 let, 1917–1947: Sb. st. Moscow-Leningrad, 1948. [29–1328–1]

SHNUROVAIA KNIGA, in the USSR, a document kept in each brigade of a kolkhoz and each division of a sovkhoz containing the field crop-rotation history. Information on the area of all land assigned to the division or brigade, classification and identification of the land by particular areas, the structure of crop lands, description of the soils, and the chief elements of the system of soil tillage and fertilization are entered in the Shnurovaia Kniga. Entries are certified by the signature of the person responsible for jobs in the particular field and by an agronomist. The Shnurovaia Kniga and the official field crop rotation record make it possible to monitor the use by kolkhozes and sovkhozes of advanced methods of soil tillage and raising agriculture crops. [29–1329–2]

SHOCK, a sudden life-threatening condition resulting from severe injury and characterized by progressive impairment of all the physiological systems of the body. The main characteristic of shock is the failure of capillary circulation in the tissues owing to impairment of cardiac output and arterial and venous tonus, capillary dysfunction, and changes in the rheological properties of blood. Shock can be brought on by an injury, burns, surgery (traumatic shock, burn shock, surgical shock), incompatible blood transfusion (hemolytic shock), anaphylaxis (anaphylactic shock), functional cardiac disorders (cardiogenic shock), ischemia of tissues and organs, and excessive loss of blood. The condition was described in detail by the French surgeon H. F. Ledran (1737) and by the Russian physician N. I. Pirogov (1870), who described the symptoms of the erectile phase (brief transient excitement) and torpid phase (subsequent sharp functional inhibition) of shock. The clinical manifestations of shock vary considerably. Progressively increasing extreme weakness and a progressive drop in blood pressure are the most characteristic.

Many aspects of the mechanisms underlying the development of shock still remain unclear. From the neuroreflex viewpoint, the various dysfunctions are due to numerous pain impulses that produce sharp excitation and subsequent inhibition of the nervous system, including the vital centers of the medulla oblongata. From the hemodynamic viewpoint, the decrease in the volume of circulating blood, which leads to peripheral circulatory insufficiency, is the principal factor. From the toxemic viewpoint, shock is caused by the entry into the blood of biologically active substances of tissue origin that interfere with the local and systemic blood flow. It is reasonable to assume that each of these factors plays a part: the primary abrupt activation of the central nervous system by extreme nerve impulses (or toxic substances) increases the amount of catecholamines released into the blood, causing a redistribution of the volume of circulating blood—spasms of the blood vessels of the skin, muscles, kidneys, and abdominal cavity accompanied by the increased flow of blood through arteriovenous anastomoses with maintenance of the circulation in the heart and brain (centralization of the circulation). This period of shock is clinically manifested by pallor and clamminess of the skin, contraction of the pupils, cold perspiration on the face, decreased urine flow, and moderately rapid breathing. The blood pressure is normal or slightly lowered.

"Centralization" of the circulation under conditions of extremely severe and prolonged injury becomes the principal mechanism of circulatory failure and further aggravation of the patient's condition. The decreased flow of blood to the tissues leads to the accumulation of the products of anaerobic metabolism, biogenic amines, kinins, and other substances. Upon entering the bloodstream, these products, along with other humoral factors, such as increased concentration of some hormones and reduced partial pressure of oxygen, further disrupt the regulatory functions of the nervous system.

The chief factors in the pathogenesis of shock in its late stages are hypoxia, decreased vascular tonus, dysfunction of the tissue microcirculation, and gross derangement of cell metabolism, which results in injury to the cell membranes. The transfer of intravascular fluid to the tissues causes a decrease in the volume of circulating blood. This stage is marked by cyanosis, rapid pulse, lowered blood pressure, and dilatation and slow reaction of the pupils.

The subsequent stage of shock is complicated by congestion in small blood vessels, intravascular agglutination of the erythrocytes, decreased blood flow to the heart, acute cardiac insufficiency, and functional impairment of the vital organs. This stage is clinically manifested by gray cyanosis, thready pulse, abrupt drop in blood pressure, rapid, shallow breathing, dilatation of the pupils, and unconsciousness.

In cases of shock, emergency therapeutic measures are undertaken, chosen according to the cause of the shock, stage of its development, and severity of the patient's condition. Other measures include the administration of pain relievers, keeping the patient warm, the transfusion of blood and blood substitutes, the administration of oxygen, and the injection of hormones, vitamins, and cardiovascular and other agents.

The term "shock" is also applied to persons in an unusual mental state or persons with severe emotional disturbances (mental, or emotional, shock).

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S. A. DOLINA and T. M. OKSMAN [29–1334–1]

SHOCKLEY, WILLIAM BRADFORD. Born Feb. 13, 1910, in London. American physicist.

Shockley graduated from the California Institute of Technology in 1932 and later continued his studies at the Massachusetts Institute of Technology. From 1936 to 1942 and from 1946 to 1954 he worked at the Bell Telephone Laboratories. From 1942 to 1945 he worked in the Department of War. From 1955 to 1958 he was director of the Shockley Semiconductor Laboratory. From 1958 to 1960 he was president of the Shockley Transistor Corporation, and from 1960 to 1963, director of the Shockley Transistor unit of the Clevite Corporation. Beginning in 1958, Shockley taught at Stanford University, where he was a professor from 1963 to 1975.

Shockley's main research has dealt with solid-state physics, including semiconductor physics, ferromagnetism, the plasticity of metals, and the theory of dislocations. In 1948, Shockley discovered the transistor effect, for which he received a Nobel Prize in 1956 (with J. Bardeen and W. Brattain).

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[29–1336–5]

SHOGENTSUKOV, ADAM OGURLIEVICH. Born Aug. 31 (Sept. 13), 1916, in the village of Kuchmazukino, in what is now

Baksan Raion, Kabarda-Balkar ASSR. Soviet Kabardin writer. People's Poet of the Kabarda-Balkar ASSR (1969). Member of the CPSU since 1944.

Shogentsukov graduated from the Kabarda-Balkar Pedagogical Institute in 1940. He worked as a schoolteacher and an instructor at a higher educational institution. He served in the Great Patriotic War (1941–45). Shogentsukov's first published works appeared in 1938. His poetry affirms friendship among peoples and reflects the history of the Kabardin people and their struggle for freedom. Focusing on man's complex inner world, Shogentsukov wrote the first Kabardin sonnets. He is the author of the verse collections *We Are Flourishing* (1940), *Songs of the Heart* (1951), *The Restless Heart* (1958), and *Roads of Friendship* (1961). His novella *The Spring of Sofiat* (1956; Russian translation, 1956), which deals with the life of a mountain girl in the Soviet period, has received wide recognition and has been translated into many languages. Shogentsukov has also written the plays *Madina* (staged 1961) and *The Sweethearts* (staged 1966).

Shogentsukov has been chairman of the administrative board of the Writers' Union of the Kabarda-Balkar ASSR from 1951 to 1954, from 1956 to 1958, and from 1970. He has been awarded four orders as well as medals.

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IU. B. ROZENBLIUM [29–1332–4]

SHOGENTSUKOV, ALI ASKHADOVICH. Born Oct. 28, 1900, in the village of Kuchmazukino, in what is now Baksan Raion, Kabarda-Balkar ASSR; died Nov. 29, 1941, in Bobruisk. Soviet Kabardin poet. Honored Art Worker of the Kabarda-Balkar ASSR (1939). Member of the CPSU from 1940.

Shogentsukov attended a teachers college in Istanbul from 1917 to 1919. He then returned to his homeland and took part in the construction of a Soviet society, devoting many years to teaching. He served in the Great Patriotic War (1941–45) and perished in a fascist concentration camp.

Shogentsukov's first published works appeared in 1917. His literary legacy, which includes the first examples of Soviet Kabardin poetry, is a fictional chronicle of the life of the Kabardin people in the prerevolutionary era and under Soviet power. Outstanding are the narrative poem *Madina* (1933), the heroic narrative poem *Past Days of Tembot* (1935), and the novel in verse *Kambot and Liatsa* (1938). Shogentsukov developed traditional poetic forms and provided models of profoundly ideological, realistic poetry. His short stories "A Pood of Flour" and "Under the Old Pear Tree" marked the beginning of Soviet Kabardin prose.

Shogentsukov translated into Kabardin works by A. S. Pushkin, M. Iu. Lermontov, T. G. Shevchenko, M. Gorky, and K. Khetagurov. Works by Shogentsukov have been translated into many languages of the peoples of the USSR.

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KH. I. TEUNOV [29–1333–1]

SHOKAL'SKII, IULII MIKHAILOVICH. Born Oct. 5 (17), 1856, in St. Petersburg; died Mar. 26, 1940, in Leningrad. Soviet oceanographer, geographer, and cartographer. Honorary member of the Academy of Sciences of the USSR (1939; corresponding member, 1923).

After graduating from the Marine Academy, Shokal'skii worked at the Main Geophysical Observatory and Main Hydrographic Administration. From 1910 to 1930 he was a professor at the Naval Academy; beginning in 1925, he was also a professor at Leningrad State University. He served as president of the Geographic Society of the USSR from 1917 to 1931.

Shokal'skii's principal works dealt with meteorology, hydrology, and oceanography. From 1923 to 1927, Shokal'skii led an oceanographic expedition in the Black Sea and studied the Northern Sea Route and ways of developing the route. He headed projects summarizing hypsometric materials and compiled a relief map of Russia. With A. A. Tillo, he developed a cartometric technique and applied it to calculating the surface of the Asiatic part of Russia and the lengths of the most important rivers. Shokal'skii was the compiler and editor of a series of general geographic maps and atlases. Twelve geographic features, including a strait between islands of Severnaia Zemlia, an island at the entrance to Ob' Bay, and an island in the Kara Strait, have been named after Shokal'skii.

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SHOKAL'SKII ISLAND (until 1926, Agnessa), an island in the Kara Sea, situated at the entrance to Ob' Bay, Tiumen' Oblast, RSFSR. Shokal'skii Island measures approximately 30 km in length and 20 km in width. It has a flat surface with elevations to 27 m. There is tundra vegetation. The island was named in honor of Iu. M. Shokal'skii. [29–1336–1]

SHOKAL'SKII STRAIT, a strait in the Severnaia Zemlia Archipelago, situated between the islands of Bol'shevik and Oktiabr'skaia Revoliutsiia and connecting the Kara and Laptev seas. The Shokal'skii Strait measures 110 km in length. It ranges from 20 to 50 km in depth and has prevailing depths of 200–250 m. The shores are steep and covered with glaciers, from which icebergs break off. The strait is covered with ice for most of the year. It was named in honor of Iu. M. Shokal'skii. [29–1336–2]

SHOKIN, ALEKSANDR IVANOVICH. Born Oct. 15 (28), 1909, in Moscow. Soviet state and party figure. Twice Hero of Socialist Labor (1975, 1979). Member of the CPSU since 1936.

The son of a worker, Shokin graduated from the N. E. Bauman Moscow Higher Technical School in 1934. Between 1932 and 1938 he worked in the shipbuilding industry as a foreman, shop chief, head engineer, and head of a design project office. Between 1938 and 1943 he was chief engineer in the central boards of the People's Commissariat of the Defense Industry and the People's Commissariat of the Shipbuilding Industry.

Shokin was deputy minister of the communications equipment industry of the USSR from 1949 to 1953. He served as deputy minister of the radio engineering industry of the USSR in 1954 and 1955 and as first deputy minister from 1955 to 1957. From 1958 to 1961 he was first deputy chairman of the State Committee for Radio Electronics of the Council of Ministers of the USSR. He held the ministerial post of chairman of the State Committee for Electronic Technology of the Council of Ministers of the USSR from 1961 to 1963, and in 1963 he assumed the ministerial post of chairman of the State Committee for Electronic Technology of the USSR. In 1965 he was named minister of the electronics industry of the USSR.

Shokin became a candidate member of the Central Committee of the CPSU in 1961 and a member in 1966. He was a deputy to the sixth through tenth convocations of the Supreme Soviet of the USSR. Shokin received the State Prize of the USSR in 1952 and 1953, and he has been awarded six Orders of Lenin, three other orders, and various medals. [29–1336–3]

SHOLAPUR, a city in India, in Madhya Pradesh, in the western part of the Deccan Plateau. Population, 398,000 (1971). Sholapur is a trade and transportation center. Industry includes the production of cotton cloth and vegetable oil, and cottage industries produce articles made of leather, metal, glass, and cloth. [29–1337–4]

SHOLOKHOV, MIKHAIL ALEKSANDROVICH. Born May 11 (24), 1905, in the *khutor* (farmstead) of Kruzhilin of the *stanitsa* (large cossack village) of Veshenskaia, Oblast of the Don Host (now Veshenskii Raion, Rostov Oblast). Soviet Russian writer. Academician of the Academy of Sciences of the USSR (1939). Hero of Socialist Labor (1967). Member of the CPSU from 1932. Member of the Central Committee of the CPSU from 1961.

Sholokhov, who was of peasant birth, fought in the Civil War. His early short stories, first published in newspapers and magazines in 1923, were later collected in *Tales of the Don* and *The Azure Steppe*, both published in 1926. Sholokhov's stories represented a notable contribution to the Soviet literature of the first half of the 1920's; their themes were the Civil War in the Don region, the bitter class struggle, the place of the individual in the great social changes taking place in the villages and rural areas, and the author's dream of a new world of social justice.

In 1925, Sholokhov began writing *The Quiet Don* (books 1–4, 1928–40; State Prize of the USSR, 1941), the novel that brought him world renown. The idea of history's lawlike regularity underlies the novel's intricate structure and plot. Sholokhov depicts the grandeur of the struggle between two worlds—the breakup of established social relations, traditions, and customs and the emergence and establishment of new ones. The novel deals with very important social issues, such as the relationship between the individual and the people's historic destiny, the question of historical necessity and freedom of choice, and the historical circumstances that give rise to tragic conflicts and dramatic outcomes. In *The Quiet Don*, Sholokhov creatively develops the traditions of epic narration of "people's destinies," portraying the broad-scale movement of the masses as part of the historical process. The people are the novel's hero.

Sholokhov's poetic world is the world of high tragedy, with strong and clear-cut characters acting at critical moments in history. The story of the life of Grigorii Melekhov is not merely part of the dramatic history of the Don Cossacks; it also reflects historical processes of enormous social and psychological importance. The figure of Grigorii Melekhov was an innovation in world literature. His personality is revealed through full exposition of his feelings in a variety of circumstances. The wide range of Sholokhov's psychological analysis is a typical aspect of his artistic skill.

Sholokhov's evaluative ability is an important attribute of his skill at psychological analysis. The people's revolutionary struggle, taken as the objective criterion of evaluation, makes it possible to separate Melekhov's historically justified delusions from his guilt. At history's sudden turning points, Grigorii is constantly faced with the need to choose. The social tragedy is carried over into the depths of consciousness; its sources lie in the hero himself—in his social ambivalence and contradictions. Grigorii has rejected the old world, but he neither understands nor trusts the truth of the new reality confirmed in blood, struggle, and suffering, and he is ultimately left behind at the crossroads of history.

The truly great artist is the one who can see reality in all its complexity and conditionality and perceive the stern objective laws by which it is governed. The technique used by Sholokhov in depicting the character and fate of Grigorii Melekhov played a significant part in the development of the method of socialist realism. The revolutionary masses so powerfully portrayed in *The Quiet Don* affirm the optimistic idea of the triumph of life—the victory of the new through trials and suffering—and convey the grandeur of the changes taking place. The heroic spirit that pervades the novel arises from its historical optimism; it arises from the affirmation of the majesty of life and the greatness of the deed.

Virgin Soil Upturned (books 1–2, 1932–60; Lenin Prize 1960) is an epic novel about the year 1930 and the revolutionary changes in village life. The first part of the novel (book 1) is basically constructed as a "case history"; the story of a kolkhoz in Gremiachii, it is a novel with many heroes. One of Sholokhov's aesthetic principles is to rely as much as possible on actual historical situations. This first part of *Virgin Soil Upturned* resounds with the full force of the emotions attendant upon the transformation of society, the abolishment of old forms of ownership, and the difficult birth of new social relations. The novel's heroes, aware that their life's purpose is to serve the great cause of the people, are the agents of and participants in the novel's historical events; the author's well-defined and intensely individualized characterization of three Communists—Davydov, assigned by the party to carry out the collectivization of the countryside, Razmetnov, and Nagul'nov—helps reveal the meaning of these great events.

The second part of the novel (book 2) captivates the reader with its lyrical "poetry of feelings"; the author's voice is now more markedly poetic. Hence the unique manner in which the plot is developed—the external slowness of the action, the many stories told by the heroes about themselves, the protracted conversations, and the more intense focus on relations in which intimate feelings are revealed. One of the most highly valued aspects of Sholokhov's talent is his ability to see and to vividly reproduce both the tragic and the humorous in life. The character of Grandfather Shchukar', for example, is marvelously conceived. The novel abounds with meditations on what constitutes genuine humaneness, on the paths of progress, and on historical necessity.

During the Great Patriotic War, Sholokhov's essays were published in various periodicals and in such collections as *On the Don*, *In the South*, and *The Cossacks*. His short story "The Sciences of Hatred" (1942) was widely read. Chapters from his novel *They Fought for Their Fatherland* were first printed in *Pravda* and *Krasnaia Zvezda* in 1943–44. Sholokhov's goal in this novel (which appeared in a later version in 1969) was to record the people's heroic wartime feats.

The short story "Fate of a Man" (1956–57) was a notable event in socialist art. The tragic story of Andrei Sokolov is shown to be conditioned by and related to the historic trials that the war inflicted on the people, the state, and the individual. This enables the author to present man and war in large-scale and generalized terms, to place them in historical perspective, and to show the incompatibility of the socialist and fascist worlds. The underlying theme of the story is faith in goodness, humanity, and social progress—the affirmation of life and of the great deed.

Sholokhov is one of the great masters of the literature of socialist realism. His novels were the first in the history of world literature to show the working people in all their wealth of types and characters; his protagonists are so fully portrayed in social, moral, and emotional terms that they have joined the ranks of the lasting figures of world literature.

In his novels, Sholokhov combined the poetic heritage of the Russian people with the advances of the realistic novel of the 19th and 20th centuries; he discovered previously unknown links between the spiritual and the material and new connections between man and the world around him. Sholokhov's epic body of work represents man, society, and nature as manifestations of the eternally creative stream of life; it is their unity and interdependence that give Sholokhov's world its uniquely poetic character. His works have been translated into most of the languages of the peoples of the USSR and of the world.

Sholokhov was a deputy to the first through ninth convocations of the Supreme Soviet of the USSR. He has been a member of the board of directors of the Writers' Union of the USSR since 1934 and has been a member of the World Peace Council. He is honorary doctor of philological sciences of the University of Rostov-on-Don and the University of Leipzig and honorary doctor of law of the University of St. Andrews. He was awarded four Orders of Lenin and two other orders, as well as various medals and a foreign order. He won the Nobel Prize for literature in 1965.

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SHOLOKHOV-SINIAVSKII, GEORGII FILIPPOVICH (real surname, Sholokhov). Born Oct 29 (Nov. 11), 1901, on the farmstead of Siniavskii, in what is now Neklinovka Raion, Rostov Oblast; died May 1, 1967, in Moscow. Soviet Russian writer. Member of the CPSU from 1938.

Sholokhov-Siniavskii was born into a peasant family. His first published work was the novella *Crime* (1928). His novels *A Bad Fishing Season* (parts 1–3, 1932–37) and *Distant Lights* (books 1–2, 1939–41) and the novella *The Kudimov Family* (1941) tell of the prerevolutionary life of fishermen and railroad workers and their participation in the revolution. The short-story collection *Zmei-Gorynych* (1944) and the novel *The Volgins* (books 1–3, 1947–51) deal with the heroism of the Soviet people during the Great Patriotic War (1941–45). The novel *The Restless Age* (1959) considers the problems that young people face in determining their path in life. Sholokhov-Siniavskii's last work was the autobiographical trilogy *Bitter Honey* (1961–64).

Sholokhov-Siniavskii was awarded the Order of the Red Banner of Labor and several medals.

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Russkie sovetskie pisateli-prozaiki: Biobibliografich. ukazatel', vol. 6, part 2. Moscow, 1969. [29–1343–1]

SHOLOKHOVSKII, an urban-type settlement in Rostov Oblast, RSFSR, under the jurisdiction of the Belaia Kalitva city soviet. Sholokhovskii is situated on the Likhovskoi-Volgograd highway, 8 km from the Grachi railroad station. Coal is mined in the area, and the settlement has an ore-enrichment plant. [29–1343–2]

SHOMAKHOV, AMIRKHAN KAMIZOVICH. Born Sept. 27 (Oct. 10), 1910, in the village of Nizhnii Kurp, in what is now Terek Raion. Soviet Kabardin writer. People's Poet of the Kabarda-Balkar ASSR (1977). Member of the CPSU from 1938.

Shomakhov graduated from the Northern Caucasus Pedagogical Institute in 1933 and from the Higher Party School of the Central Committee of the CPSU in 1955. His works first appeared in print in 1930. Shomakhov is the author of the novella *Kolkhoz Under Fire* (1958), about the events of the war years. His novel *Dawn Over the Terek* (1968; Russian translation, 1972) is about the Civil War and the first years of Soviet power in the republic. The novel *Horsemen on the Peaks* (1970) is about the formation of the working class in Kabarda-Balkaria.

Shomakhov, whose works have been translated into many of the languages of the peoples of the USSR, has been awarded two orders and several medals.

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SHOMUTEPE, the remains of an early farming settlement dating from the fifth millennium B.C., in Kazakh Raion, Azerbaijan SSR. Shomutepe was excavated between 1960 and 1963 by I. G. Narimanov. The site covers an area of about 1 hectare. The thickness of the cultural level varies from 1 to 2.5 m. Shomutepe was densely built up with round dwellings (with hearths) and farm buildings made of mud brick. Among the finds were hoes made of antler, querns, stone pestles and grain mortars, flint and obsidian sickle blades, an intact sickle with a wooden base, and the remains of various species of wheat and barley; also found were the bones of domestic animals, such as bulls, swine, sheep, and goats, and the bones of wild animals, such as boar and deer. In addition, various bone objects were found, including awls, perforators, spoons, and female figurines, as well as roughly modeled pottery of simple shapes. Some of the pots were decorated with rounded affixed designs and with incised designs. Shomutepe, along with similar remains in western Azerbaijan and the neighboring regions of Georgia, is characteristic of the most ancient settled farming culture of Transcaucasia.

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SHONA, a group of closely related languages, the most important of which are Karanga and Zezuru, of the south-central Bantu languages. According to a 1970 estimate, the Shona languages are spoken in Southern Rhodesia (Zimbabwe) and Mozambique by 1.5 million people.

The Shona languages have five vowels. Consonants include a voiced bilabial implosive and a voiced dental implosive; nasalization, aspiration, and voicing of consonants occur at morpheme boundaries. Nouns are divided into 21 classes that form a system of concordances; in addition to augmentative, diminutive, and locative classes, the Shona languages have two special classes comprising proper names, kinship terms, and the names of totemic animals. The classes are marked by prepositive monosyllables. Verbs are conjugated by means of affixes. There are many ideophones. In the Shona languages, word order is fixed in the pattern subject-predicate-object. Attributes are postpositional; that is, they follow the modified word.

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Barnes, B. H. *A Vocabulary of the Dialects of Mashonaland.* London, 1932. N. V. OKHOTINA [29–1346–1]

SHONGUI, an urban-type settlement in Kola Raion, Murmansk Oblast, RSFSR. Shongui is situated on the Kola River of the Barents Sea basin. It is served by a railroad station on the Murmansk-Kandalaksha line. Shongui has a shop of the Kil'din Brickyard. [29–1347–1]

SHONIN, GEORGII STEPANOVICH. Born Aug. 3, 1935, in the city of Roven'ki, Lugansk Oblast (now Voroshilovgrad Oblast). Pilot and cosmonaut of the USSR; major general of aviation (1977). Hero of the Soviet Union (Oct. 22, 1969). Member of the CPSU since 1957.

After graduating from the Eisk Military Aviation School (now the V. M. Komarov Eisk Higher Military Aviation Pilot School) in 1957, Shonin served in naval aviation. He became a cosmonaut in 1960. In 1968 he graduated from the N. E. Zhukovskii Air Force Engineering Academy.

From Oct. 11 to Oct. 16, 1969, Shonin completed, with V. N.

Kubasov, a spaceflight as commander of the Soyuz 6 spacecraft. During the flight, various methods of welding metals under the conditions of space were tested for the first time. During the 117 hr 42 min spent in space, his spacecraft made a group flight with the Soyuz 7 and Soyuz 8 spacecraft.

Shonin has been awarded the Order of Lenin, two other orders, and various medals.

WORKS

Samye pervye. Moscow, 1976. [29–1347–2]

SHOPTYKOL', an urban-type settlement in Baianaul Raion, Pavlodar Oblast, Kazakh SSR. Shoptykol' is situated on the northern margin of the Kazakh Melkosopochnik, 70 km southeast of the Ekibastuz I railroad station on the Tselinograd-Pavlodar line. Coal is mined near the settlement. [29–1352–2]

SHOR, ROZALIIA OSIPOVNA. Born June 11 (23), 1894, in Kaunas; died Mar. 18, 1939, in Moscow. Soviet linguist and literary historian.

Shor graduated from the Second Moscow State University (formerly the Advanced Courses for Women) in 1919. She was a professor at the N. G. Chernyshevskii Institute of Philosophy, Literature, and History from 1934 to 1939. Her principal works dealt with Germanic and Old Indic linguistics, general linguistics, and the history of linguistics. Shor founded the series *Iazykovedy Zapada* (Linguists of the West; 1933–38) and wrote on the history of Western European literature, notably in *Heinrich Heine* (1931, with F. Shiller and A. Lavretskii) and *Dickens* (1931, with A. Lunacharskii). Shor translated works of Old Indic literature, including *Pancatantra: Selected Stories* (1930) and *Twenty-five Tales of the Vetala* (1939).

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REFERENCE

Sergievskii, M. V. "Pamiati R. O. Shor." In *Sbornik statei po iazykovedeniiu*. Moscow, 1939. (Contains bibliography.)

V. N. Toporov [29–1352–3]

SHOR, the language of the Shortzy. According to the 1970 census, Shor is spoken by more than 12,000 people in Kemerovo Oblast of the RSFSR, primarily in the northern foothills of the Altai, in the Kuznetskii Alatau, along the Tom' River and its tributaries, and in the border region between the Khakass and Gorno-Altai autonomous oblasts. Shor, which belongs to the Khakass subgroup of the northeastern group of Turkic languages, has two dialects: the Mras, or *z*-dialect, which formed the basis of the literary language used in the 1920's and 1930's, and the Kondoma *y*-dialect, which in turn embraces several subdialects.

In Shor, vowels are distinguished as long or short, as in *ool* ("son") and *ol* ("he," "that one"). Stops and fricatives are unvoiced in initial and final position and voiced or semivoiced in intervocalic position, as in *kap* ("bag") and *kabí* ("his bag"). In the declension system there is an instrumental case with the affixes *-ba/-be*, *-pa/-pe*, and *-ma/-me*, as in *maltabá* ("by means of an axe"). The system of tenses includes a potential future tense with the affix *-kadíg*, a past tense indicating an incompleted action with the affix *-kalak*, and a normal past tense with the affixes *-chang/-cheng*. Adverbial participles have the affixes *-ala/-ele*, as in *turala* ("as soon as he got up").

A writing system based on the Cyrillic alphabet was introduced in 1927; a Latin alphabet was used from 1929 to 1938 when a new Cyrillic alphabet was created. There once existed an alphabet that was devised for a Shor primer published by missionaries in 1885.

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Babushkin, G. F., and G. I. Donidze. "Shorskii iazyk." In *Iazyki narodov SSSR*, vol. 2. Moscow, 1966.

L. S. Levitskaia [29–1354–3]

SHORAPANI, an urban-type settlement in Zestafoni Raion, Georgian SSR. Shorapani is situated on the Kutaisi-Tbilisi highway. It has a railroad station on the Samtredia-Tbilisi line. The Electroelement Plant and a factory for the production of building materials are located in the settlement. [29–1352–5]

SHORIN, ALEKSANDR FEDOROVICH. Born Nov. 23 (Dec. 5), 1890, in St. Petersburg; died Oct. 21, 1941, in Ul'ianovsk. Soviet inventor in radio engineering, telegraphy, and sound recording.

Shorin entered the St. Petersburg Electrical Engineering Institute in 1911. His studies were interrupted, however, in 1914, when he was drafted into the army. He served at the Tsarskoe Selo radio station, where he began his work in radio engineering. Shorin graduated from the institute in 1919 and took a teaching position there. He was a member of the staff of the Nizhny Novgorod Radio Laboratory from 1919 to 1922, head of the radio division of the Weak-current Plant Trust from 1922 to 1927, and a member of the staff at the Central Laboratory of Wired Communications from 1927 to 1934. In 1934, Shorin was named director of the Institute of Automation and Remote Control (now the Institute of Problems of Control) of the Academy of Sciences of the USSR.

Shorin is credited with a number of inventions. Among them are a start-stop printing telegraph, radio-teleprinter repeaters, loudspeaker systems, and sound-recording equipment. His name is closely associated with the birth and development of sound films in the USSR. Shorin received the State Prize of the USSR in 1941; he was also awarded the Order of Lenin.

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Iu. A. Skorospelov [29–1352–6]

SHORIN, VASILII GRIGOR'EVICH. Dates of birth and death unknown. One of the richest Moscow merchants of the 17th century.

Shorin and his assistants conducted business in Moscow, Vologda, Arkhangel'sk, and Velikii Ustiug, in cities in Siberia and the Volga Region (Povolzh'e), and in certain countries of the East. Shorin owned leather-manufacturing enterprises in Nizhny Novgorod. In 1647 and 1648 and in 1658 and 1659 he was head of customs in Arkhangel'sk. Part of a plan he proposed in 1658 for increasing customs revenue was used in the New Commercial Statute of 1667. Shorin's enterprises, shops, and warehouses were looted during the Moscow uprisings of 1648 and 1662, and a convoy of his ships was seized on the Volga in 1669 by S. T. Razin's cossacks. In 1673, part of Shorin's property was sold for arrears, and the remainder was transferred to the state treasury.

[29–1353–1]

SHORIN, VASILII IVANOVICH. Born Dec. 26, 1870 (Jan. 7, 1871), in the city of Kaliazin, in what is now Kalinin Oblast; died 1938. Soviet military leader.

The son of an artisan, Shorin graduated from the Kazan Cadet School in 1892 and from the Officers' Rifle School. He fought in the Russo-Japanese War of 1904–05 and in World War I, in which he commanded a battalion and a regiment. Shorin was promoted to colonel in 1916 and was awarded the Order of St. George Fourth Class and the Weapon of St. George. After the October Revolution of 1917 he was elected a division commander by the soldiers.

In September 1918, Shorin enlisted in the Red Army in Viatka. He was appointed commander of the Eastern Front's Second Army, which he reorganized and which he led in such actions as the Izhevsk-Votkinsk Operation of 1918. After becoming commander of the Northern Group of the Eastern Front in May 1919, he directed the Perm' and Ekaterinburg operations. In late July 1919, Shorin assumed command of the Southern Front's Special Group, which consisted of the Ninth and Tenth armies, later joined by the Eleventh. In September, the Special Group became the Southeastern Front, whose troops fought successfully in a counteroffensive against General Denikin in late 1919.

Shorin was named commander of the Caucasian Front in January 1920. From May 1920 through January 1921, as assistant commander in chief of the armed forces of the republic in Siberia, he directed the suppression of the kulak rebellions and the eradication of Ungern von Sternberg's forces. Shorin was commander of the Turkestan Front from January to November 1922, during the elimination of Enver Pasha's Basmachi bands.

After serving as deputy commander of the Leningrad Military District from 1923 to 1925, Shorin was put on reserve status for reasons of age. He directed the Society for Assistance to Defense, Aviation, and Chemical Construction in Leningrad.

Shorin was awarded the Order of the Red Banner, the Honorary Revolutionary Weapon, and orders of the Bukhara and Khorezm people's republics.

REFERENCE
Ladukhin, V. I. *V. I. Shorin*. Kalinin, 1960. [29–1353–2]

SHORIN TELEGRAPH, one of the first Soviet start-stop printing telegraphs, introduced in 1929 and named for its inventor, A. F. Shorin. The Shorin telegraph transmits with a five-unit equal-length code. When the device is used in a receiving mode, the message texts are automatically printed onto a tape. The Shorin telegraph was replaced in the mid-1930's by more advanced equipment. [29–1354–1]

SHORSU, an urban-type settlement in Uzbekistan Raion, Fergana Oblast, Uzbek SSR. Shorsu is situated in the foothills of the Alai Range, 26 km south of the Iaipan railroad station, on the Kokand-Khavast line. A plant for the production of drainage pipes was under construction in Shorsu in 1978. [29–1355–1]

SHORTANDY, an urban-type settlement and the administrative center of Shortandy Raion, Tselinograd Oblast, Kazakh SSR. Shortandy has a railroad station on the Petropavlovsk-Tselinograd line, 67 km northwest of Tselinograd. A furniture factory, a butter factory, a food-processing combine, and a grain elevator are located in the settlement. [29–1355–3]

SHORTANOV, ASKERBI TAKHIROVICH. Born Oct. 3 (16), 1916, in the village of Anuzorovka, now the village of Lesken II, Urvan' Raion, Kabarda-Balkar ASSR. Soviet Kabardin writer. Honored Art Worker of the Kabarda-Balkar ASSR (1939); Honored Art Worker of the RSFSR (1971). Member of the CPSU since 1941.

Shortanov studied at the State Institute of Theatrical Arts from 1934 to 1936. He was first published in 1939. His main theme is the history of the Kabardins and their life in the Soviet period. Shortanov is the author of the historical novel *The Mountaineers* (1954; Russian translation, 1967); the chronicle-like novel *Betal Kalmykov* (1968; Russian translation under the title *Always in the Saddle*, 1970), which deals with the Civil War hero of that name; and the plays *Aul Batyr* (staged 1939) and *When The Light Breaks* (published 1947; Russian translation, 1950), which deals with life in a kolkhoz village. His play *The Party's Envoy* (published 1961) was staged in 1967.

Shortanov is a well-known folklorist. He has been awarded five orders and various medals. Shortanov's works have been translated into many languages of the USSR.

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IU. B. ROZENBLIUM [29–1355–4]

SHORTHORN, a beef and dual-purpose (beef and dairy) breed of cattle. The Shorthorn was developed in the 18th century in Great Britain by improving local short-horned cattle, by crossing with Dutch and the Galloway breeds, and by selection, first for meat qualities and in the mid-19th century also for dairy qualities.

There are two types of Shorthorn: beef and dual-purpose. The coloring is various shades of red, as well as white and roan. Bulls weigh 850 to 950 kg (up to 1,200 kg), and cows, 500 to 600 kg (up to 750 kg); young reared for meat weigh 400 to 420 kg by one year of age. The yield of dressed meat is 66 to 67 percent. The meat is tender and marbled. The milk yield of dual-purpose cows is 3,500 to 4,000 kg, sometimes reaching 14,000 kg; the fat content of the milk is 3.7 to 3.9 percent. Shorthorn bulls are widely used for commercial crossbreeding with cows of various dairy breeds. Shorthorns were first imported into Russia in the 19th century and were used to develop the Bestuzhev and later the Kurgan breeds.

Shorthorns are raised in the countries of Europe and North and South America (in the USA the Santa Gertrudis breed was developed using Shorthorns) and in Australia and New Zealand; in the USSR, they are raised in Orenburg, Voronezh, Tiumen', and Rostov oblasts and in the Bashkir ASSR.

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Skotovodstvo. Edited by E. A. Arzumanian. Moscow, 1970.
B. V. FANDEEV [29–1356–1]

SHORTT CLOCK (also free-pendulum clock), a highly accurate pendulum clock. The Shortt clock is named after the British inventor W. H. Shortt, who devised it in 1921.

A Shortt clock has two pendulums made of Invar. The first, called the master pendulum, is enclosed in a low-pressure chamber and placed in a constant-temperature cellar. The second, known as the working pendulum, is installed in an ordinary wooden clock case and kept in a convenient place. The working pendulum is connected to the indicating mechanism, which consists of hands, a clockface, and electric contacts. The clock is powered by an 8-volt DC battery.

In the Shortt clock, an impulse is released every second. The master pendulum, which swings freely, receives a mechanical impulse every 30 sec in order to overcome the damping associated with friction. Special electromechanical devices synchronize the oscillations of the working pendulum, which functions as both a drive mechanism and a counter. The length of the working pendulum may be adjusted so that the clock will keep either sidereal time or mean solar time. The mean-square clock rate of a Shortt clock is ±0.002–0.003 sec per day.

Shortt clocks became obsolete in the 1950's because they did not provide the accuracy required in many astronomical investigations.

REFERENCE
Bakulin, P. I., and N. S. Blinov. *Sluzhba tochnogo vremeni*. Moscow, 1968.
L. V. RYKHLOVA [29–1355–2]

SHORTZY (also Shortsy; self-designation, *shor*), a nationality living in southern Kemerovo Oblast (Gornaia Shoriia), RSFSR, chiefly in the basin of the Tom' River and its tributaries the Kondoma and Mras-Su. In Russian historical documents of the 17th and 18th centuries the Shortzy are called the Kuznets, Kondoma, or Mras Tatars. According to the 1979 census, the Shortzy number 16,000. They speak Shortzy. Although considered in the past to be Russian Orthodox, they in fact continued to practice shamanism and forms of worship associated with hunting and fishing.

The Shortzy nationality was formed over a protracted period in which Ugrian, Samoyed, Ket-speaking, and Turkic tribes intermingled. In culture and origin the Shortzy are related to the northern Altais and certain ethnic groups of Khakass. Until the early 20th century the Shortzy retained, to a considerable extent, vestiges of clan relations. Before the October Revolution of 1917 they engaged chiefly in hunting and fishing, although some groups practiced primitive land cultivation as well; smithery was important, as were the mining and smelting of iron ore—hence the name Kuznets (Blacksmith) Tatars.

Under Soviet power the life of the Shortzy has changed radically. The majority are employed in agriculture: they engage in land cultivation and stock raising and pursue the traditional economic activities of hunting, fishing, and the gathering of pine nuts. Many Shortzy work in industry, and a sizable intelligentsia has developed.

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Narody Sibiri. Moscow-Leningrad, 1956. [29–1356–2]

SHORYGIN, PAVEL POLIEVKTOVICH. Born Apr. 16 (28), 1881, in the village of Gorki, Kovrov District, Vladimir Province; died Apr. 29, 1939, in Moscow. Soviet organic chemist. Academician of the Academy of Sciences of the USSR (1939; corresponding member, 1932).

Shorygin graduated in 1906 from the Moscow Higher Technical School, where he then worked from 1906 to 1910. From 1910 to 1918 he was an engineer at a textile factory in Moscow. Between 1919 and 1925 he was a professor at the Moscow Veterinary Institute and the Moscow Forest Engineering Institute, and between 1925 and 1939 he was a professor at the D. I. Mendeleev Moscow Institute of Chemical Engineering. From 1931 to 1939 he was scientific director of the Moscow Scientific Research Institute of Synthetic Fibers.

Shorygin's main works dealt with the chemistry of organosodium compounds. Shorygin discovered the process of metallization (the direct substitution of sodium or potassium for hydrogen in hydrocarbons and their derivatives [Shorygin reaction]), the decomposition of ethers by the action of metallic sodium, and two new types of intramolecular rearrangements of ethers—carbinolic and phenolic. The research carried out by Shorygin on the chemistry of hydrocarbons, begun in 1924, terminated in the synthesis of many new cellulose ethers and esters and their derivatives. Under Shorygin's guidance, many problems in the manufacture of synthetic fibers and pulp and paper were solved and methods of synthesizing valuable perfumes were developed.

WORKS
Izbr. trudy. Moscow-Leningrad, 1950. (Contains references.) [29–1357–3]

SHOSHA, a river in Kalinin Oblast and Moscow Oblast, RSFSR; a right tributary of the Volga. The Shosha is 163 km long and drains an area of 3,080 sq km. It rises in the Moscow Upland and empties into the Ivan'kovo Reservoir. The Shohsha is fed chiefly by snow; high water occurs in April. The mean flow rate 51 km from the mouth is 8.5 cu m per sec. The Shosha freezes over between November and early January, and the ice breaks up in late March or April. [29–1383–1]

SHOSHONE, a mountain range in the Great Basin region of the USA, in the state of Nevada. The Shoshone Mountains stretch from north to south along the Reese River, which is situated in the closed basin of the Humboldt River. They measure approximately 250 km in length and rise to a maximum elevation of 3,143 m at North Shoshone Peak. The range is composed primarily of metamorphic rocks. Vegetation includes sparse mountain forests of pine and juniper, as well as shrubs. [29–1383–2]

SHOSHONEAN LANGUAGES, the languages of the Shoshoni Indians, who include the Comanche, Ute, and Hopi; the collective name for the languages of the four subgroups of the Uto-Aztecan family spoken in the southwestern USA and Lower California.

The four subgroups of the Shoshonean languages are the Numic languages, the Tübatulabal language, the Takic languages, and the Hopi language. The Numic, or Plateau Shoshonean, languages include Bannock, whose dialects are Snake, Northern Paiute, and Mono; Shoshoni, whose dialects are Comanche, Gosiute, and Koso (Panamint); and Ute, whose dialects are Southern Paiute, Chemehuevi, and Kawaiisu. The Takic, or Southern Californian, languages comprise Serrano, Luiseño, Cupeño, Cahuilla, and the extinct Gabrielino and Juaneño.

The theories of linguists of the early 20th century that the Shoshonean languages form a single group within the Uto-Aztecan family have been controverted by later studies based on the research of such American scholars as B. Whorf and S. Lamb.

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Kroeber, A. L., and G. W. Grace. *The Sparkman Grammar of Luiseño*. Berkeley–Los Angeles, 1960. [29–1383–3]

SHOSHONI (also Shoshone), a group of North American Indian tribes. The Shoshoni speak the Shoshonean languages, which belong to the Uto-Aztecan language family. They are divided into three groups of tribes: the Pueblo Shoshoni, which are made up of the Hopi; the Plateau Shoshoni, which comprise the Ute, Shoshoni proper, Comanche, Koso, Painte, Bannock, and Mono; and the Southern Californian Shoshoni, which include the Serrano, Gabrielino, Luiseño, and Cahuilla. The various groups were at different stages of cultural development, ranging from primitive gatherers and small-game hunters in California to settled land cultivators (Hopi) and horse-mounted hunters of bison (Comanche and Shoshoni).

Before the arrival of the European colonialists, the Shoshoni proper inhabited Utah, Nevada, and Idaho. They hunted, fished, and gathered wild cereal grains. In the mid-18th century the hunting of bison from horseback became the basis of the economy. In the mid-19th century, the Shoshoni tribes, after stubborn resistance, were settled on reservations in Nevada, Utah, Idaho, and Oregon. According to the 1970 census, the Shoshoni number 14,200, of whom 4,100 live on reservations; the rest live in cities and work as hired laborers. [29–1383–4]

SHOSSE, a road with a hard surface. The term *shosse* was used extensively from the early 19th century to the mid-20th century in place of the term *guzhevaia doroga* (cart road). In the 1950's, the word *shosse* came to be applied to highways with a multilayered surface consisting of granular materials that are compacted and then treated either with organic binders (used in building a blacktop road) or with water (used in building a macadam road). The term *shosse* is preserved in the names of such roads as the Gorky Shosse and the Leningrad Shosse as well as in everyday speech. The more precise term *avtomobil'naia doroga* (highway) is used instead of *shosse* in scientific and industrial literature. [29–1357–4]

SHOSTAKOVICH, DMITRII DMITRIEVICH. Born Sept. 12 (25), 1906, in St. Petersburg; died Aug. 9, 1975, in Moscow. Soviet composer. People's Artist of the USSR (1954); Hero of Socialist Labor (1966); doctor of the arts (1965). Member of the CPSU from 1960.

The son of an engineer, Shostakovich graduated from the Leningrad Conservatory, where he studied piano with L. V. Nikolaev until 1923 and composition with M. O. Shteinberg until 1925. In 1927 he received an honorable mention at the First Chopin International Competition for Pianists in Warsaw. He subsequently gave concerts at which he performed his own compositions. In 1937 he began teaching composition at the Leningrad Conservatory, where he became a professor in 1939; from 1943 to 1948 he taught at the Moscow Conservatory. Among his pupils

were R. S. Bunin, A. D. Gadzhiev, G. G. Galynin, O. A. Evlakhov, K. A. Karaev, G. V. Sviridov, B. I. Tishchenko, K. S. Khachaturian, and B. A. Chaikovskii. He became a secretary of the Composers' Union of the USSR in 1957 and of the Composers' Union of the RSFSR in 1960; from 1960 to 1968 he was first secretary of the Composers' Union of the RSFSR.

Shostakovich, whose work represents a high point in 20th-century music, invariably turned to socially important themes and images and rendered the most important aspects of contemporary life. His music combines epic scope and psychological profundity, the emotional power of a crusading artist and a highly refined, intimate lyricism. Several of Shostakovich's works reflect the global conflicts of the modern age and give expression to the clash between the world of victorious socialism and the world of reaction and oppression. Particularly important to the composer were the themes of war and peace and the struggle against fascism: to images of evil and aggression he counterposed the will and reason of the Soviet people and a faith in the ultimate victory of light over darkness. Shostakovich's works, which affirm the ideals of Soviet humanism, are imbued with a boundless sympathy for man and his sufferings.

Symphonic works distinguished by a sense of high drama occupy a central place in Shostakovich's oeuvre. The varied musical development in these works is marked by sharp conflicts and contrasts and by the free hand with which the composer worked out his themes: Shostakovich often rethought his musical ideas, and the same theme sometimes embodies totally contrasting aspects of life. Shostakovich, an innovator in the tradition of M. P. Mussorgsky (with whom he felt a special affinity), J. S. Bach, Beethoven, and Mahler, created his own profoundly original style. The individuality of his music is strikingly apparent in its tonal structure and harmony. Shostakovich modified the harmonic systems of classical Russian music to create his own harmonic idiom. An oustanding polyphonist, he reinterpreted the fugue and passacaglia, made extensive use of polyphonic devices to develop musical themes, and restructured the symphony and sonata cyclic forms, whose component parts he fashioned anew to suit his own needs. Shostakovich used the interplay of orchestral timbres to great expressive effect. The principles of symphonic composition are evident in his chamber music.

Shostakovich's Symphony No. 1 (1925), like several of the symphonies to follow, gained worldwide recognition. Subsequent compositions, such as the Symphony No. 2 (*October Symphony*, 1927), the Symphony No. 3 (*First of May Symphony*, 1931), and the ballets *The Golden Age* (1930) and *Bolt* (1931), reflect a search for new directions. In certain works, notably the opera *The Nose* (after N. V. Gogol, 1928), Shostakovich showed a predilection for satire, humor, and the grotesque.

In the opera *Katerina Izmailovna* (or *Lady Macbeth of the Mtsensk District*, 1932; new version, 1963), which marks the beginning of the composer's mature period, the tragic vein, so important in all Shostakovich's works, is combined with social satire. The Symphony No. 4 (1936) and Symphony No. 5 (1937) —particularly the latter—established the principles of Shostakovich's mature symphonic style. Of the *Fifth Symphony* the composer wrote: "The subject of my symphony is the development of the individual. It was precisely man, with all his sufferings, that I saw as the focal point of this work" (*Vecherniaia Moskva*, Jan. 25, 1938, p. 3). Other compositions of the 1930's are the Symphony No. 6 (1939), the Concerto No. 1 for Piano and Orchestra (1933), *Twenty-four Preludes for Piano* (1933), the ballet *The Limpid Stream* (1935), and the String Quartet No. 1 (1938).

The Quintet for Piano and Strings (1940; State Prize of the USSR, 1941), a work imbued with a poetic lyricism, is one of Shostakovich's most harmonious compositions. Shostakovich worked on the Symphony No. 7 (*Leningrad Symphony*; State Prize of the USSR, 1942) in the besieged city of Leningrad. The symphony, which depicts the Soviet people's heroic struggle against fascism, became a musical monument of the war years and played an important role in rallying the world against fascism. Images from the Great Patriotic War also appear in the Symphony No. 8 (1943), a work of enormous tragic power, and in the Trio No. 2 for Violin, Cello, and Piano (1944; State Prize of the USSR, 1946), the String Quartet No. 3 (1946), and songs and choruses from this period. Shostakovich returned to the war for subject matter in such late works as the String Quartet No. 8 (1960), dedicated to the victims of war and fascism.

The Symphony No. 10 (1953), which reflects the composer's concern about the fate of the world, is distinguished by its profound psychological insight. The oratorio *Song of the Forests* (words by E. A. Dolmatovskii, 1949; State Prize of the USSR, 1950) depicts socialist labor. The monumental cycle *Twenty-four Preludes and Fugues for Piano* (1951), which communicates a variety of emotions and moods ranging from high tragedy to carefree gaiety, from epic heroism to moving lyricism, adds to the tradition of Bach a distinctly Russian character.

Other notable postwar works are the Symphony No. 9 (1945), the Violin Concerto No. 1 (1948), and the song cycle *From Jewish Folk Poetry* (1948, set to traditional poems). In this period Shostakovich's fondness for historical and revolutionary subjects became evident. His *Ten Narrative Poems for A Cappella Chorus* (set to words by revolutionary poets, 1951; State Prize of the USSR, 1952) is dedicated to the struggle of the proletariat in the early 20th century. Works in a similar vein include the Symphony No. 11 (*1905 Symphony*, 1957; Lenin Prize, 1958) and the Symphony No. 12 (*1917 Symphony*, 1961), dedicated to V. I. Lenin; these compositions are notable for their striking musical idiom and are imbued with the traditional spirit of the revolutionary song. The Russian past also found expression in the symphonic poem for voice and orchestra *The Execution of Stepan Razin* (words by E. A. Evtushenko, 1964; State Prize of the USSR, 1968).

During this period Shostakovich continued to use a broad range of images and varied subject matter. He turned to humor and satire once again in the musical comedy *Moscow, Cheremushki* (1958) and the song cycle *Satires* (1960, words by Sasha Chernyi).

In the 1960's and 1970's, Shostakovich composed vocal instrumental suites to poems by A. A. Blok (1967) and M. I. Tsvetaeva (1973). The vocal work *Suite on Verses by Michelangelo* (1974), summing up several major themes of the composer's work, registered a protest against evil and injustice and affirmed the creative triumph and immortality of the artist. The principles of the vocal-instrumental suite are combined with operatic elements in the symphonies for voice and orchestra: Symphony No. 13 (1962, words by Evtushenko) and Symphony No. 14 (1969, words by Garcia Lorca, G. Apollinaire, W. K. Küchelbecker, and R. Rilke), an enormously profound and emotionally powerful treatment of the theme of life and death, a subject that is central to such works as the Symphony No. 15 (1971) and the late string quartets. The Sonata for Alto and Piano (1975) marks the end of Shostakovich's creative output.

Shostakovich, who composed music for more than 35 motion pictures, including *The Youth of Maksim* (1935), *The Return of Maksim* (1937), *The Vyborg Side* (1939), *The Man With a Gun* (1938), and *Hamlet* (1964), was a pioneer of Soviet motion-picture music. He adapted several of his film scores for concert performance, notably *Golden Mountains* (1931), *The Young Guard* (1948), and *The Gadfly* (1955). Several songs by Shostakovich for motion pictures have achieved great popularity. He wrote music for the stage and prepared new orchestral versions of Mussorgsky's operas *Boris Godunov* (1940) and *Khovanshchina* (1959). His articles include "Thoughts on the Road I Have Traveled" (1956).

The music of Shostakovich, whose compositions are among the classic works of the 20th century, is of tremendous importance for Soviet and international music.

Shostakovich was a deputy to the sixth through ninth convocations of the Supreme Soviet of the USSR. He was a member of the Soviet Peace Committee (1949), the Slavic Committee of the USSR (1942), and the International Peace Committee (1968). He was an honorary member of Sweden's Royal Academy of Music (1954), Italy's Saint Cecilia National Academy (1956), and the Serbian Academy of Sciences and Arts (1965).

Shostakovich was awarded honorary doctorates by Oxford University (1958), Northwestern University in Evanston, Ill. (1973), and France's Académie des Beaux-Arts (1975). He was a corresponding member of the Academy of Arts of the German Democratic Republic (1956) and the Bavarian Academy of Fine Arts (1968), a member of Great Britain's Royal Academy of Music (1958) and the National Academy of Sciences of the USA

(1959) and an honorary professor at Mexico's National Conservatory. He served as president of the USSR-Austria Society (1958). A recipient of the International Peace Prize (1954), Shostakovich was awarded three Orders of Lenin, the Order of the October Revolution, the Order of the Red Banner of Labor, and various medals.

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D. Shostakovich: Stat'i i materialy. Moscow, 1976.

L. V. DANILEVICH [29–1357–6]

SHOSTAKOVSKII, MIKHAIL FEDOROVICH. Born May 24 (June 6), 1905, in Novoselitsy, in what is now Kirovograd Oblast. Soviet organic chemist. Corresponding member of the Academy of Sciences of the USSR (1960). Member of the CPSU since 1946.

Shostakovskii graduated from the University of Irkutsk in 1929. From 1932 to 1962 he worked at the Institute of Organic Chemistry of the Academy of Sciences of the USSR. From 1957 to 1971 he was director of the Irkutsk Institute of Organic Chemistry of the Siberian Division of the Academy of Sciences of the USSR, and from 1971 to 1973, director of the Institute of Petrochemistry of the Siberian Division of the Academy of Sciences of the USSR. In 1973 he became head of a subdepartment of the All-Union Polytechnical Correspondence Institute.

Shostakovskii's main works deal with the chemistry of vinyl ethers, organosilicon and organostannum compounds, and acetylene and its derivatives. Shostakovskii developed an antiphlogistic coating agent based on polyvinyl butyl ether (vinylene) known as Shostakovskii balsam, a blood substitute based on polyvinylpyrrolidone, and an agent to combat ringworm in animals.

A recipient of the State Prize of the USSR (1949), Shostakovskii has been awarded two orders and several medals.

WORKS
Prostye vinilovye efiry. Moscow, 1952.
Khimiia diatsetilena HC≡C—C≡CH. Moscow, 1971. (With A. V. Bogdanova.) [29–1361–1]

SHOSTKA, a city (since 1924) under oblast jurisdiction and the administrative center of Shostka Raion, Sumy Oblast, Ukrainian SSR. Situated on the Shostka River, a tributary of the Desna. Railroad station on a branch line of the Khutor-Mikhailovskii–Konotop line. Population, 64,000 (1977).

The Svema Production Association, which makes motion-picture film and recording tape, is located in Shostka. The city also has a furniture factory and plants for the production of chemical reagents and reinforced concrete structures. The food-processing industry is represented by a meat-packing plant, a butter factory, and a brewery. Shostka has a chemical engineering technicum, a museum of local lore, and a museum of military glory.

[29–1361–2]

SHOTEMOR, SHIRINSHO. Born December 1899 in the *kishlak* (hamlet) of Parshnev, in what is now Shugni Raion, Gorno-Badakhshan Autonomous Oblast; died Oct. 27, 1937. Soviet government and party figure. Member of the Communist Party from 1921.

The son of a peasant, Shotemor became a worker in Tashkent in 1919. He took part in the struggle for the establishment of Soviet power in Turkestan. From 1921 to 1924 he was chairman of a revolutionary committee in the Pamirs and an instructor for the Central Committee of the Communist Party (Bolshevik) of Turkestan. From 1925 to 1927 he was people's commissar of the Workers' and Peasants' Inspectorate and the commissioner of the Central Committee of the Communist Party (Bolshevik) of Uzbekistan in the Tadzhik ASSR; he helped lead the struggle against the Basmachi revolt.

Shotemor graduated from the Communist University for Workers of the East in 1929 and served as executive secretary of the Tadzhik oblast committee of the Communist Party (Bolshevik) of Uzbekistan. He was a delegate to the Sixteenth and Seventeenth Party Congresses. From 1930 to 1933 he was second secretary of the Central Committee of the Communist Party (Bolshevik) of Tadzhikistan. In 1933 he was named chairman of the Central Executive Committee of the Tadzhik SSR. Shotemor became a member of the Central Executive Committee of the USSR in 1925.

REFERENCE
"Gosudarstvennyi deiatel'." In the collection *Za narodnoe delo*. Dushanbe, 1970. [29–1361–4]

SHOTMAN, ALEKSANDR VASIL'EVICH. Born Aug. 25 (Sept. 6), 1880, in the village of Aleksandrovskoe, now within the Leningrad city limits; died Oct. 30, 1937. Soviet state and party figure. Member of the Communist Party from 1899.

The son of a worker, Shotman was a lathe operator. During the period from 1899 to 1902 he was a member of the St. Petersburg League of Struggle for the Emancipation of the Working Class, a participant in the Obukhov defense of 1901, and a member of the St. Petersburg committee of the RSDLP. Shotman was a delegate to the Second Congress of the RSDLP in 1903. During the Revolution of 1905–07 he was a member first of the St. Petersburg committee of the party and then of the Odessa committee. In 1911 and 1912 he was a member of the Helsingfors committee of the Social Democratic Party of Finland; in 1913 he took part in the Poronin meeting of the Central Committee of the RSDLP with party officials. Shotman was co-opted into membership in the Central Committee and the Russian Bureau of the Central Committee of the RSDLP. He was arrested in November 1913 and exiled to Siberia.

In 1917, Shotman became a member of the Tomsk committee of the Russian Bureau of the Central Committee of the RSDLP(B) and a member of the executive committee of the local soviet; in June 1917 he became a member of the Petrograd district committee of the party. He was a delegate to the Sixth Congress of the RSDLP(B). Shotman maintained communication between the party's Central Committee and V. I. Lenin, who was in Razliv, and organized Lenin's move to Finland. After October 1917, Shotman served as deputy people's commissar for postal and telegraph services.

From 1918 to 1920, Shotman was a member of the Presidium of the Supreme Council on the National Economy and chairman of the Siberian Council on the National Economy. In 1923 and 1924 he was chairman of the Central Executive Committee of the Karelian ASSR. In 1926, Shotman became a member of the Supreme Council on the National Economy and the Presidium of the All-Russian Central Executive Committee. A delegate to the Thirteenth through Seventeenth Party Congresses, he served as a member of the Central Control Commission from 1924 to 1934. Shotman was a member of the All-Russian Central Executive Committee and the Central Executive Committee of the USSR.

WORKS
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"Lenin v podpol'e (i-iul'-oktiabr' 1917 g.)." In *Vospominaniia o V. I. Lenine*, vol. 2. Moscow, 1969.
REFERENCES
Lenin, V. I. *Poln. sobr. soch.*, 5th ed., part 2. Page 486.
Bondarevskaia, T. P. *A. V. Shotman*. Moscow, 1963. [29–1378–3]

SHOVELER (*Anas clypeata*), a bird of the family Anatidae. The body length is about 50 cm. Males weigh about 700 g; the females weigh less. The tip of the bill is very broad (hence the name). The shoveler, which is a migratory bird, is distributed in the temperate climates of Europe and Asia and in western North America. In the USSR is it more common in the forest-steppe and steppe

zones and can be found in Transcaucasia and Middle Asia in the winter. During the summer, shovelers gather for molting in the delta of the Volga River and on the lakes of the Transurals Region and Kazakhstan. They prefer shallow tranquil bodies of water and quiet stretches of river. Nests are built on dry land. The clutch contains seven to ten eggs, which are incubated from 22 to 23 days. The diet consists of mollusks, crayfish, and insects. The shoveler is a game bird. [29–1229–1]

SHOVI, a balneological and climatic health resort in the Georgian SSR, on the southern slopes of the Vodorazdel'nyi (Glavnyi) Range of the Greater Caucasus. Shovi is situated at an elevation of 1,600 m on the Ossetian Military Road, in the valley of the Chanchakhi River, 147 km from Kutaisi. Summers are moderately warm, with an average July temperature of 16°C, and winters are relatively mild, with an average January temperature of −6°C; precipitation totals 1,103 mm annually. The resort offers climatotherapy; it also has carbonic hydrocarbonate calcium-sodium springs, the waters of which are used for drinking. Treatment is given for nontubercular ailments of the respiratory system and for disorders of the digestive organs and nervous system. The resort has boarding hotels and a polyclinic. [29–1330–2]

SHOVKOPLIAS, IURII IUR'EVICH. Born Jan. 24 (Feb. 6), 1903, in Kharkov; died there Oct. 12, 1978. Soviet Ukrainian writer. Member of the CPSU since 1945.

Shovkoplias graduated from the Kharkov Institute of Public Education in 1927. His early stories deal primarily with young people and the scientific-technical intelligentsia. Shovkoplias' novel *The Engineers* (books 1–2, 1934–37; new supplementary ed. 1967) describes the scope of the technical revolution and depicts the romanticism of the first five-year plans. The heroes of his trilogy of novels *Man Lives Twice* (1962–64) are Soviet medical scientists.

Shovkoplias also wrote for children and young people. His works have been translated into other languages of the USSR and foreign languages. Shovkoplias was awarded the Order of Lenin, two other orders, and various medals.

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[29–1331–2]

SHOVKUNENKO, ALEKSEI ALEKSEEVICH. Born Mar. 9 (21), 1884, in Kherson; died Mar. 12, 1974, in Kiev. Soviet painter. People's Artist of the USSR (1944). Member of the Academy of Arts of the USSR (1947).

Shovkunenko studied at the Odessa Art School from 1901 to 1908 under K. K. Kostandi and at the St. Petersburg Academy of Arts from 1909 to 1917. He worked in watercolors. Shovkunenko produced psychologically probing portraits of B. I. Iakovlev (1944), S. A. Kovpak (1945), M. I. Litvinenko-Vol'gemut (1947), and M. G. Lysenko (1947)—all at the Museum of Ukrainian Fine Arts of the Ukrainian SSR in Kiev. His works also include industrial landscapes, for example, the series *The Dneprostroi Construction Project* (1930–32, Museum of Ukrainian Fine Arts) and colorful landscapes of the Ukraine and Moldavia, notably *Spring* (1955, Odessa Art Museum).

Shovkunenko also taught painting, becoming a professor at the Kiev Art Institute in 1935. His pupils included A. M. Lopukhov and V. G. Puzyr'kov. A recipient of the T. G. Shevchenko State Prize of the Ukrainian SSR in 1970, he was also awarded the Order of Lenin, three other orders, and several medals.

REFERENCE

Vladich, L. *A. A. Shovkunenko*. Kiev, 1960. [29–1332–1]

SHPAGA, the Russian term for a type of cold-steel weapon used for thrusting and cutting or simply for thrusting. A variety of sword, the *shpaga* has a narrow, straight blade that is a meter or more in length. The blade may be single or double edged, or it may be of polygonal cross section. The handle, or hilt, of the *shpaga* may have varying kinds of knuckle bow and guard. Various types of *shpaga* have been made, one of which is the foil, which is shorter than an ordinary *shpaga* and has a cup-like guard and a blade with a polygonal cross section.

The *shpaga* first appeared in the 16th century, in Western Europe, and became the characteristic weapon of the nobility. Between the 16th and 18th centuries, the *shpaga* was also a military weapon used chiefly by cavalrymen and officers. Gradually supplanted in the 18th century by the broadsword and the saber, the *shpaga* was retained as an honorary, dueling, or full-dress weapon.

The *shpaga* was first used in the Russian Army in the early 18th century. In 1741, however, the *shpaga* used by infantry soldiers was replaced by a small saber (*polusablia*). Later, the *shpaga* used by officers was replaced by a saber. In the 19th century, the *shpaga* became part of the uniform of generals and of cuirassier-regiment officers not in formation; it was also worn as part of the full-dress uniform of civilian officials. These formal uses of the *shpaga* were discontinued in 1917. [29–1384–1]

SHPAGIN, GEORGII SEMENOVICH. Born Apr. 17 (29), 1897, in the village of Kliushnikovo, in what is now Kovrov Raion, Vladimir Oblast; died Feb. 6, 1952, in Moscow. Soviet small-arms designer. Hero of Socialist Labor (1945). Member of the CPSU from 1944.

The son of a peasant, Shpagin entered the army in 1916 and worked in a regimental ordnance repair shop. After World War I he served as a gunsmith in a rifle regiment of the Red Army. Upon being discharged in 1920, Shpagin became a fitter at a machine-gun plant where V. G. Fedorov and V. A. Degtiarev were employed.

Shpagin became involved in new-weapons design in 1922. In 1938, he and Degtiarev designed the large-caliber 12.7-mm DShK machine gun. Shpagin designed the PPSh automatic submachine gun in 1940 and developed the OPSh flare pistol in 1943. His weapons were widely used in the Great Patriotic War of 1941–45.

Shpagin was a deputy to the second convocation of the Supreme Soviet of the USSR. He received the State Prize of the USSR in 1941 and was awarded three Orders of Lenin, two other orders, and various medals.

REFERENCE

Bolotin, D. N. *Sovetskoe strelkovoe oruzhie za 50 let*. Leningrad, 1967. [29–1385–1]

SHPAK, VLADIMIR STEPANOVICH. Born Feb. 7 (20), 1909, in Pskov. Soviet chemist. Corresponding member of the Academy of Sciences of the USSR (1968). Hero of Socialist Labor (1961). Member of the CPSU from 1939.

Shpak graduated in 1931 from the Lensovet Leningrad Institute of Technology, where he worked from 1932 to 1975, becoming a professor in 1955. Beginning in 1948, he also worked at the Institute of Applied Chemistry, of which he was director from 1952 to 1977.

Shpak's main works deal with commercial organic chemistry. The synthesis and technological development of the manufacture of many nitro compounds, amines, ethers, esters, and other organic compounds, carried out by Shpak, were introduced in industry. Shpak was also involved in organizing the creation of new branches in the chemical industry, such as the manufacture of organofluorine compounds.

Shpak has been awarded two Orders of Lenin, three other orders, and several medals.

REFERENCE

Gosudarstvennomu institutu prikladnoi khimii piat'desiat let, 1919–1969. Leningrad, 1969. [29–1385–3]

SHPAKOVSKII, ALEKSANDR IL'ICH. Born Aug. 20 (Sept. 1), 1823, in Smolensk Province; died June 25 (July 7), 1881, in St. Petersburg. Russian inventor.

Shpakovskii entered the Pavel Cadet Corps in St. Petersburg in 1846 and taught physics there from 1854 to 1870, when he retired. He joined the staff of the Kronstadt Mine Plant in 1878. An injury received in an explosion during a mine test in 1879 left him disabled.

In the 1850's, Shpakovskii was engaged in a number of projects involving photography, including the development of a wet-collodion process. He also built an arc lamp with automatic adjustment of the distance between carbons. In the 1860's, Shpakovskii invented a night signal light that was approved in 1866 for vessels in the Russian Navy and was later adopted by the British Navy. He developed an oil burner for a steam-generating system in 1866 and a feed pump for shipboard steam boilers in 1868. In 1872, Shpakovskii proposed a technique for preparing potassium nitrate from sodium nitrate, and in 1873, a method for pressing peat into briquettes.

REFERENCE

Bel'kind, L. D. *Aleksandr Il'ich Shpakovskii.* Moscow-Leningrad, 1949. [29–1385–5]

SHPANBERG, MARTYN PETROVICH. Date of birth unknown; died 1761. Russian navigator; captain first class.

An immigrant from Denmark, Shpanberg took part in the First Kamchatka Expedition, from 1725 to 1730, aboard the vessel *Sv. Gavriil*. Sailing aboard the *Arkhangel Mikhail* he commanded a detachment of ships in the Second Kamchatka Expedition and, after Bering's death, became the leader of the expedition. An island in the Lesser Kuril Chain, mountains in the Chukchi region and on Sakhalin, a strait in the Kuril Islands, and capes on the island of Hokkaido and in the Anadyr' Gulf are named for Shpanberg.

REFERENCE

Divin, V. A. *Russkie moreplavaniia na Tikhom okeane v XVIII v.* Moscow, 1971. [29–1389–1]

SHPET, GUSTAV GUSTAVOVICH. Born Mar. 26 (Apr. 7), 1879, in Kiev; died Mar. 23, 1940, in Tomsk Oblast. Russian idealist philosopher. Follower of E. Husserl's phenomenology.

Shpet graduated from the faculty of history and philology of the University of Kiev in 1905, and in 1907 he moved to Moscow. Beginning as a privatdocent at the University of Moscow in 1910, he was a professor there from 1918 to 1923. From 1923 to 1929 he was vice-president of the Russian Academy of Artistic Disciplines (later the State Academy of Artistic Disciplines).

Shpet conceived of a universal understanding (*urazumenie*), meaning the search for the "first causes" and "principles" of existence, which he called "meanings," *eide*, or "ideas." According to Shpet, reality is not simply "given" in experience but "guessed at," and its meaning is disclosed by uncovering the intuitive acts of the human mind. Intuition is interpreted by Shpet in the spirit of the rationalism of R. Descartes, B. Spinoza, and G. von Leibniz: the intuitive "perception of essence" can be fully expressed and communicated by means of logical definitions based on analytical reasoning, even though the mind initially discerns essence, or "meaning," just as directly as it perceives sense data. Mediation is that derivative aspect represented by description, proof, and interpretation. In *The Internal Form of the Word* (1927), Shpet discusses the philosophy of language as the foundation of the philosophy of culture, and he anticipates many of the ideas later developed in hermeneutics—the study of interpretation.

In the 1930's Shpet translated and annotated various works of world literature, primarily by English writers such as Byron and Dickens. His translation of Hegel's *Phenomenology of the Spirit* was published in 1959.

WORKS

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Vvedenie v etnicheskuiu psikhologiiu, fasc. 1. Moscow, 1927.

A. A. MITIUSHIN [29–1393–2]

SHPIKOV, an urban-type settlement in Tul'chin Raion, Vinnitsa Oblast, Ukrainian SSR. Shipkov is 8 km from the Rakhny railroad station, which is on the Zhmerinka-Vapniarka line. The settlement has a sugar mill and a separation division of the Tul'chin Creamery. [29–1394–3]

SHPILEVSKII, SERGEI MIKHAILOVICH. Born May 8, 1833; died July 21, 1907. Russian historian; specialist in the history of law and the early history and archaeology of the Volga Region (Bulgaria on the Volga).

Shpilevskii was a professor at the University of Kazan from 1870 to 1885 and the director of the law school in Yaroslavl from 1885 to 1904. Shpilevskii's *Ancient Cities and Other Bulgar-Tatar Monuments in Kazan Province* (1877) is a valuable catalog of historical sources and archaeological remains.

REFERENCE

Katanov, N. F. "Pamiati S. M. Shpilevskogo." *Izv. Obshchestva arkheologii, istorii i etnografii pri Kazanskom universitete*, 1907, vol. 23, issue 4. [29–1394–4]

SHPINDLER, IOSIF BERNARDOVICH. Born 1848; died 1919. Russian hydrographer, oceanographer, and meteorologist.

Shpindler graduated from the hydrographic division of the Marine Academy in St. Petersburg in 1874 and that same year became director of publication of the marine bulletin at the Main Physical Observatory. In 1884 he became head of the meteorological section of the Ministry of the Navy. In 1888 he began lecturing at the Marine Academy. Between 1890 and 1897, Shpindler organized oceanographic expeditions to study the Black Sea, the Sea of Azov, the Sea of Marmara, Lake Chudskoe, Kara-Bogaz-Gol, and other bodies of water. In 1891 he became one of the editors of the *Meteorologicheskii vestnik* (Meteorological Herald). Shpindler published many works on oceanography and marine meteorology, among them *Hydrology of the Sea (Oceanography)* (parts 1–2, 1914–15), the first Russian monograph on oceanography. [29–1396–2]

SHPINEL', IOSIF ARONOVICH. Born Sept. 25 (Oct. 7), 1892, in Belaia Tserkov', in what is now Kiev Oblast. Soviet motion-picture designer. Honored Art Worker of the RSFSR (1940).

Shpinel' graduated from the architectural department of the Kiev Art School in 1914 and from the print-making department of the Vkhutemas. He began to work in the theater in 1921 and in the cinema in 1927. He created designs for the films *The Night Coachman* (1929), *Arsenal* (1929), *Ivan* (1932), *Boule de Suif* (1934), *Petersburg Night* (1934), *Parisian Dawns* (1937), *Alexander Nevsky* (1938), *Mashen'ka* (1942), *Ivan the Terrible* (1945, 1958), *The Story of a Real Man* (1948), *Sisters* (1957), *The Year 1918* (1958), *Gloomy Morning* (1959), and *A Year Like a Lifetime* (1965).

Shpinel', a teacher since 1928, joined the faculty of the All-Union State Institute of Cinematography, becoming a professor in 1965. He was awarded the State Prize of the USSR in 1951. [29–1397–1]

SHPITAL'NYI, BORIS GAVRILOVICH. Born July 25 (Aug. 7), 1902, in Rostov-on-Don; died Feb. 6, 1972, in Moscow. Soviet designer of aircraft armament. Hero of Socialist Labor (1940). Professor (1949). Member of the CPSU from 1940.

Shpital'nyi graduated from the M. V. Lomonosov Moscow Institute of Mechanics in 1927. In 1930, he and I. A. Komaritskii developed the ShKAS 7.62-mm rapid-fire machine gun, which was adopted as armament on Soviet aircraft. The rate of fire of the weapon was subsequently doubled, to 3,000 rounds per minute. The ShKAS was the basis for the ShVAK 20-mm cannon, which was designed by Shpital'nyi and S. V. Vladimirov in 1936. The ShVAK was mounted in a number of aircraft, including the Iakovlev, Lavochkin, and Tupolev models, as well as on the T-60 tank.

Shpital'nyi was head and master designer of a special design office from 1934 to 1953. He later took a position as a professor in a subdepartment of the Moscow Engineering Institute of Geodesy, Aerial Photographic Surveying, and Cartography.

Shpital'nyi received the State Prize of the USSR in 1941 and 1942 for his work in the development of new types of aircraft armament; he was also awarded two Orders of Lenin, four other orders, and various medals.

REFERENCE
Sytin, V. A. *Izobretatel' sverkhpulemeta.* Moscow, 1941. [29–1398–1]

SHPITAL'SKII, EVGENII IVANOVICH. Born Sept. 16 (28), 1879, in Ardagan, Kars Oblast, in what is now Turkey; died Nov. 23, 1931. Soviet physical chemist. Corresponding member of the Academy of Sciences of the USSR (1929).

Shpital'skii graduated from Moscow University in 1904 and subsequently worked there. His main works dealt with catalysis and electrochemistry. Shpital'skii developed a theory of intermediate compounds in homogeneous catalysis and proposed a method for the production of white leads (the Shpital'skii method).

WORKS
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REFERENCE
Pamfilov, A. V., K. G. Khomiakov, and N. N. Kobozev. "Evgenii Ivanovich Shpital'skii." *Zhurnal fizicheskoi khimii*, 1960, vol. 34, no. 8. [29–1399–1]

SHPOLA, a city (since 1938) and administrative center of Shpola Raion, Cherkassy Oblast, Ukrainian SSR. Situated on the Shpolka River (southern Bug River basin). Railroad station on the Khristinovka-Tsvetkovo line. Population, 21,000 (1974). Shpola produces sugar, spare parts (a branch of the Mytishchi Machine Plant), confectionary goods, garments, and furniture. [29–1403–2]

SHPOL'SKII, EDUARD VLADIMIROVICH. Born Sept. 11(23), 1892, in Voronezh; died Aug. 21, 1975, in Moscow. Soviet physicist. Doctor of sciences in physics and mathematics (1933); Honored Worker in Science and Technology of the RSFSR (1968).

Shpol'skii graduated from Moscow University. He began his scientific career in 1913 at Shaniavskii University under the supervision of P. P. Lazarev. He was on the staff of the Institute of Physics and Biophysics from 1918 to 1930 and of Moscow State University from 1930 to 1932. In 1932 he became the head of a subdepartment at the V. I. Lenin Moscow State Pedagogical Institute. Shpol'skii was editor in chief of the journal *Uspekhi fizicheskikh nauk* (Advances in Physical Sciences), which he helped found.

Shpol'skii's main works dealt with spectroscopy and with the use of spectroscopic methods in biophysics and biochemistry. Shpol'skii investigated the absorption spectra and emission spectra of complex organic compounds. In 1952 he discovered the Shpol'skii effect.

Shpol'skii received the State Prize of the USSR in 1970. He was awarded the Order of the Red Banner of Labor and various medals.

REFERENCE
"Pamiati Eduarda Vladimirovicha Shpol'skogo." *Uspekhi fizicheskikh nauk*, 1976, vol. 118, issue 1. [29–1403–3]

SHPOL'SKII EFFECT, the appearance of quasi-line spectra of complex organic compounds in specially selected solvents at low temperatures. The Shpol'skii effect was first observed in 1952 by E. V. Shpol'skii and his co-workers L. A. Klimova and A. A. Il'ina.

The solvent used should be chemically neutral with respect to the solute molecules, should not interact with the solute molecules, and should be optically transparent in the spectral region where the solute molecules emit or absorb light. Liquid *n*-paraffin, for example, has such properties. The substance in question is dissolved in the solvent in low concentrations (10^{-5}–10^{-7} g/cm^3). The solution is then cooled to a temperature below the freezing point of the solvent; in the case of *n*-paraffin, the solution is cooled to −196°C or lower. Under such conditions, the molecules in question are isolated from one another and are fixed in the solvent. The electronic-vibrational emission and absorption spectra (*see* MOLECULAR SPECTRA) of the molecules in question consist of series of narrow spectral lines and resemble atomic spectra. Hence, they are referred to as quasi-line spectra. Under ordinary conditions, the spectra of complex organic compounds are continuous overlapping bands.

Quasi-line spectra have a well-developed vibrational structure, making it possible to determine the vibrational frequencies of molecules not only in the ground state but also in excited states. Such spectra have a markedly individual character. They differ for molecules that are similar in structure and even for isomeric molecules. Quasi-line spectra make it possible to investigate the following: the structure of individual complex organic compounds; the physical and chemical properties of free complex organic radicals; photochemical processes for organic compounds; compounds that are important for life, such as chlorophyll and its analogs, the porphyrins; carcinogenic compounds; and individual organic compounds in the earth's crust, in order to study the formation of hydrocarbons in the crust and to develop new methods of prospecting for petroleum and other minerals.

The spectrochemical analysis of mixtures on the basis of the Shpol'skii effect makes possible the simultaneous determination of several individual compounds in a mixture and has an absolute sensitivity of up to 10^{-11} g.

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L. F. UTKINA [29–1403–4]

SHRAMKOVKA, an urban-type settlement in Drabov Raion, Cherkassy Oblast, Ukrainian SSR. Shramkovka is located 5 km from the Kononovka railroad station on the Grebenka-Kiev line. Industry includes the production of sugar and consumer goods. [29–1411–1]

SHRAPNEL, originally an artillery shell filled with round shot. Shrapnel is primarily intended to strike live, exposed targets. It was named for an English officer, H. Shrapnel, who in 1803 proposed filling an artillery shell with cast-iron case shot, thereby intensifying the shell's effect. Exploded in the air at a predetermined distance from the target, shrapnel was highly effective and was widely used in World War I.

Shrapnel was replaced in the 1930's by the more powerful fragmentation and high-explosive fragmentation shells. The late 1960's witnessed the introduction of shrapnel-type artillery shells filled with dart-like projectiles, or fléchettes, intended to strike unconcealed enemy personnel. There are up to 8,000 such projectiles in the US 105-mm shell, each fléchette 24 mm long and weighing 0.5 g. Thrown from the shell as a result of centrifugal force and the pressure of the powder gases of the bursting charge, the fléchettes are scattered in a conical pattern. [29–1411–3]

SHREDER, IVAN FEDOROVICH (also J. Schröder). Born Mar. 29 (Apr. 4), 1858, in St. Petersburg; died there Nov. 29, 1918. Russian physical chemist.

Shreder graduated from the St. Petersburg Institute of Mines in 1884 and became a professor there in 1891. His major research was devoted to the study of solutions. In 1890 he theoretically derived the relationship between solubility, the melting point, and the heat of melting of crystalline bodies (*see* SHREDER EQUATION) and experimentally confirmed the relationship.

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Stepanov, N. I. "Ocherk istorii i sovremennogo sostoianiia khimii v Gornom institute." *Izvestiia In-ta fiziko-khimicheskogo analiza*, 1927, vol. 3, issue 2, p. 510. [29–1411–5]

SHREDER, RIKHARD IVANOVICH. Born 1822 in Denmark; died 1903. Russian horticulturist.

Shreder settled in Russia in the late 1840's. From 1862 he was the head gardener and instructor of the Petrovskoe Agricultural Academy (now the K. A. Timiriazev Moscow Agricultural Academy). Shreder founded an extensive dendrological garden, a nursery, and a dwarf-fruit orchard-garden at the academy. He conducted experiments in acclimatizing a number of tree and shrub species. Shreder was the author of the popular and much reprinted work *The Russian Garden, Nursery, and Fruit Orchard* (1877; 10th ed., 1929). [29–1411–6]

SHREDER EQUATION, a mathematical equation relating the solubility of a crystalline body x_T at a temperature T (in °K) to its heat of melting ΔH_m (in cal/mole) and melting point T_m:

$$\ln x_T = \frac{\Delta H_m(T - T_m)}{RTT_m}$$

where R is the gas constant; ΔH_m is taken as constant in the interval T_{m-T}. The rigorous application of the Shreder equation is limited to ideal solutions. By constructing curves for the temperature dependence of the solubility of a solid phase of each of the components of a binary system using the Shreder equation, it is possible to find the eutectic point and to obtain the solubility diagram.

The Shreder equation was derived in 1890 by I. F. Shreder (Schröder). It is also known as the Shreder logarithm and the Shreder–Le Châtelier equation. (H. Le Châtelier previously had obtained an equation for solubility as a function of temperature in differential form and, using this expression, derived an equation similar to the Shreder equation in 1894.)

REFERENCE

Kipnis, A. Ia. *Razvitie khimicheskoi termodinamiki v Rossii.* Moscow-Leningrad, 1964. M. Kh. Karapet'iants [29–1412–3]

SHRENK, LEOPOL'D IVANOVICH. Born Apr. 24 (May 6), 1826, on the estate of Khiten', Sumy District, Kharkov Province; died Jan. 8 (20), 1894, in St. Petersburg. Russian ethnographer and naturalist. Academician of the St. Petersburg Academy of Sciences (1863). Director of the Museum of Anthropology and Ethnology in St. Petersburg (1879–94).

From 1854 to 1856, Shrenk led an expedition to the Amur River and the island of Sakhalin, where he studied the Nivkh (Giviak) and other peoples. The expedition's findings were published in a four-volume work in German, from which the material dealing with ethnography was published in Russian as *The Inhabitants of the Amur Region* (vols. 1–3, 1883–1903). Shrenk introduced the term "Paleo-Asiatic" as a designation for the ancient population of Northeast Asia.

WORKS

Reisen und Forschungen im Amur-Lande in den Jahren 1854–1856, vols. 1–4. St. Petersburg, 1859–1900. [29–1416–2]

SHREVEPORT, a city in the southern USA, in the state of Louisiana, on the right bank of the Red River. Population, 195,000 (1975; with suburbs, 350,000). Shreveport is a commercial and transportation center in an area that is rich in oil deposits; cotton is also grown extensively in the region. In 1975, 5,000 people were employed in the extraction industry, and 25,000 in manufacturing. Oil and natural gas are extracted and refined near Shreveport. The city has plants for the manufacture of chemicals, wood products, and food products. [29–1417–1]

SHROPSHIRE, a breed of semifine-wooled short-haired sheep bred for meat and wool. The breed was developed in the first half of the 19th century in Great Britain, in Shropshire and Staffordshire, by crossing dark-headed ewes with Southdown rams.

The animals are hornless. The rams weigh 80 to 120 kg, and the ewes, 70 to 90 kg. The wool is white (the face, ears, and legs are dark brown), of 54th to 56th quality; it measures about 10 cm in length and is characterized by softness and resilience. The maximum wool clip from rams is 4–6 kg, and from ewes 3–4 kg. The breed is characterized by high fertility: 150 to 170 lambs per 100 ewes. The sheep mature early and transmit their meat qualities well to offspring. They are adapted to various natural and climatic conditions.

The Shropshire sheep is raised in Great Britian, the USA, New Zealand, Australia, and other countries; in the USSR it was used to develop the Latvian Dark-head and Estonian Black-headed breeds.

REFERENCE

Ovtsevodstvo, vol. 2. Edited by G. R. Litovchenko and P. A. Esaulov. Moscow, 1972. A. A. Veniaminov [29–1442–3]

SHTAKENSHNEIDER, ANDREI IVANOVICH. Born Feb. 22 (Mar. 6), 1802, near Gatchina; died Aug. 8 (20), 1865, in Moscow. Russian architect.

Shtakenshneider studied at the St. Petersburg Academy of Arts from 1815 to 1821, becoming an academician in 1834 and a professor in 1844. He built many palaces and private homes, chiefly in St. Petersburg, combining architectural styles of various periods in eclectic fashion. They include the Mariinskii Palace (1839–44, now the Executive Committee of the Leningrad Soviet of Workers' Deputies), the Belosel'skii-Belozerskii Palace (1846–48, now the Kuibyshev District Committee of the CPSU), and the Nicholas Palace (1853–61, now the Palace of Labor).

REFERENCE

Pamiatniki arkhitektury Leningrada, 4th ed. Leningrad, 1975. [29–1446–1]

SHTALBERG, ERNEST EKABOVICH (also Ernest Iakovlevich Shtalberg; in Latvian, Ernsts Štālbergs). Born Aug. 22 (Sept. 3), 1883, in Liepāja; died June 12, 1958, in Riga. Soviet architect. Honored Science Worker of the Latvian SSR (1945). Academician of the Academy of Sciences of the Latvian SSR (1946).

Shtalberg studied under L. N. Benois at the St. Petersburg Academy of Arts, graduating in 1914. He served as rector of the academy from 1919 to 1922. Shtalberg was chairman of the administrative board of the Architects' Union of the Latvian SSR from 1945 to 1951. He taught in the architecture department of the Latvian University in Riga from 1922 to 1950, becoming a professor in 1945. His pupils included A. Reinfelds and M. Staņa.

Shtalberg collaborated with V. A. Shchuko on the Russian pavilion at the International Exhibition in Rome of 1910–11. His other major structures include an apartment house on Lomonosov Street (1930) and a university auditorium (1929–36), both in Riga, and a sanatorium near Cēsis (1936–38). In Riga he also collaborated on monuments to freedom (1931–35, sculptor K. Zāle) and to V. I. Lenin (1947–50, sculptors V. Ia. Bogoliubov and V. I. Ingal).

REFERENCE

Vasil'ev, Iu. "E. Shtalberg (1883–1958)." In the collection *Iz istorii tekhniki Latviiskoi SSR*, no. 5. Riga, 1964. [29–1446–2]

SHTEIMAN, STANISLAV IVANOVICH. Born Dec. 6 (18), 1887, in the village of Vaikulāni, in what is now Daugavpils Raion, Latvian SSR; died Nov. 26, 1965, in the settlement of Karavaevo, Kostroma Raion, Kostroma Oblast. Soviet zootechnician. Hero of Socialist Labor (1949); Honored Zootechnician of the RSFSR (1951). Member of the CPSU from 1939.

Beginning in 1920, Shteiman worked in the Gorinskoe and Ivanovskoe sovkhozes in Kostroma Province. In 1927 he began working in the Karavaevo Sovkhoz, first as senior zootechnician and then as chief zootechnician. He was one of the persons involved in the efforts to breed Kostroma cattle, for which he was awarded the State Prize of the USSR in 1943. Working with a team of Karavaevo stock breeders, he developed the very valuable pedigree herd that became the nucleus of the Kostroma breed. He devised a method for raising calves in unheated quarters in the winter and in the open in the summer that is currently used in the USSR and abroad. Shteiman was the author of many studies on the improvement of dairy herds.

Shteiman served as a deputy to the second, third, and fourth

convocations of the Supreme Soviet of the USSR. He was awarded six Orders of Lenin, the Order of the Red Banner of Labor, and various medals.

WORKS

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Izbr. trudy. Moscow, 1969. [29–1462–2]

SHTEIN, ALEKSANDR PETROVICH. Born Sept. 15 (28), 1906, in Samarkand. Soviet Russian playwright. Member of the CPSU since 1930.

Shtein, the son of office workers, has worked as a journalist since 1923. His plays, which are mainly devoted to military and revolutionary history, include *The Spring of '21* (1939), which deals with the tragic events of the Kronstadt Anti-Soviet Rebellion in 1921 and the defeat of the counterrevolution, and *The Admiral's Flag* (1950; State Prize of the USSR, 1951), which is about the Russian naval commander F. F. Ushakov. Shtein's best plays are characterized by sharp conflicts and complex psychological characterizations. Openly tendentious, they are notable for their social commentary. They include *Talent* (1936), *The Ocean* (1961), *Between Downpours* (1964), and *Applause* (1967). The plays *A Personal Case* (1954) and *The Hotel Astoria* (1956) focus on the dramatic fates of people and the restoration of Leninist norms in party life. Shtein has also written literary-biographical dramas and screenplays, including *The Court of Honor* (1948; State Prize of the USSR, 1949), *Admiral Ushakov* (1952), *The Ships Storm the Bastions* (1953) and *A Version* (1977), as well as short stories. He has been awarded two orders and several medals.

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SHTEINBERG, LEV PETROVICH. Born Sept. 3 (15), 1870, in Ekaterinosiav, now Dnepropetrovsk; died Jan. 16, 1945, in Moscow. Soviet conductor and composer. People's Artist of the USSR (1937).

Shteinberg graduated from the St. Petersburg Conservatory in 1893 and pursued further study of the piano with A. G. Rubenstein. He conducted opera in St. Petersburg and Saratov. In 1914, at the invitation of S. Diaghilev, he took part in the Russian Seasons Abroad in Paris and London. Actively involved in building ■ Soviet musical culture, he was in Kiev from 1917 to 1924 and Kharkov from 1924 to 1926; in both cities he helped organize philharmonic societies and music theaters.

In 1928, Shteinberg became a conductor at the Bolshoi Theater in Moscow. In 1937 and 1938 he was ■ professor at the Moscow Conservatory. Among his compositions are the opera *Ten Days That Shook the World*, the ballet *Mirra*, three symphonies, the cantata *October*, and the symphonic poem *Red Square*.

Shteinberg was awarded the Order of the Red Banner of Labor and various medals. [29–1465–1]

SHTEINBERG, MAKSIMILIAN OSEEVICH (also Maximilian Steinberg). Born June 22 (July 4), 1883, in Vilnius; died Dec. 6, 1946, in Leningrad. Soviet composer. Honored Art Worker of the RSFSR (1934); People's Artist of the Uzbek SSR (1944); doctor of the arts (1943).

In 1908, Shteinberg graduated from the St. Petersburg Conservatory, where he had studied composition under N. A. Rimsky-Korsakov. He composed five symphonies, the ballets *Metamorphoses* (after Ovid, 1913) and *Tyl Ulenspiegel* (after C. de Coster, 1936), symphonic works, and works for voice and orchestra. In several works he drew on the musical folklore of peoples of the USSR, notably in the Symphony No. 4 (*Turksib Symphony*, 1933), based on Kazakh and Kirghiz folk themes, and the Symphony No. 5 (1942), a rhapsody on Uzbek themes. Shteinberg was also known as a conductor.

In 1908, Shteinberg began teaching at the St. Petersburg (later Leningrad) Conservatory, where he became a professor in 1915. He served as dean of the faculty of composition from 1917 to 1931 and head of the division of conducting from 1931 to 1934; in 1939 he was named head of the subdepartment of composition. Among his students were M. Ashrafi, E. G. Brusilovskii, S. A. Chernetskii, Iu. A. Shaporin, D. D. Shostakovich, and V. V. Shcherbachev. He completed Rimsky-Korsakov's *Foundations of Orchestration*.

Shteinberg was awarded the Order of the Red Banner of Labor and a medal.

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SHTEINBERG, SERGEI SAMOILOVICH. Born Sept. 26 (Oct. 8), 1872, in Moscow; died Sept. 7, 1940, in Sverdlovsk. Soviet metallurgist. Corresponding member of the Academy of Sciences of the USSR (1939).

Upon graduating from the Freiberg Mining Academy in 1906, Shteinberg worked at metallurgical plants in the Urals until 1925. At the same time, from 1920 to 1925, he was head of the electrometallurgical division of the Uralmet trust in Zlatoust. Between 1925 and 1940 he was a professor at the Urals Polytechnic Institute. From 1927 to 1930 he was head of the Urals section of the Institute of Metals, which he had organized. In 1932 he began working at the Urals Branch of the Academy of Sciences of the USSR, where in 1939 he was named head of the Institute of Metallurgy, Metal Science, and Metal Physics.

Shteinberg's main research dealt with metallurgy and with the heat treatment and alloying of steel. Shteinberg founded a school of metallurgists in the Urals.

Shteinberg was awarded the Order of the Red Banner of Labor.

WORKS

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Sadovskii, V. "Pamiati S. S. Shteinberga." *Metallurg*, 1940, no. 11–12. N. K. LAMAN [29–1465–3]

SHTEINGART, ALEKSANDR MATVEEVICH. Born Apr. 23, 1887, in Odessa; died Feb. 19, 1934, in Moscow. Soviet party figure. Member of the Communist Party from 1913.

The son of a worker, Shteingart became ■ printshop worker in 1901. In the army during World War I, he carried out revolutionary work among soldiers on the Rumanian front. During the October Revolution of 1917, he served as chairman of the revolutionary committee of his corps and chairman of the corps committee of the RSDLP(B). Shteingart fought in the Civil War of 1918–20, and from 1921 to 1925 he was head of the organizational department of the Political Directorate of the Workers' and Peasants' Red Army.

From 1930 to 1932, Shteingart was a member of the collegium of the People's Commissariat of Agriculture of the RSFSR. In 1933 he became deputy director of the Political Administration of Machine Tractor Stations (MTS) of the People's Commissariat of Agriculture of the USSR; while holding that post, he served ■ head of the political sector of MTS and head of the Northern Caucasus Krai Agricultural Administration. In 1934 he became secretary of the Saratov Krai Committee of the ACP(B). In the same year he served as ■ delegate to the Seventeenth Party Congress, at which he was elected a candidate member of the Central Committee of the ACP(B).

Shteingart, who was awarded the Order of the Red Banner, is buried on Red Square by the Kremlin wall. [29–1466–1]

SHTEINGEL', VLADIMIR IVANOVICH. Born Apr. 13 (24), 1783, in the city of Obvinsk, now the village of Verkh-Iaz'va, Krasnovishersk Raion, Perm' Oblast; died Sept. 20 (Oct. 2), 1862, in St. Petersburg. Decembrist; lieutenant colonel; baron.

After graduating from the Naval Cadet School in 1799, Shteingel' served as a naval officer. He fought in the Patriotic War of 1812 as a member of the St. Petersburg volunteer corps, and from 1814 to 1817 he was adjutant to General A. P. Tormasov, the commander in chief of Moscow. An advocate of constitutional monarchy, Shteingel' joined the Northern Society of Decembrists in 1824 and helped prepare the Decembrist uprising in St. Petersburg. Although he was not present in Senate Square on Dec. 14, 1825, he was sentenced to 20 years' hard labor, at the Nerchinsk mines. Shteingel' spent the period 1835 to 1856 in exile in Siberia.

WORKS

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REFERENCE

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SHTELLER, PAVEL PAVLOVICH. Born Jan. 1 (14), 1910, in St. Petersburg; died Feb. 4, 1977, in Moscow. Soviet architect. Honored Architect of the RSFSR (1971).

In 1936, Shteller graduated from the architecture department of the Academy of Arts in Leningrad, where he studied under N. A. Trotskii. From 1937 to 1945 he worked under the direction of L. V. Rudnev. Shteller collaborated on several noteworthy buildings in Moscow, including the Hotel Sovetskaia (1950; State Prize of the USSR, 1951), the pavilion of the Central Chernozem Regions at the Exhibition of the Achievements of the National Economy of the USSR (1954), the Kremlin Palace of Congresses (1959–61; Lenin Prize, 1962), the Hotel Rossiia (1970), the concert hall in Zariad'e (1974), and the House of the Council of Ministers of the RSFSR (from 1968, with D. N. Chechulin and others). He headed an architectural team working on designs for Novokirovskii Prospect (1968–77), also in Moscow.

Shteller was awarded the Order of the Badge of Honor and several medals. [29–1469–3]

SHTELLING, EDUARD VASIL'EVICH. Born Apr. 28, 1850; died July 2, 1922. Russian geophysicist. Corresponding member of the St. Petersburg Academy of Sciences (1901).

Shtelling joined the staff of the Main Physical Observatory in 1874. In 1885 he was named director of the Irkutsk Magnetic and Meteorological Observatory, which he used as a base in organizing a network of meteorological stations in Siberia. Between 1897 and 1917, Shtelling was assistant director of the Main Physical Observatory and head of its division of climatology.

Shtelling's works dealt with climatology and terrestrial magnetism; he advanced an empirical formula for calculating evaporation from the surface of a water body. [29–1469–4]

SHTEMENKO, SERGEI MATVEEVICH. Born Feb. 7 (20), 1907, in the *stanitsa* (large cossack village) of Uriupinskaia, now the city of Uriupinsk, Volgograd Oblast; died Apr. 23, 1976, in Moscow. Soviet military commander; general of the army (1968). Member of the CPSU from 1930.

The son of a peasant, Shtemenko joined the Red Army in 1926. He graduated from the Sevastopol' Antiaircraft Artillery School in 1930, the Military Academy of Mechanization and Motorization of the Workers' and Peasants' Red Army in 1937, and the Military Academy of the General Staff in 1940. Beginning in 1940, he held high-level posts on the General Staff of the Red Army.

During the Great Patriotic War of 1941–45, Shtemenko was named deputy axis chief of the Operations Directorate of the General Staff in August 1941. Before becoming first deputy chief of the directorate in April 1943, he served as axis chief. In May 1943, Shtemenko was appointed chief of the Operations Directorate of the General Staff. He was assigned by the General Headquarters of the Supreme Command in 1942 to help organize and conduct the operations of the Transcaucasian Front. He carried out similar assignments for the Black Sea and Northern groups of forces and the Separate Primor'e Army in 1943 and for the First, Second, and Third Baltic fronts, the Western Front, the Fourth Ukrainian Front, and the Second Byelorussian Front in 1944.

After the war, Shtemenko served as deputy chief of the General Staff. He was chief of the General Staff and deputy minister of the armed forces of the USSR from November 1948 to June 1952. Beginning in June, he held high-level troop-command positions. Shtemenko was named chief of staff and first deputy commander in chief of the ground forces in July 1962, deputy chief of the General Staff of the Armed forces of the USSR in April 1964, and chief of staff of the Joint Armed Forces of the member countries of the Warsaw Pact in August 1968.

Shtemenko was a candidate member of the Central Committee of the CPSU from 1952 to 1956. He was awarded the Order of Lenin, three Orders of the Red Banner, two Orders of Suvorov First Class, the Order of Kutuzov First Class, the Order of Suvorov Second Class, the Order of the Red Banner of Labor, the Order of the Red Star, the Order for Service to the Motherland in the Armed Forces of the USSR Third Class, and various medals and foreign orders. Shtemenko was the author of *The General Staff in the War Years* (parts 1–2, 1968–73). [29–1470–1]

SHTERENBERG, DAVID PETROVICH. Born July 14 (26), 1881, in Zhitomir; died May 1, 1948, in Moscow. Soviet painter and graphic artist.

From 1907 to 1917, Shterenberg lived in Vienna and in Paris, where he attended the Academy of Arts and the Vitti Academy. He was head of the art department of the People's Commissariat of Education from 1918 to 1920. Shterenberg was one of the organizers and the chairman of the Society of Easel Painters from 1925 to 1930. He taught in the State Free Art Workshops, the Vkhutemas, and the Vkhutein in Moscow between 1920 and 1930.

As an active supporter of Western modernist trends, Shterenberg took a one-sided approach to the tasks of reinterpreting the artistic heritage for the new revolutionary society. His works are distinguished for their strikingly expressive imagery and laconic composition, as well as for the precision of their abstracted forms and flatness of composition. Notable examples include *Anis'ka*, (1926), *The Agitator* (1927), and *The Old* (1927), all at the Tret'iakov Gallery in Moscow, and *Still Life With Lamp* (1920), at the Russian Museum in Leningrad. [29–1471–2]

SHTERN, GRIGORII MIKHAILOVICH. Born July 24 (Aug. 6), 1900, in the village of Smela, now a city in Cherkassy Oblast, Ukrainian SSR; died Oct. 28, 1941. Soviet military leader; colonel general (1940). Hero of the Soviet Union (Aug. 29, 1939). Member of the CPSU from 1919.

The son of a physician, Shtern graduated from a *Gymnasium* in 1918 and enlisted in the Red Army in March 1919. Between August 1919 and December 1920 he engaged in political work in the 46th Rifle Division of the Southern Front as military commissar of a regiment and of a brigade and as a worker in the division's political section. He was military commissar of a regiment, of the headquarters of the 3rd Rifle Division, and of the First Horse Cavalry Corps between 1921 and 1923. Between November 1923 and May 1925, on the Turkestan Front, Shtern took part in the struggle against the Basmachi, serving as military commissar of a cavalry brigade and as commander of special-assignment units of the Khorezm Group of Forces.

Shtern completed advanced courses for higher command personnel at the M. V. Frunze Military Academy in 1926 and graduated from the eastern department of the academy in 1929. Between 1929 and 1936 he carried out particularly important assignments for the people's commissar for military and naval affairs (from 1934, the people's commissar of defense of the USSR). During the National Revolutionary War in Spain, Shtern was the chief military adviser for the republican government from January 1937 to April 1938.

Shtern was appointed chief of staff of the Far Eastern Front in May 1938. In August of that year he directed the combat opera-

tions of the Soviet forces in the Soviet-Japanese conflict at Lake Khasan. From the autumn of 1938 to June 1939, Shtern commanded the First Red Banner Separate Far Eastern Army. He led a frontline group for the coordination of operations of the Soviet and Mongolian forces in the Soviet-Japanese conflict on the Khalkin-Gol River in August 1939 and commanded the Eighth Army during the Soviet-Finnish War of 1939–40. Shtern served as commander of the Far Eastern Front from January to April 1941 and headed the Air Defense Directorate of the People's Commissariat of Defense from April to June of that year.

Shtern was a member of the Central Committee of the ACP(B) from 1939 to 1941. Shtern was awarded two Orders of Lenin, three Orders of the Red Banner, and the Order of the Red Star. [29–1472–1]

SHTERN, LINA SOLOMONOVNA (also Lina Šterna). Born Aug. 14 (26), 1878, in Liepāja, in what is now the Latvian SSR; died Mar. 7, 1968, in Moscow. Soviet physiologist. Academician of the Academy of Sciences of the USSR (1939) and the Academy of Medical Sciences of the USSR (1944). Member of the CPSU from 1938.

After graduating from the University of Geneva in 1903, Shtern taught there, becoming a professor in 1917. In 1925 she moved to the USSR. From 1925 to 1948 she was head of the subdepartment of physiology of the Second Moscow Medical Institute, and from 1929 to 1948 she was also director of the Institute of Physiology of the Academy of Sciences of the USSR. From 1954 to 1968 she was head of the physiology section of the Institute of Biophysics of the Academy of Sciences of the USSR.

Shtern's main works dealt with the chemical and physicochemical bases of the vital functions of humans and animals. Shtern developed the concept of barrier functions and demonstrated the importance of such functions in maintaining the stability of the internal environment (homeostasis). She thoroughly investigated the blood-brain barrier. Her studies on the significance of nonspecific metabolic products (metabolites) in the functioning of the organism played a major role in elucidating the humoral regulation of functions.

Shtern received the State Prize of the USSR in 1943. She was awarded two orders.

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SHTERNBERG, LEV IAKOVLEVICH (also Sternberg). Born Apr. 21 (May 3), 1861, in Zhitomir; died Aug. 14, 1927, in Dudergof, now the settlement of Mozhaiskii, Lomonosov Raion, Leningrad Oblast. Soviet ethnographer. Corresponding member of the Academy of Sciences of the USSR (1924).

Shternberg became a professor at Leningrad University in 1918. He was exiled to Sakhalin (1889–97) for participation in various activities of the People's Will. There he studied the ethnography of the Nivkh (Giliak) and found that they had a clan system with a kinship hierarchy and vestiges of group marriage, as noted by Engels (see K. Marx and F. Engels, *Soch.*, 2nd ed., vol. 22, pp. 364–67). Beginning in 1901, he worked in the Museum of Ethnography and Anthropology in Leningrad. Shternberg demonstrated the unity of mankind from the standpoint of evolutionary theory. He regarded ethnography as a science concerned with the culture of primitive peoples and its vestiges. Shternberg made an important contribution to the study of primitive religion (the concepts of supernatural overlords and divine election, outline of the stages of evolution of religions).

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REFERENCE

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SHTERNBERG, PAVEL KARLOVICH. Born Mar. 21 (Apr. 2), 1865, in Orel; died Feb. 1, 1920, in Moscow. Soviet astronomer; revolutionary figure. Member of the Communist Party from 1905.

The son of a small-scale contractor, Shternberg graduated from the physics and mathematics faculty at Moscow University in 1887. He was named a professor there in 1914 and became director of the Moscow Observatory in 1916.

Between 1905 and 1908, Shternberg was a member of a financial commission of the Moscow committee of the RSDLP and served in the committee's military technical office. During the February Revolution of 1917 he was a member of the party's Moscow committee, a member of the Central Headquarters of the Red Guard in the Moscow city soviet, and a member of the Moscow military revolutionary committee. He also directed combat operations in Zamoskvorech'e Raion.

After the October Revolution of 1917, Shternberg became a member of the presidium of the Moscow provincial executive committee and head of the provincial military committee. He served on the collegium of the People's Commissariat for Education in 1918 and headed its department of higher educational institutions. Shternberg was chosen a member of the Revolutionary Military Council of the Second Army in September of that year and a member of the Revolutionary Military Council of the Eastern Front in October 1919.

Shternberg's principal works dealt with gravimetry and photographic astrometry. He was one of the first to use photography in the measurement of binary stars, and he studied the motion of the earth's poles. In 1931, the Institute of Astronomy at Moscow University was named for Shternberg.

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SHTERNFEL'D, ARI ABRAMOVICH (also A. A. Sternfeld). Born May 14, 1905, in Sieradz, Poland; died July 5, 1980, in Moscow. Soviet scientist; pioneer in astronautics. Doctor of technical sciences *honoris causa* of the Academy of Sciences of the USSR (1965). Honored Worker in Science and Technology of the RSFSR (1965).

Shternfel'd studied at the University of Kraków in 1923 and 1924. He graduated from the University of Nancy, France, in 1927 and conducted research at the Sorbonne in astronautics from 1928 to 1930. After emigrating to the USSR in 1935, he joined the staff of the Jet Scientific Research Institute.

Shternfel'd's principal works dealt with the calculation of the most energy-efficient flight trajectories for spacecraft. Shternfel'd received the REP-Hirsh International Astronautical Prize in 1934 and, for oustanding achievements in space science, the Galabert Prize in 1963.

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Vvedenie v kosmonavtiku, 2nd ed. Moscow, 1974. [29–1476–1]

SHTEROVKA, an urban-type settlement in Voroshilovgrad Oblast, Ukrainian SSR, under the jurisdiction of the Krasnyi Luch city soviet. Shterovka is situated 7 km from the Petroven'ka railroad station on the Chernukhino-Dolzhanskaia line. The settlement's population works in the city of Krasnyi Luch. [29–1476–3]

SHTIGLITS SCHOOL OF DESIGN (full name, Baron Shtiglits Central School of Design; TsUTR), a school founded in 1876 in St. Petersburg under the patronage of A. L. Shtiglits. Opened with the Primary School of Drawing, Drafting, and Sculpting in 1879, the Shtiglits School merged with the Petrograd Vkhutein (Higher Art and Technical Institute) in 1922. Its purpose was to prepare individuals for teaching drawing and decorative applied art in industrial arts schools. A number of outstanding Russian and Soviet artists studied at the school, including M. G. Manizer, I. N. Pavlov, and A. F. Pakhomov.

In 1945, the Shtiglits School was reorganized into what is now the V. I. Mukhina Leningrad Higher Industrial Arts School.
[29–1478–1]

SHTIURMER, BORIS VLADIMIROVICH. Born 1848; died Aug. 20 (Sept. 2), 1917, in Petrograd. Russian state figure; large-scale *pomeshchik* (landowner).

After graduating from the faculty of law at the University of St. Petersburg, Shtiurmer served in the ministries of justice and the court. In 1894 he was named governor of Novgorod Province, and in 1896 he became governor of Yaroslavl Province. Appointed director of the Department of General Affairs of the Ministry of the Interior in 1902, he became one of V. K. Pleve's closest associates. Shtiurmer was appointed to the Council of State in 1904. On Jan. 20, 1916, with the support of G. E. Rasputin, he was named chairman of the Council of Ministers; from Mar. 3 (16) to July 7 (20), 1916, he also served as minister of the interior, and on July 7 (20) he was appointed minister of foreign affairs.

Shtiurmer fought against the revolutionary movement and bourgeois opposition. On Nov. 10 (23), 1916, he was released from his duties. After the February Revolution of 1917, Shtiurmer was arrested; he died in the Peter and Paul Fortress.
[29–1510–2]

SHTOF, an old unit of liquid measure, equal to 1.2299 liters. The term was also applied to a distinctive type of bottle for strong alcoholic beverages with a capacity of 1 *shtof*. Such bottles were usually of glass and had a squat, cubelike shape. [29–1487–3]

SHTOF, a decorative woven fabric with a combination or other weave, piece-dyed, and with an elaborate, large-figured textural design. Such fabrics, produced primarily from chemical threads, are used for furniture coverings, wall coverings, and curtains.
[29–1487–4]

SHTOGARENKO, ANDREI IAKOVLEVICH. Born Oct. 2 (15), 1902, in the village of Novye Kaidaki, in what is now Dnepropetrovsk Oblast. Soviet composer. People's Artist of the USSR (1972). Member of the CPSU since 1944.

Shtogarenko graduated from the Kharkov Conservatory in 1936. From 1954 to 1968 he served as rector of the Kiev Conservatory, where he became a professor in 1960. In 1968 he became chairman of the administrative board of the Composers' Union of the Ukraine.

Shtogarenko is known primarily for his symphonic and vocal music. He has developed in a variety of ways the subject of the Great Patriotic War of 1941–45, notably in the cantata-symphony *My Ukraine* (State Prize of the USSR, 1946). Among his other compositions are the symphonic suite *In Memory of Lesia Ukrainka* (State Prize of the USSR, 1952) and three symphonies, including the *Kiev Symphony* (T. G. Shevchenko State Prize of the Ukrainian SSR, 1974).

Shtogarenko has been awarded the Order of Lenin, the Order of the October Revolution, and the Order of the Red Banner of Labor.

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SHTOKOLOV, BORIS TIMOFEEVICH. Born Mar. 19, 1930, in Kuznetsk. Soviet Russian singer (bass). People's Artist of the USSR (1966).

Shtokolov graduated from the Urals Conservatory in Sverdlovsk in 1954. He apprenticed at the Sverdlovsk Theater of Opera and Ballet from 1951 until 1954, when he became a soloist. In 1959 he became a soloist at the S. M. Kirov Theater of Opera and Ballet in Leningrad.

Shtokolov, a leading Soviet vocalist, possesses a beautiful, expressive voice and portrays his characters vividly and convincingly. His roles have included the Miller in Dargomyzhskii's *The Mermaid*, Susanin and Ruslan in Glinka's *Ivan Susanin* and *Ruslan and Liudmila*, Godunov and Dositheos in Mussorgsky's *Boris Godunov* and *Khovanshchina*, the title role in Rubinstein's *The Demon*, Gremin in Tchaikovsky's *Eugene Onegin*, Mephistopheles in Gounod's *Faust*, Don Basilio in Rossini's *The Barber of Seville*, and Andrei Sokolov in Dzerzhinskii's *The Fate of a Man*. He also performs on the concert stage and has toured abroad.

Shtokolov has been awarded two orders and several medals.
V. I. ZARUBIN [29–1483–2]

SHTORKH, ANDREI KARLOVICH (also Heinrich Friedrich Storch). Born Feb. 18 (Mar. 1), 1766, in Riga; died Nov. 1 (13), 1835, in St. Petersburg. Russian economist, historian, and bibliographer. Academician of the St. Petersburg Academy of Sciences (1804); the academy's vice-president (1830).

Shtorkh studied at the universities of Jena and Heidelberg from 1784 to 1787. After returning to Russia, he taught history and literature at the St. Petersburg Cadet Corps. For 20 years, beginning in 1799, he tutored the children of the imperial family. With F. P. Adelung he compiled *The Systematic Review of Literature in Russia During the Five-year Period 1801–1806* (parts 1–2, 1810–11), which exhaustively surveyed the works printed in Russia in the indicated period and which marked the beginning of Russian book statistics.

Shtorkh wrote a textbook on political economy that gained wide recognition in the early 19th century. In economic theory, he borrowed a number of ideas, such as the theory of wages and profits, from A. Smith; he rejected Smith's theory of labor value, however, siding with T. Malthus on several issues. Although he demonstrated the advantage of free over serf labor, Shtorkh asserted that Russian agriculture could develop successfully under serfdom. Shtorkh was a member of 21 academies and scholarly societies.

WORKS

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Zdobnov, N. V. *Istoriia russkoi bibliografii do nachala XX v.*, 3rd ed. Moscow, 1955. Pages 144–47. [29–1486–3]

SHTORM, GEORGII PETROVICH. Born Sept. 12 (24), 1898, in Rostov-on-Don; died Apr. 27, 1978. Soviet Russian writer and literary historian.

The son of an office worker, Shtorm studied in the department of history and philology at Don University (now the University of Rostov) from 1919 to 1921. He was first published in 1921. Shtorm's *Tale of Bolotnikov* (1930) was praised by M. Gorky. In the 1930's he published the scholarly historical works *The Bishop's Move* (also known as *A Lot of Daily Life*; 1930) and *The Works and Days of Mikhail Lomonosov* (1932). He was the author of a poetic translation of *The Tale of Igor's Campaign* (1934) and of documentary-biographical books dealing with heroes of the Russian Navy, including *F. F. Ushakov* (1947) and *Pages of Naval Glory* (1954). His diligent archival research resulted in *The Hidden Radishchev: The Second Life of "A Journey From St. Petersburg to Moscow"* (1965). Shtorm was awarded the Order of the Red Banner of Labor and various medals.

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Russkie sovetskie pisateli-prozaiki: Biobibliograficheskii ukazatel', vol. 6, part 2. Moscow, 1969. [29–1485–1]

SHTRAUKH, ENGEL'BERT MADISOVICH (also Engelbert Strauch). Born Jan. 10 (22), 1896, in Helsingfors (Helsinki); died Apr. 21, 1938. Participant in the struggle for Soviet power in Estonia; party figure. Member of the Communist Party from 1912.

The son of a worker, Shtraukh became a metalworker in 1911 in the naval port of the city of Revel (now Tallinn). After the February Revolution of 1917, he was a member of the Revel soviet and chairman of the naval port and Revel committees of the RSDLP(B). During the October Days of 1917, he served as a member of the presidium of the city's revolutionary committee, chairman of its revolutionary tribunal, and commissar for foodstuffs.

In 1918, during the Ice Campaign of the Baltic Fleet, Shtraukh helped organize the transfer of ships from Revel to Helsingfors. Between 1918 and 1921 he served as chairman of the collegium for foodstuffs of Omsk Province, and he took part in the struggle against the forces of A. V. Kolchak and the White Czechs; during the same period he also served as commissar for foodstuffs of Omsk and deputy commissar for foodstuffs of Tomsk Province. In 1921 and 1922, Shtraukh was secretary of the Russian Bureau of the Communist Party of Estonia (in Petrograd) and a member of the Central Committee of the Communist Party of Estonia. From 1922 he served in the People's Commissariat for Foodstuffs of the RSFSR, the Central Control Commission and Workers' and Peasants' Inspectorate of the RSFSR, and the apparatus of the Council of People's Commissars of the RSFSR.

Shtraukh was a delegate to the Fifteenth through Seventeenth Congresses of the ACP(B), and from 1927 to 1934 he served as a member of the Central Control Commission of the ACP(B). In 1921, Shtraukh was a delegate to the Third Congress of the Comintern. [29–1491–2]

SHTRAUKH, MAKSIM MAKSIMOVICH (Maxim Strauch). Born Feb. 11 (24), 1900, in Moscow; died there Jan. 3, 1974. Soviet Russian actor. People's Artist of the USSR (1965).

From 1921 to 1924, Shtraukh appeared with the Workers' Theater of the Proletkul't. He performed from 1929 to 1931 with the Meyerhold Theater, and in 1932 he joined the Moscow Theater of the Revolution (now the Mayakovsky Theater). In the experimental films of S. M. Eisenstein and the plays staged by V. E. Meyerhold, Shtraukh displayed a flair for extravagance and a socially oriented grotesque style. He portrayed satirical characters in plays by Mayakovsky, including Pobedonosikov in *The Bathhouse* and Prisypkin in *The Bedbug*. In a number of roles, however, he revealed a talent as a master of subtle, profoundly human psychological portraits, for example, as Rubinchik in Zarkha's *Street of Joy* and the Chief in Pogodin's *My Friend*. Shtraukh's supreme creative achievement was his deeply realistic portrayal of V. I. Lenin in a number of plays and in films directed by S. I. Iutkevich, including *Man With a Gun* (1938), *Stories of Lenin* (1958), and *Lenin in Poland* (1966). Also among his major cinematic roles were the Sleuth in *Strike* (1925), the Detective in *The Ghost That Doesn't Return* (1930), and Tibo in *Murder on Dante Street* (1956).

Shtraukh was awarded the Lenin Prize in 1959 and the State Prize of the USSR in 1949 and twice in 1951. He was awarded the Order of Lenin, two other orders, and several medals.

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Shakhov, G. *M. M. Shtraukh*. Moscow, 1964. [29–1491–1]

SHTROMBERG, ALEKSANDR PAVLOVICH. Born Sept. 5 (17), 1854; died Oct. 10 (22), 1884. Revolutionary and member of the People's Will; naval lieutenant; baron.

Shtromberg graduated from the St. Petersburg Naval School in 1875 and served in the Baltic Sea and the Pacific Ocean. In 1880 he helped organize a revolutionary circle of sailors at Kronstadt, and, together with A. I. Zheliabov, N. N. Kolodkevich, N. M. Rogachev, and N. E. Sukhanov, he directed the Central Military Organization of the People's Will.

In late April 1881, Shtromberg was arrested. Because of insufficient evidence, his sentence was merely exile to Verkholensk. Betrayed by S. P. Degaev in 1883, he was recalled from exile and sentenced to death in the Trial of the 14. Shtromberg and Rogachev were hanged at Shlissel'burg Fortress.

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Selivanov, V. I. *Moriaki-narodovol'tsy*, 2nd ed. Moscow, 1931. [29–1497–2]

SHTUTSER, the Russian term for a type of firearm with a rifled bore, loaded from the muzzle; a forerunner of the rifle. Such weapons first appeared in Germany in the 16th century, and in the early 17th century a few were used by troops in Poland and Bavaria. By the end of the 17th century all noncommissioned infantry officers in the Prussian and Swedish services were armed with *shtutsery*, and by the end of the 18th century noncommissioned officers in the French armies were also so armed. *Shtutsery* appeared in Russia in the 18th century; they were first manufactured in Tula in 1726. Rifle battalions were established in the Russian army in 1843, and the best marksmen, called *shtutsernye*, were assigned six to a company in infantry regiments. After the rearming of all armies in the second half of the 19th century with breech-loading rifles, the Russian term was reserved for certain types of hunting rifles (*see* GUNS, SPORTING). [29–1506–2]

SHTYK-IUNKER, the lowest junior-officer rank in the Russian artillery. Introduced in 1712 by Peter I, the rank *shtyk-iunker* existed until the late 18th century and corresponded to the 13th class in the Table of Ranks. [29–1509–1]

SHTYKOV, TERENTII FOMICH. Born Feb. 28 (Mar. 13), 1907, in the village of Liubki, in what is now Gorodok Raion, Vitebsk Oblast; died Oct. 25, 1964, in Moscow. Soviet party and military figure; colonel general (1944). Member of the CPSU from 1929.

The son of a peasant, Shtykov graduated from a vocational-technical school in 1927. In 1938 he became second secretary of the Leningrad oblast committee of the ACP(B), and during the Soviet-Finnish War of 1939–40 he served concurrently as a member of the Military Council of the Seventh Army. During the Great Patriotic War of 1941–45, he was a member of the military councils of the Northwestern Front (1941–42), the Leningrad Front (1942–43), the Volkhov Front (1943–44); and the Karelian Front (1944). In April 1945 he became a member of the Military Council of the Primor'e Group of Forces, and from August 1945 to October 1945 he was a member of the Military Council of the First Far Eastern Front.

After the war, Shtykov served from 1945 to 1947 as a member of the Military Council of the Primor'e Military District, and in 1947 and 1948 he was deputy commander for political matters in the military district. He was ambassador extraordinary and plenipotentiary of the USSR to the People's Democratic Republic of Korea from 1948 to 1951. From 1951 to 1959 he engaged in party work in such capacities as the secretary of oblast and krai committees. Shtykov became ambassador extraordinary and plenipotentiary of the USSR to the Hungarian People's Republic in April 1959. In 1961 he was named chairman of the Commission of State Control of the Council of Ministers of the RSFSR, and in February 1963 he became deputy chairman of the Committee of Party and State Control of the Bureau for the RSFSR of the Central Committee of the CPSU and the Council of Ministers of the RSFSR. He was a candidate member of the Central Committee of the ACP(B) from 1939 to 1952 and a member of the Central Committee of the CPSU from 1956 to 1961.

Shtykov served as a deputy to the first, second, fourth, and fifth convocations of the Supreme Soviet of the USSR. Shtykov was awarded three Orders of Lenin, the Order of the Red Banner, the Order of Suvorov First Class, three Orders of Kutuzov First Class, and various medals. [29–1508–3]

SHTYRBUL, KIRILL ANTONOVICH (surname also spelled Shtirbul, Shtirbu). Born Feb. 17 (Mar. 2), 1915, in the village of Brushteny, Rybnitsa Raion. Soviet Moldavian actor. People's Artist of the USSR (1960). Member of the CPSU since 1947.

Shtyrbul graduated from the theatrical school in Odessa in 1937 and joined the First Moldavian Drama Theater in Tiraspol'

(now the Moldavian Pushkin Academic Music and Drama Theater in Kishinev). He was one of the first actors to depict V. I. Lenin on the Moldavian stage, in Pogodin's *The Kremlin Chimes* and *Man With a Gun* and Shatrov's *In the Name of Revolution*. His best roles were Shvandia in Trenev's *Liubov' Iarovaia*, Truffaldino in Goldoni's *The Servant of Two Masters*, the Mayor in Gogol's *The Inspector-General*, and the title roles in Shakespeare's *King Lear* and Brecht's *Schweik in the Second World War*. Shtyrbul's outstanding roles in musicals were Foma in Dunaevskii's *Free Wind* and Susik in Miliutin's *Trembita*.

Shtyrbul, a member of the Central Committee of the Communist Party of Moldavia from 1963 until 1976, was a deputy to the second through fourth convocations of the Supreme Soviet of the Moldavian SSR. In 1970, Shtyrbul won the State Prize of the Moldavian SSR. He has been awarded the Order of Lenin, the Order of the October Revolution, the Order of the Red Banner of Labor, and several medals. [29–1509–2]

SHUAMTA (also Dzveli-Shuamta or Staraia Shuamta; that is, Old Shuamta), a complex of medieval churches located 7 km southwest of Telavi, Georgian SSR. The main structures are a fifth-century basilica and two seventh-century domed churches, including one large structure similar in style to Dzhvari and one smaller church. Located 2 km from Dzveli-Shuamta is Akhali-Shuamta (Novaia Shuamta or New Shuamta), a 16th-century monastery with a domed church of the 16th or 17th century with 16th-century interior paintings. [29–1510–5]

SHUB, ESFIR' IL'INICHNA. Born Mar. 4 (16), 1894, in Moscow; died there Sept. 21, 1959. Soviet director of documentary films. Honored Artist of the RSFSR (1935).

Shub began her career in the cinema in 1922. Along with D. Vertov, she was among the first Soviet artists to introduce social commentary into the visual arts. She created the distinctive genre of the historical-documentary montage film. Her films *The Fall of the Romanov Dynasty* (1927, made from prerevolutionary newsreels), *The Great Path* (1927), and *Nicholas II's Russia and Leo Tolstoy* (1928) were vivid documents of great social impact. Shub later made films using footage from contemporary newsreels, including *Moscow Builds a Metro* (1934), *The Land of the Soviets* (1937), *Spain* (1939), and *The Face of the Enemy* (1941). From 1943 to 1953 she worked at the Central Documentary Film Studio. She was director of the newsreel *News of the Day* and held other positions. Shub was the author of the book *Close-up* (1959).

Shub was awarded the Order of the Badge of Honor and several medals. [29–1511–1]

SHUBARKUDUK, an urban-type settlement and the administrative center of Temir Raion, Aktiubinsk Oblast, Kazakh SSR. Shubarkuduk has a railroad station on the Gur'ev-Orsk line, 179 km southwest of Aktiubinsk. The settlement has enterprises serving railroad transportation. [29–1511–2]

SHUBARSHI, an urban-type settlement in Temir Raion, Aktiubinsk Oblast, Kazakh SSR. Shubarshi is situated on the Temir River (a right tributary of the Emba), 125 km southeast of the Shubarkuduk railroad station on the Gur'ev-Orsk line. Oil is extracted near the settlement. [29–1511–4]

SHUBERT, FEDOR IVANOVICH. Born Oct. 19 (30), 1758, in Helmstadt, Germany; died Oct. 10 (22), 1825, in St. Petersburg. Russian astronomer and geodesist. Member of the St. Petersburg Academy of Sciences from 1789.

Shubert was named head of the observatory of the St. Petersburg Academy of Sciences in 1804. He published a university-level textbook on theoretical astronomy in 1798 and conducted magnetic observations along the route extending from St. Petersburg through Kazan and Tobol'sk to Irkutsk in 1805. Shubert helped found the naval astronomical observatories at Kronstadt and Nikolaev.

Shubert was the author of *A Guide to Astronomical Observations Used in Determining Latitude and Longitude* (1803). In 1813 he began publishing annually *Morskoi mesiatseslov* (Maritime Calendar), which was used by the navy. Shubert was also the author of *Popular Astronomy* (parts 1–3, 1804–10), which explained the universe in accessible language.

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SHUBIN, FEDOT IVANOVICH. Born May 17 (28), 1740, in the village of Tiuchkovskaia, in what is now Arkhangel'sk Oblast; died May 12 (24), 1805, in St. Petersburg. Russian sculptor; one of the greatest representatives of enlightened classicism in 18th-century Russian art.

Shubin, the son of a peasant from the White Sea coast, did bone carvings as a child. He arrived in St. Petersburg in 1759, and from 1761 to 1767 he studied at the Academy of Arts there under N. F. Gillet. He received a stipend to study at the Academy of Arts in Paris, where he was a pupil of J. B. Pigalle from 1767 to 1770; he also studied in Rome from 1770 to 1772.

The classical clarity and realistic precision of Shubin's early works, for example, *F. N. Golitsyn* (marble, 1771, Tret'iakov Gallery), reveal the influence of ancient Greek art. In 1773, upon returning to St. Petersburg, Shubin created portraits, preferring to use marble because its soft texture enabled him to achieve many beautiful subtle effects. A master at sculpting the human face, he skillfully utilized the great variety of effects possible with circular carving motions, combining them to create an artistically successful likeness of the subject.

Shubin emphasized imposing dignity and grandeur in his portrait busts, notably *A. M. Golitsyn* (marble, 1775, Tret'iakov Gallery). Creating an impression of inner strength and vigor, he made an unprepossessing face seem inspired, for example, *Z. G. Chernyshev* (1774, Tret'iakov Gallery) and *P. A. Rumiantsev-Zaduniskii* (1778, Russian Museum, Leningrad), both in marble. He was remarkably successful in revealing the complex inner world of his subject in a marble portrait of an unidentified man (mid-1770's, Tret'iakov Gallery).

In the years 1774–75, Shubin executed 58 medallions depicting Russian princes and tsars for the Chesmé Palace (marble, State Armory, Moscow), and in 1789–90 he created the statue *Catherine II, the Legislator* for the Tauride Palace (marble, Russian Museum). In the 1770's and 1780's he also did numerous monumental decorative works in marble, such as the statues and relief works for the Marble Palace (1775–82) and for the Troitskii Cathedral of the Alexander Nevsky Laura (1786–89).

Shubin reached an exceptional degree of precision and truthfulness of characterization in his portraits of the 1790's, such as *G. A. Potemkin-Tavricheskii* (marble, 1791), *E. M. Chulkov*, *M. V. Lomonosov* (gypsum, 1792), and *A. A. Bezborodko* (marble, c. 1798), all of which are housed at the Russian Museum. His bust *Paul I* (marble, 1797 [?], Russian Museum) is a complex work of uncommon psychological depth.

Shubin spent the last years of his life in poverty, largely owing to the hostility of the ruling circles toward his art.

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SHUBIN, PAVEL NIKOLAEVICH. Born Mar. 14 (27), 1914, in the village of Chernavsk, Elets District, Orel Province; died Apr. 11, 1951, in Moscow. Soviet Russian poet.

The son of an artisan, Shubin graduated from the A. I. Herzen Leningrad Pedagogical Institute in 1938. He depicted the variegated beauty of the Russian countryside in his poetry collections *Wind in the Face* (1937) and *The Sail* (1940), which contain vivid word paintings. Shubin's best poems—including "Fidelity," "Half an Instant," "The Attack" and "The Driver"—depict the bravery of soldiers and contain reflections on Russia, fidelity, and love. Shubin was awarded two orders and various medals.

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Pavel Nikolaevich Shubin (1914–1951): Ukazatel' literatury. Voronezh, 1970. [29–1515–1]

SHUBIN, SEMEN PETROVICH. Born July 18 (31), 1908, in Liepāja, in what is now the Latvian SSR; died Nov. 28, 1938. Soviet theoretical physicist; doctor of physical and mathematical sciences (1935).

Shubin graduated from Moscow State University in 1927. He was a member of the staff of the Urals Physicotechnical Institute (now the Institute of Physics of Metals of the Urals Scientific Center of the Academy of Sciences of the USSR, in Sverdlovsk) from 1932 to 1937. In 1935, Shubin was named a professor at the Urals Physicomechanical Institute (later a department of the Urals Polytechnic Institute).

Shubin's principal works dealt with the classical vibration theory, the quantum theory of solids, and quantum theory in general. He and I. E. Tamm formulated a quantum theory of the photoelectric effect in metals in 1931, and Shubin advanced a band theory of liquid metals in 1933. Between 1934 and 1936, Shubin and S. V. Vonsovskii constructed polar and *s-d* exchange models of crystals.

REFERENCE

"Semen Petrovich Shubin. (K 50-letiiu so dnia rozhdeniia i 20-letiiu so dnia smerti)." *Uspekhi fizicheskikh nauk*, 1958, vol. 65, issue 4. (Contains bibliography.) [29–1515–2]

SHUBINKA, a very old Russian variety of cherry. The fruits are small and dark red; the firm flesh is somewhat tart, with a bitter astringent aftertaste. Shubinka cherries ripen in early August but do not fall from the tree immediately. The cherries are usually processed into jam, juice, or wine. The trees grow vigorously and are well foliated; they are winter-hardy and resistant to many diseases. Fruit production first occurs in the seventh or eighth year. The annual fruit yield from one tree is 6–11 kg. The Shubinka variety is grown in the central zone of the RSFSR. [29–1516–1]

SHUBINSKII, SERGEI NIKOLAEVICH. Born June 2 (14), 1834, in Moscow; died May 28 (June 10), 1913, in St. Petersburg. Russian historian and journalist.

A graduate of the Moscow Institute of the Nobility, Shubinskii served in the military from 1854 until 1887, achieving the rank of major general. He was a popularizer of Russian history of the 18th and first half of the 19th centuries. From 1875 to 1879 he edited the journal *Drevniaia i novaia Rossiia* (Ancient and New Russia); in 1880 he founded and became the editor of *Istoricheskii vestnik* (Historical Journal). Shubinskii held conservative, monarchist views.

WORKS

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Istoricheskie ocherki i rasskazy, 6th ed. St. Petersburg, 1911.
Ocherki iz zhizni i byta proshlogo vremeni. St. Petersburg, 1888. [29–1516–2]

SHUBNIKOV, ALEKSEI VASIL'EVICH. Born Mar. 17 (29), 1887, in Moscow; died there Apr. 27, 1970. Soviet crystallographer. Academician of the Academy of Sciences of the USSR (1953; corresponding member, 1933). Hero of Socialist Labor (1967).

Shubnikov graduated from Moscow University in 1912. He then worked at the Shaniavskii People's University under G. V. Vul'f. From 1920 to 1925 he was a professor at the Urals Mining Institute. Beginning in 1925, he worked at the Academy of Sciences of the USSR. In 1937 he became head of the crystallography laboratory of the Academy of Sciences of the USSR, and in 1944, director of the Institute of Crystallography, which was founded on his initiative. Beginning in 1953, Shubnikov was a professor and head of a subdepartment at Moscow State University.

Shubnikov's main works dealt with crystal physics, symmetry, the formation and growth of crystals, and applications of crystals. Shubnikov laid the foundations for the generalizations of crystallographic symmetry, thus creating the study of antisymmetry. He developed the symmetry approach in the investigation and description of the properties of single crystals and polycrystals. Shubnikov predicted the existence of and was the first to create piezoelectric textures. One of the first to study crystal growth, he was instrumental in developing modern techniques for growing and processing crystals.

Shubnikov received the State Prize of the USSR in 1947 and 1950. He was awarded two Orders of Lenin, two other orders, and various medals.

WORKS

Izbr. trudy po kristallografii. Moscow, 1975. [29–1517–3]

SHUBNIKOV, LEV VASIL'EVICH. Born Sept. 29, 1901; died 1945. Soviet physicist. Doctor of sciences in physics and mathematics.

After graduating from the Leningrad Polytechnic Institute in 1926, Shubnikov was sent to the Cryogenic Laboratory in Leiden. In 1930 he joined the staff of the Ukrainian Physicotechnical Institute. In 1931 he was made the director of the USSR's first cryogenic laboratory, which was established at the Ukrainian Physicotechnical Institute. In 1934, Shubnikov became a professor at the University of Kharkov.

Shubnikov's early scientific works dealt with the growth of single crystals of metals and—together with I. V. Obreimov—the plastic deformation and hardening of crystals. In 1930, together with the Dutch scientist W. de Haas, Shubnikov discovered the phenomenon of a periodic change in the resistance of bismuth as a function of a magnetic field at low temperatures. Shubnikov studied the magnetic properties of superconductors and of alloys as well as the temperature dependence of heat capacity at low temperatures. He brought about the transition of a substance from the paramagnetic state to the antiferromagnetic state.

REFERENCE

Balabekian, O. I. "Lev Vasil'evich Shubnikov." *Uspekhi fizicheskikh nauk*, 1966, vol. 89, issue 2. (Contains a bibliography.) [29–1517–4]

SHUBNIKOV–DE HAAS EFFECT, an oscillating dependence of the electrical resistivity ρ of single crystals of metals on the reciprocal of the strength of a magnetic field $1/H$. The effect, which is observed at low temperatures, was discovered by L. V. Shubnikov and W. de Haas in 1930 in single crystals of Bi.

The oscillation period is related to the area of extreme sections of the Fermi surface and depends on the direction of the field **H** with respect to the crystallographic axes. The oscillation amplitude decreases exponentially as temperature increases.

The Shubnikov–de Haas effect makes it possible to determine both the shape of the Fermi surface and the electronic energy spectrum. The nature of the Shubnikov–de Haas effect is the same as that of the de Haas–Van Alphen effect. [29–1518–1]

SHU CHING (Book of Historical Legends, Book of History, Book of Documents; also *Shang Shu* [Ancient Writing]), a work of ancient Chinese literature.

The *Shu Ching* contains material on the history of China from the rule of the legendary ruler Yao (third millennium B.C.) to 624 B.C. The oldest parts apparently date to the period between the 14th and 11th centuries B.C. According to tradition, it was compiled by Confucius. In 213 B.C., the *Shu Ching* was burned along with the other Confucian classics, but it was reproduced in the second century B.C., partly from memory (the "new text," which modern scholarship considers authentic) and partly from discovered manuscripts (the "ancient text"). It contains elements of myths, heroic legends, traditional historical tales, and examples of oratory and philosophy. The texts are accompanied by an expanded Confucian commentary. The *Shu Ching* has become part of the Confucian canon and has had a great influence on Chinese culture.

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I. S. LISEVICH [29–1556–3]

SHUGNI RANGE, a mountain range in the western Pamirs, in the Tadzhik SSR. The Shugni Range is the watershed for the Gunt and Shakhdara rivers. It measures approximately 80 km in length and rises to a maximum elevation of 5,704 m at Skalistyi Peak. Approximately 150 sq km of the range is glaciated. High-mountain steppes and meadows are found on the slopes.
[29–1521–2]

SHUGUROVO, an urban-type settlement in Leninogorsk Raion, Tatar ASSR. Shugurovo is situated on the Lesnaia Sheshma River of the Kama River basin, 28 km north of the Kliavlino railroad station on the Ul'ianovsk-Bugul'ma line. Industry is represented by a brickyard and a factory for the production of petroleum bitumens. A people's amateur theater is located in Shugurovo. [29–1521–5]

SHUIA, a city under oblast jurisdiction and the administrative center of Shuia Raion, Ivanovo Oblast, RSFSR. Landing on the Teza River, a tributary of the Kliaz'ma; railroad station on the Novki-Ivanovo line. Population, 72,000 (1977; 58,000 in 1939).

Shuia is first mentioned in historical documents in the year 1539. In the 16th and 17th centuries it traded with cities along the Volga and was known for the production of sheepskin, leather, linen, and felted fabric and the manufacture of such goods as sleighs and wagons. In the 18th century the textile industry began to develop in the city, and the first factory was built circa 1755. In 1778, Shuia became the capital of a district in Vladimir Vicegerency (from 1796, Vladimir Province). The first cotton mill was built in the city in 1838, and as of 1850 the city had 17 weaving mills with 5,122 workers.

In 1903, F. A. Afanas'ev formed the first Social Democratic circle in Shuia. During the Revolution of 1905–07, M. V. Frunze carried on propaganda among the textile workers of the city. In September 1917 he was elected chairman of the district soviet of workers' and peasants' deputies; under his leadership the workers of Shuia took part in the October Armed Uprising in Moscow. In 1918, Shuia became the capital of a district in Ivanovo-Voznesensk Province, and in 1932 it became the administrative center of a raion in Ivanovo Oblast.

Shuia has three textile mills, an accordion factory, a furniture factory, a felted-fabric factory, a drawn-thread embroidery workshop, a garment factory, and a knitwear factory. The city also has a machine-building plant, a chemical fibers plant, an oil extraction plant, and a plant for the manufacture of rolled metal products. Educational institutions include a pedagogical institute, an industrial technicum, and a medical school. The M. V. Frunze Memorial Museum and a museum of local lore are located in the city.

REFERENCE
Ryzhov, V. *Gorod Shuia i Shuiskii okrug: Geograficheskoe, istoricheskoe i ekonomicheskoe opisanie*. Shuia, 1930. [29–1559–5]

SHUIA, an urban-type settlement in Onega Raion, Karelian ASSR. Shuia is located 4 km from the Shuiskaia railroad station on the Petrozavodsk-Murmansk line. The settlement has a sovkhoz specializing in meat and dairy farming. [29–1560–1]

SHUIA (also Suoioki), a river in the Karelian ASSR. The Shuia has a length of 194 km and drains an area of 10,100 sq km. It issues from the lake Suoiarvi (area, 58.5 sq km) and flows through several small lakes and the lake Shotozero (area, 74 sq km) before emptying into the lake Logmozero (16 sq km), which is linked with Lake Onega by a channel 0.8 km long. Lakes occupy 10.6 percent of the Shuia's length. The mean flow rate 11 km from the river's mouth is 90.2 cu m per sec. The Shuia freezes over between November and January, and the ice breaks up in April or the first half of May. The river's flow is regulated at the mouth. The Shuia is used for floating timber. [29–1559–3]

SHUIA, a river in Kostroma Oblast, RSFSR; a left tributary of the Nemda River of the Volga River basin. The Shuia originates on the Galich Rise. The river is fed by mixed sources, but mainly by snow. High water occurs in April and May; there are freshets in the summer and autumn. The mean flow rate 25 km from the river's mouth is approximately 11 cu m per sec. The Shuia freezes over in November, and the ice breaks up in April. The river is used for floating timber. [29–1559–4]

SHUIKIN, NIKOLAI IVANOVICH. Born Mar. 18 (30), 1898, in Mstera, in what is now Vladimir Oblast; died Sept. 1, 1968, in Moscow. Soviet organic chemist. Corresponding member of the Academy of Sciences of the USSR (1953). Member of the CPSU from 1942.

A student of N. D. Zelinskii's, Shuikin graduated from Moscow State University in 1927. He joined the staff of the university in 1930 and became a full professor there in 1943. In 1937 he also became a staff member of the Institute of Organic Chemistry of the Academy of Sciences of the USSR. Shuikin's principal works were devoted to the study of the catalytic transformations of various organic compounds, such as hydrocarbons, furan, and furan derivatives. He developed methods for preparing stable and highly active catalysts for the dehydrogenation of six-membered cycloparaffins and certain alkanes.

Shuikin received the State Prize of the USSR in 1946; he was also awarded two orders and various medals. [29–1522–3]

SHUISKII, a family of princes and boyars in Russia from the 15th to 17th centuries; a branch (descended from Alexander Nevsky's son Andrei) of the line of princes of Nizhny Novgorod and Suzdal'.

The founder of the elder Shuiskii line was Prince Iurii, a son of Prince Vasilii Dmitrievich Kirdiapa. Iurii's sons were the princes Vasilii Iur'evich and Fedor Iur'evich, each of whom founded one branch of the elder Shuiskii line. A third branch, the Skopin-Shuiskii family, was founded by Iurii's grandson Prince Vasilii Vasil'evich Blednyi-Shuiskii; the branch came to an end in 1610 with the death of Prince Mikhail Vasil'evich Skopin-Shuiskii.

Among the best-known descendants of Prince Vasilii Iur'evich were Prince Andrei Mikhailovich (date of birth unknown; died 1589), who became a boyar in 1538 and head of the Shuiskii party in 1542, and Prince Andrei Ivanovich (date of birth unknown; died 1589), who became a boyar in 1584 and took part in the palace struggle of the mid-1580's. Other noteworthy descendants included two brothers of Andrei Ivanovich—the Russian tsar Vasilii Ivanovich Shuiskii and Prince Dmitrii Ivanovich, who was named a boyar in 1586. With the death of Prince Ivan Ivanovich in 1638, all lines of the Shuiskii family in Russia came to an end.

The best-known descendants of Prince Fedor Iur'evich in the 16th century were Prince Vasilii Vasil'evich Nemoi-Shuiskii (date of birth unknown; died October 1538), who became a boyar in 1512 and was the de facto ruler of the country for a few months in 1538; Prince Ivan Vasil'evich (date of birth unknown; died May 1542), who became a boyar in 1532 and was the de facto ruler of the country from 1538 to 1540 and again in 1542; and Prince Ivan Petrovich (date of birth unknown; died Nov. 16, 1588), who became a boyar in 1574 and led the Pskov Defense of 1581–82.

The founder of the younger Shuiskii line was Prince Iurii's first cousin Prince Vasilii Semenovich. His first son, Prince Aleksandr Glazatyi, was the progenitor of two branches of the family—the Glazatyi-Shuiskii family, which came to an end in the early 16th century, and the Barbashin-Shuiskii family. Vasilii Semenovich's second son, Prince Ivan Gorbatyi, founded the Gorbatyi-Shuiskii family in the mid-15th century; the family came to an end in 1565.

The best-known members of the Gorbatyi-Shuiskii family were Prince Mikhail Vasil'evich Gorbatyi-Shuiskii (date of birth unknown; died c. 1535), who became a boyar in 1529, and Prince Aleksandr Borisovich Gorbatyi-Shuiskii (date of birth unknown;

died February 1565), who became a boyar in 1544. Prince Aleksandr Borisovich led the Russian troops during the seige of Kazan in 1522 and served as a member of the Selected Council (Izbrannaia Rada). [29–1523–1]

SHUKHMIN, PETR MITROFANOVICH. Born Jan. 13 (25), 1894, in Voronezh; died May 2, 1955, in Moscow. Soviet artist.

Shukhmin studied in V. N. Meshkov's studio in Moscow in 1912 and at the Moscow Academy of Arts from 1912 to 1916 under I. I. Tvorozhnikov, A. V. Makovskii, and D. N. Kardovskii. He was a founding member of the Association of Artists of Revolutionary Russia. He taught at the Academy of Arts from 1934 to 1936 and at the Institute of Applied and Decorative Art in Moscow from 1948 to 1952.

Shukhmin's best paintings were *The Conductor* (1923), *An Order to Advance* (1925), both of which are housed at the Central Museum of the Armed Forces of the USSR, *Landing From the Aurora* (1931, Museum of the Revolution of the USSR, Moscow), and *The Unsubdued* (1948, Russian Museum, Leningrad). The paintings treated the historical-revolutionary theme with true-to-life realism and were characterized by expressive composition and austere colors. Shukhmin also produced portraits and masterful drawings, which were published in the journals *Krasnyi perets* and *Krasnaia Niva* and included in the series Okna Tass (1941–45; State Prize of the USSR, 1942).

REFERENCE

Razumovskaia, S. *Petr Shukhmin*. Leningrad, 1966. [29–1554–4]

SHUKHOV, VLADIMIR GRIGOR'EVICH. Born Aug. 16 (28), 1853, in Graivoron, in what is now Belgorod Oblast; died Feb. 2, 1939, in Moscow. Soviet engineer and scientist. Honorary academician (1929; corresponding member, 1928). Hero of Labor (1932). Member of the All-Russian Central Executive Committee (1927).

Upon his graduation from the Moscow Higher Technical School in 1876, Shukhov was sent to the United States to pursue his studies further. In 1877 and 1878 he headed the design office of the Warsaw Railroad in St. Petersburg. He was named chief engineer of a construction-engineering office in Moscow in 1878. After the October Revolution of 1917, Shukhov worked in Moscow in the construction office of the Parastroi Plant and, later, at the plant itself.

Shukhov's principal works dealt with petroleum engineering, heat engineering, and construction. He was holder or coholder of a number of patents for industrial equipment that refined or used petroleum. In 1891 he patented an industrial apparatus used for the fractional distillation of petroleum by means of high temperatures and pressures. Because the apparatus was the first to involve cracking in the liquid phase, Shukhov is recognized as the inventor of the cracking process. He was also the first to effect industrial flame-front combustion of liquid fuel with an atomizing nozzle, which he invented in 1880. The nozzle made possible the efficient burning of mazut, which up to that time had been a mere waste product. In addition, Shukhov designed a furnace in which the air was heated before it reached the flame front.

Shukhov designed and supervised the construction of Russia's first petroleum pipeline, which in 1878 extended from the Balakhany oil fields to Baku. Later, also in Baku, he built the world's first preheated-mazut pipeline. Shukhov directed the design and construction of Russia's first metal oil tanker and was responsible for the introduction of riveted oil-storage tanks. Shukhov's solution to the problem of optimum storage-tank dimensions has been used in many branches of industry.

Shukhov's scientific and engineering work involved extremely diverse areas of technology. He developed water-tube boilers that became world famous, and he created designs for lightweight, economical roofs. Among the designs were those for suspended, web-frame roofs covering areas of several thousand square meters; arched, metal roofs such as the overhead cover of the platforms at the Kiev Railroad Terminal in Moscow; and web-frame and doubly curved vaults with spans of up to 40 m.

Shukhov's designs have been used for approximately 200 towers both in the USSR and abroad, including the Shabolovka Radio Tower in Moscow. Approximately 500 bridges were designed and built under Shukhov's direction, some spanning rivers, such as the Oka, the Volga, and the Enisei. Shukhov also supervised the design and construction of grain elevators, blast furnaces, floodgates for floating dry docks, and the revolving stage of the Moscow Art Academic Theater. He planned and directed the raising of the leaning minaret of the Ulug Beg Madrasa in Samarkand and took part in the development and production of several types of obstacle-mine systems, mine fuzes, and platforms for heavy guns.

Shukhov received the V. I. Lenin Award in 1929.

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V. V. Novikov [29–1555–1]

SHUKSHIN, VASILII MAKAROVICH. Born July 25, 1929, in the village of Srostki, Biisk Raion, Altai Krai; died Oct. 2, 1974, in the *stanitsa* (large cossack village) of Kletskaia, Volgograd Oblast; buried in Moscow. Soviet Russian writer, motion-picture director, and actor. Honored Art Worker of the RSFSR (1969). Member of the CPSU from 1955.

Shukshin, the son of a peasant, graduated from the directing department of the All-Union State Institute of Cinematography in 1960. His stories first appeared in print in 1959, and in 1963 he published the collection *Country Dwellers*.

The film *There's a Certain Fellow* was made from a screenplay by Shukshin in 1964. The hero, who was typical of Shukshin's early works, attracted the author by his ingenuousness, his rejection of formality in human relationships, and his great vitality. With time, Shukshin's view of his heroes grew more complex. He openly expressed his opinion of ruffians and troublemakers and harshly criticized "phantom people" and demagogues and bureaucrats who skillfully find their place in society. This is particularly true of the short-story collection *There in the Distance* (1968) and the film *An Unfortunate Acquaintance* (*Pechki-lavochki*, 1973).

Shukshin's deep interest in the expansive Russian character was reflected throughout the novel of revolutionary history *The Liubavins* (1965; film version entitled *The End of the Liubavins*, 1972), in the cinematic novel about Stepan Razin *I Have Come to Give You Freedom* (1971), and in several cycles of short stories, for example, *Characters* (1973), which served as the basis of the films *Your Son and Brother* (1966), and *Strange Folks* (1971).

In several of his works, Shukshin dealt with the incompatibility of the human soul with the spiritually empty petit bourgeois mentality. He raised the theme to the height of artistic expression in the film *Red the Rosetree* (1973), which he directed using his own screenplay and playing the leading role himself. Other films he acted in were *Two Fedors*, *I Ask for the Floor*, and *They Fought for the Homeland*.

Shukshin's style as a director is distinguished by the realistic rendering of texture, the use of details of everyday life, and psychological depth. His films combine these qualities with a poetic perception of the Russian countryside and the people who live there in harmony. Shukshin devoted considerable attention to the world's diverse ethnic and sociopsychosocial elements and to cultural and moral differentiation within modern society, a phenomenon that reflects the complex problems encountered in life.

Shukshin received the State Prize of the USSR for his performance as Chernykh in S. Gerasimov's film *By the Lake* (1971). In 1976 he was posthumously awarded the Lenin Prize. He was also a recipient of the Order of the Red Banner of Labor.

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G. A. BELAIA [29–1523–3]

SHULAVERI, an early farming settlement dating from the second half of the sixth and the fifth millennium B.C., located 30 km south of Tbilisi. Shulaveri, which was excavated from 1964 to 1966 and in 1970, occupies an area of 1 hectare. The cultural layer is 6 m thick, with nine horizons. Discoveries include round houses and auxiliary structures of raw brick, crude pottery, and implements made of bone (awls, polishers), antler, stone, and obsidian (sickles, end scrapers, adzes). The inhabitants engaged in farming, stock raising, and the tanning of hides. Such settlements as Shulaveri and Shomutepe are typical of the earliest farming culture of Transcaucasia.

REFERENCE

Munchaev, R. M. *Kavkaz na zare bronzovogo veka*. Moscow, 1975.

[29–1524–1]

SHULEIKIN, MIKHAIL VASIL'EVICH. Born Oct. 21 (Nov. 2), 1884, in Moscow; died there July 17, 1939. Soviet specialist in radio engineering. Academician of the Academy of Sciences of the USSR (1939).

After graduating from the St. Petersburg Polytechnic Institute in 1908, Shuleikin remained there to study radio engineering and to teach. He was employed at the radio-telegraph plant of the Naval Administration from 1913 to 1918, when he entered the Red Army as a brigade engineer. He headed the radio engineering laboratory of a military engineering directorate from 1918 to 1921.

In 1919, Shuleikin was named a professor at the Moscow Higher Technical School, where he founded a radio engineering division. He became a professor at the Institute of the National Economy in 1921 and concurrently taught at other educational institutions. Shuleikin served as chairman of the Society of Radio Engineers from 1919 to 1929 and was appointed head of the radio communications commission of the Academy of Sciences of the USSR in 1938.

Shuleikin was the author of a number of seminal works on radio-wave propagation. He investigated the effects of the upper layers of the atmosphere on radio-wave propagation and derived formulas for calculating the propagation of radio signals along the surface of the earth. He developed a theory of long-wave antennas as well as techniques for their design. Shuleikin published several works on radio engineering and in 1916 pointed out the existence of side bands in amplitude-modulated radio-frequency oscillations.

REFERENCE

Mikhail Vasil'evich Shuleikin (collection of articles). Moscow, 1952.

V. M. RODIONOV [29–1525–1]

SHULEIKIN, VASILII VLADIMIROVICH. Born Jan. 1 (13), 1895, in Moscow; died there Apr. 24, 1979. Soviet geophysicist. Academician of the Academy of Sciences of the USSR (1946; corresponding member, 1929). Member of the CPSU from 1942.

Shuleikin graduated in 1916 from the Moscow Higher Technical School, where he began teaching in 1918 and was a professor from 1923 to 1929. At the same time, from 1920 to 1931, he worked at the Institute of Physics and Biophysics. Shuleikin founded the Black Sea Hydrophysical Station in Katsiveli and was its director from 1929 to 1941. He also founded (1942) the Marine Hydrophysical Laboratory of the Academy of Sciences of the USSR and served as its director. From 1942 to 1945 he worked for the Hydrographic Survey of the Navy, and from 1945 to 1947, at the A. N. Krylov Naval Academy. Beginning in 1943, he was head of the marine physics subdepartment at Moscow State University, which he had organized. From 1947 to 1950 he was director of the Main Administration of the Hydrometeorological Service of the Council of Ministers of the USSR. In 1948 he began working at the Marine Hydrophysical Institute of the Academy of Sciences of the Ukrainian SSR, which he had founded, and served as its director from 1948 to 1957.

Shuleikin's main works deal with the theory of the interaction of the world ocean, the atmosphere, and the continents, the theory of wind-driven waves, ocean currents, and tropical hurricanes. Shuleikin was one of the founders of the Soviet school of marine physics. He wrote the classic monograph *Marine Physics* (4th ed., Moscow, 1968; State Prize of the USSR, 1942).

Shuleikin was awarded two Orders of Lenin, the Order of the October Revolution, three other orders, and various medals.

REFERENCE

V. V. Shuleikin. (*Materialy k biobibliografii uchenykh SSSR: Ser. fiziki*, fasc. 16.) Moscow, 1974.

[29–1524–2]

SHUL'GIN, VASILII VITAL'EVICH. Born Jan. 1 (13), 1878, in Kiev; died Feb. 15, 1976, in Vladimir. Russian political figure; a leader of the nationalists; publicist.

The son of a *dvorianin* (nobleman) of Volyn' Province, Shul'gin graduated from the faculty of law at the University of Kiev in 1900. He contributed to the Russian nationalist newspaper *Kievlianin*, but in 1912 and 1913 he severed ties with the nationalists as a result of the Beilis case. Shul'gin was held under arrest for three months because of articles he had written in defense of M. Beilis.

During the February Revolution of 1917, Shul'gin served on the Provisional Committee of the State Duma. In Pskov on Mar. 2, 1917, he and A. I. Guchkov presented Nicholas II with the Duma's demand that the tsar abdicate. After the October Revolution of 1917, Shul'gin was one of the organizers of the struggle against Soviet power, and he helped create the Volunteer Army. He emigrated after the Civil War ended but made illegal trips to the USSR in 1925 and 1926.

Shul'gin was the author of the books *Days* (1925), *The Year 1920* (1927), and *Three Capitals* (1927). In the 1930's he moved to Yugoslavia, and in 1937 he gave up political activity. In 1944 he was arrested in Yugoslavia and extradited to the USSR, where he was tried and sentenced to imprisonment; in 1956 he was released.

In the early 1960's, Shul'gin wrote two open letters to Russian émigrés in which he called on them to renounce their hostile attitude toward Soviet power.

WORKS

Pis'ma k russkim emigrantam. Moscow, 1961.

[29–1525–2]

SHULIACHENKO, ALEKSEI ROMANOVICH. Born Mar. 17 (29), 1841, in Ekaterinopol', in what is now Zvenigorod Raion, Cherkassy Oblast; died May 29 (June 11), 1903, in St. Petersburg. Russian chemist.

Shuliachenko graduated from the Nikolai Engineering Academy in St. Petersburg in 1864. He taught first at the Engineering School and then at the Nikolai Engineering Academy, where he became a professor in 1880.

Shuliachenko's research dealt primarily with the theory of the hardening of binders (hydraulic lime and portland cement) and the study of the causes for the breakdown of concrete in port installations and ways of preventing it. Shuliachenko was involved in developing the first technical standards in Russia for cement and the scientific nomenclature of binders. He was the first to propose and provide scientific evidence for the use of mixed (lime-cement) mortars for masonry. Shuliachenko was instrumental in the establishment of the Russian cement industry.

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[29–1529–2]

SHULIATIKOV, VLADIMIR MIKHAILOVICH. Born Sept. 30 (Oct. 12), 1872, in Moscow; died there Mar. 26 (Apr. 8), 1912. Participant in the Russian social democratic movement from the 1890's; Bolshevik. Marxist literary critic.

Shuliatikov graduated from Moscow University in 1898. From 1902 to 1905 he was a member of the Moscow and Arkhangel'sk

committees of the RSDLP. He was a member of the literary lecture group of the Moscow committee of the RSDLP during the Revolution of 1905–07 and a member of the Moscow committee and the oblast bureau of the central industrial region in 1908 and 1909.

Shuliatikov took part in the conference of the enlarged editorial board of *Proletarii* in 1909. In his opposition to eclectic and idealist currents in art and literature, he often oversimplified and distorted Marxism. V. I. Lenin criticized Shuliatikov for deriving class ideology in a simplistic way directly from the production practice of the class in question. [29–1529–1]

SHUL'TS, MIKHAIL MIKHAILOVICH. Born July 1, 1919, in Petrograd. Soviet physical chemist. Corresponding member of the Academy of Sciences of the USSR (1972). Member of the CPSU since 1946.

Shul'ts graduated from the chemistry department of Leningrad State University in 1947 and performed research in the department until 1952. In 1952 and 1953 and again from 1959 to 1972, he was head of a laboratory at the university's scientific research institute of chemistry, and from 1953 to 1959 he taught in the chemistry department. In 1965 he became a professor at the I. V. Grebenshchikov Institute of Silicate Chemistry of the Academy of Sciences of the USSR; he was named director of the institute in 1972.

Shul'ts' principal works are devoted to the physical chemistry of glass and the thermodynamics of heterogeneous equilibrium processes. Shul'ts received the State Prize of the USSR in 1973; he has been awarded three orders and various medals. [29–1527–1]

SHUL'ZHENKO, KLAVDIIA IVANOVNA. Born Mar. 11 (24), 1906, in Kharkov. Soviet Russian singer. People's Artist of the USSR (1971).

Shul'zhenko was an actress at the Kharkov Drama Theater under the direction of N. N. Sinel'nikov from 1923 until 1928, when she began to perform on the variety stage (estrada). She was the first performer of many Soviet songs of everyday life, as well as many lyrical songs. Songs that she made famous included "The Blue Kerchief" by Petersburgskii, "Let's Light Up" by Tabachnikov, and "Pick Up the Guitar" by Lepin.

Shul'zhenko has been awarded the Order of Lenin, the Order of the Red Banner of Labor, and several medals.

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Skorokhodov, G. *Klavdiia Shul'zhenko: Sud'ba aktrisy—sud'ba pesni*. Moscow, 1974. [29–1526–2]

SHUMAUSKAS, MOTEIUS IUOZOVICH (also Motiejus Šumauskas). Born Nov. 2 (15), 1905, in Kaunas. Soviet state and party figure. Hero of Socialist Labor (1975). Member of the CPSU since 1924.

The son of a worker, Shumauskas became a worker himself in Kaunas in 1922. In 1925 and 1926 he was a member of the Central Committee of the Komsomol of Lithuania, and in 1928 and 1929 he served in the Panevėžys underground raion committee of the Communist Party of Lithuania. In 1930 and 1931, Shumauskas was secretary of the Central Committee of the Komsomol of Lithuania, and in 1930 he became a member of the Central Committee of the Communist Party of Lithuania. In 1931 he was sentenced to six years' hard labor; in 1939 he was sent to a concentration camp.

After the restoration of Soviet power in Lithuania in July 1940, Shumauskas became chairman of the Central Bureau of Trade Unions of the Lithuanian SSR and people's commissar of local industry of the republic. From 1941 to 1946 he served as a deputy chairman of the Council of People's Commissars of the Lithuanian SSR. In 1942, during the Great Patriotic War of 1941–45, he joined the Soviet Army. In 1943 and 1944 he headed an operational headquarters of the Lithuanian partisan movement and of the Central Committee of the Communist Party of Lithuania; during the same period he also served as secretary of the Northern underground oblast committee of the Communist Party of Lithuania, and in July 1944 he became chairman of the Vilnius city executive committee.

From 1944 to 1950, Shumauskas served as chairman of the State Planning Committee of Lithuania, and in 1946 and 1947 he served concurrently as deputy chairman of the Council of Ministers of the Lithuanian SSR. From 1950 to 1953 he was first secretary of the Šiauliai oblast committee. From 1954 to 1956 he served as second secretary of the Central Committee of the Communist Party of Lithuania. In 1953 and 1954, Shumauskas was first deputy chairman of the Council of Ministers of the Lithuanian SSR, and from 1956 to 1967 he was chairman of the council. From 1967 to 1975 he was chairman of the Presidium of the Supreme Soviet of the Lithuanian SSR and deputy chairman of the Presidium of the Supreme Soviet of the USSR.

Shumauskas was a candidate member of the Central Committee of the CPSU from 1956 to 1976. He served as a deputy to the second through ninth convocations of the Supreme Soviet of the USSR. In December 1975 he became a personal pensioner. Shumauskas has been awarded five Orders of Lenin, two other orders, and various medals.

WORKS

V vodovorote bor'by. Moscow, 1975. [29–1537–1]

SHUMAVTSOV, ALEKSEI SEMENOVICH. Born Mar. 27, 1925, in the village of Ol'shanitsa, Diat'kovo Raion, Briansk Oblast; died Nov. 10, 1942, in the city of Liudinovo, Orel Oblast (now Kaluga Oblast). Head of the Liudinovo underground Komsomol group during the Great Patriotic War of 1941–45. Hero of the Soviet Union (Oct. 12, 1957, posthumously). Member of the Komsomol from 1940.

The son of a worker, Shumavtsov entered secondary school in 1932. In October 1941, by decision of the Liudinovo raion committees of the ACP(B) and of the Komsomol, he became one of the organizers of the Komsomol underground. Shumavtsov was arrested by the Gestapo in late October 1942; after being brutally tortured, he and A. M. Liasotskii, another member of the Komsomol group, were shot to death in a forest on the outskirts of the city. A memorial stone was placed at the execution site in 1960. [29–1533–2]

SHUMEN (from 1950 to 1965, Kolarovgrad), a city in northeastern Bulgaria. Capital of Shumen District. Population, 85,000 (1976).

Shumen is a transportation center. Highly developed industries include transportation machine building (the production of trucks and of equipment for ships), nonferrous metallurgy (the manufacture of rolled aluminum products), and food processing (meat packing, canning, the brewing of beer, and the manufacture of tobacco products). The city also has enterprises for the production of furniture and clothing. Shumen was the birthplace of V. Kolarov.

In the 18th and 19th centuries, Shumen was an Ottoman fortress and an important strongpoint on the road linking Silistra (Silistria) and Istanbul. Together with the fortresses of Varna, Silistra, and Ruse (Ruschuk), it formed the strategically important quadrangle of fortresses on which the Ottoman defense of the Danube region in Bulgaria depended during the Russo-Turkish wars of the 18th and 19th centuries. Russian troops unsuccessfully besieged the city in 1810 and 1828. In 1878, Shumen was incorporated into Bulgaria. [29–1537–3]

SHUMEN DISTRICT (formerly Kolarovgrad District), an administrative-territorial unit in northeastern Bulgaria. Area, 3,400 sq km. Population, 254,000 (1976). The capital is the city of Shumen. The district is located on a hilly plain north of the Stara Planina (Balkan Mountains).

The economy of Shumen District is predominantly industrial, with industry being concentrated primarily in the Shumen industrial region (the cities of Shumen, Novi Pazar, and Preslav). The main branches of industry are machine building, nonferrous metallurgy, food processing, and the production of glass, porcelain, and faïence (in the cities of Novi Pazar and Kaspichan). More

than half of the territory of Shumen District is under cultivation. The principal crops are grains, sugar beets (especially for seed), sunflowers, tobacco, and such fruits as grapes. Animal husbandry includes the raising of cattle and sheep. Agricultural production in Shumen District is concentrated at agroindustrial complexes.

E. B. VALEV [29–1538–1]

SHUMERLIA, a city (since 1937) under republic (ASSR) jurisdiction and administrative center of Shumerlia Raion, Chuvash ASSR. Situated on the right bank of the Sura River, on the Gorky-Ul'ianovsk highway. River landing. Railroad station of the Moscow-Kazan line. Population, 35,000 (1974).

Enterprises in Shumerlia include a combine producing vans, a plant for the manufacture of specialized motor vehicles, a chemical plant, a brickyard, a factory producing leather clothing accessories, and a logging and timber distribution establishment. Enterprises of the food industry include a butter factory, a meat-packing plant, a food-processing combine, and a brewery. The city also has a branch of the Rassvet Chuvash Garment Production Association and a workshop specializing in the production of carved wooden articles. Shumerlia has a branch of the Semenov Mechanized Woodworking Technicum, the central school of which is located in Gorky Oblast. [29–1539–1]

SHUMIACHI, an urban-type settlement and the administrative center of Shumiachi Raion, Smolensk Oblast, RSFSR. Shumiachi is located 7 km from the Penetovka railroad station on the Roslavl'-Krichev line. Industry is represented by a flax-processing plant, a butter factory, a vegetable starch and starch syrup plant, and a plant for the production of asphalt cement. The settlement has an art gallery, which is a branch of the Smolensk Oblast Museum of Fine and Applied Art. [29–1548–2]

SHUMIATSKAIA, ELENA IAKOVLEVNA. Born Mar. 16 (29), 1912, in Turukhansk. Soviet master of applied art.

Shumiatskaia attended the Moscow Textile Institute from 1930 to 1934. Her career has been closely linked with the Trekhgornaia Manufaktura Textile Combine, where she began working in 1934. Shumiatskaia has made a thorough study of Russian folk art and has creatively employed traditional motifs in her decorative printed fabrics. [29–1547–4]

SHUMIATSKII, BORIS ZAKHAROVICH. Born Nov. 4 (16), 1886, in Verkhneudinsk (now Ulan-Ude); died July 29, 1938. Soviet and party figure. Member of the Communist Party from 1903.

The son of an artisan, Shumiatskii became a worker in Chita in 1899. Between 1905 and 1907 he helped lead armed uprisings in Krasnoiarsk and Vladivostok. In 1917 he served as deputy chairman of the Krasnoiarsk soviet and representative of the Central Committee of the RSDLP(B) in Siberia. Shumiatskii was a delegate to the Sixth Party Congress, a member of the Bureau of the Military Organization of the Central Committee of the RSDLP(B), and chairman of the Central Executive Committee of Siberian Soviets.

In 1919 and 1920, Shumiatskii served as a deputy chairman of the Siberian Revolutionary Committee and was a member of the Siberian Bureau of the Central Committee of the RCP(B). In 1920 he served on the Far Eastern Bureau of the Central Committee of the RCP(B) and was chairman of the Council of Ministers of the Far Eastern Republic. From Jan. 5, 1921, to Sept. 6, 1922, he was a member of the Revolutionary Military Council of the Fifth Army. From 1923 to 1925 he was the plenipotentiary of the USSR in Iran.

In 1926, Shumiatskii was named a member of the bureau of the Leningrad provincial committee of the ACP(B); he subsequently was appointed rector of the Communist University for Workers of the East and became a member of the Middle Asian Bureau of the Central Committee of the ACP(B). In 1930 he was named chairman of Soiuzkino; in 1933 he became head of the Central Board of the Motion-picture Industry and deputy chairman of the Committee for the Arts under the Council of People's Commissars of the USSR.

Shumiatskii was a delegate to the Sixteenth Congress of the ACP(B) and to the Third Congress of the Comintern.

WORKS

"Nakanune Oktiabria." In *Velikaia Oktiabr'skaia sotsialisticheskaia revoliutsiia.* Moscow, 1957.

REFERENCE

Bagaev, B. *B. Shumiatskii.* Krasnoiarsk, 1974. [29–1548–1]

SHUMIKHA, a city and the administrative center of Shumikha Raion, Kurgan Oblast, RSFSR. Railroad station on the Cheliabinsk-Kurgan line, 133 km west of Kurgan. Population, 21,000 (1974). Shumikha has a machine-building plant, a plant for the repair of bearings, a plant for the manufacture of reinforced concrete products, a brickyard, and a garment factory. It also has two mixed-feed plants, a seed-cleaning plant, a poultry-packing combine, and a butter and milk combine. A museum of local lore is located in the city. [29–1542–1]

SHUMIKHINSKII, an urban-type settlement in Perm' Oblast, RSFSR, under the jurisdiction of the Gremiachinsk city soviet. Shumikhinskii is situated on the right bank of the Us'va River (a tributary of the Chusovaia River), 10 km northeast of the Us'va railroad station on the Solikamsk-Chusovskaia line. Hard coal is mined in the area, and the settlement has a shop of a garment factory that is based in the city of Gubakha. [29–1542–2]

SHUMILINO, an urban-type settlement and the administrative center of Shumilino Raion, Vitebsk Oblast, Byelorussian SSR. Shumilino is served by a railroad station on the Vitebsk-Polotsk line. The settlement has a cheese plant, a winery, a plant for the initial processing of flax, and a peat enterprise. A branch of the Vitebsk Building-Materials Industrial Association is located in Shumilino. [29–1540–3]

SHUMILOV, MIKHAIL STEPANOVICH. Born Nov. 5 (17), 1895, in the village of Verkhtechenskoe, in what is now Shadrinsk Raion, Kurgan Oblast; died June 28, 1975, in Moscow; buried in Volgograd, on Mamaev Kurgan. Soviet military commander; colonel general (1943). Hero of the Soviet Union (Oct. 26, 1943). Member of the CPSU from 1918.

The son of a peasant, Shumilov graduated from the Chuguev Military School in 1916, during World War I, as an ensign. He joined the Red Army in May 1918 and, during the Civil War of 1918–20, advanced from a platoon commander to commander of a rifle regiment. He completed courses for command and political personnel in 1924, Vystrel courses in 1929, and the Advanced Academic Courses at the K. E. Voroshilov Higher Military Academy in 1948.

Shumilov fought in the Soviet-Finnish War of 1939–40 as commander of a rifle corps. In 1941 and 1942, during the Great Patriotic War of 1941–45, he served as commander of a rifle corps and as deputy commander of the Fifty-fifth and Twenty-first armies on the Leningrad and Southwestern fronts. In August 1942, Shumilov was named commander of the Sixty-fourth Army, which fought successfully south of Stalingrad and was reorganized in March 1943 into the Seventh Guards Army. Shumilov served in this capacity between 1942 and 1945 on the Stalingrad, Don, Voronezh, Steppe, and Second Ukrainian fronts.

After the war, Shumilov served as commander of the White Sea Military District in 1948 and 1949 and the Voronezh Military District from 1949 to 1955. He was in retirement from 1956 to 1958, when he became a military consultant to the Group of Inspectors General of the Ministry of Defense.

Shumilov was a deputy to the third and fourth convocations of the Supreme Soviet of the USSR. He was awarded three Orders of Lenin, four Orders of the Red Banner, two Orders of Suvorov First Class, the Order of Kutuzov First Class, the Order of the Red Star, the Order for Service to the Motherland in the Armed Forces of the USSR Third Class, and various medals. Shumilov was also the recipient of foreign orders and medals. [29–1541–1]

SHUMILOV, NIKOLAI VASIL'EVICH. Born 1875 in Zlatoust; died Jan. 19, 1919, in Tashkent. Participant in the revolutionary movement in Russia; one of the Turkestan commissars who were murdered in 1919 (*see* TURKESTAN COMMISSARS). Member of the Communist Party from 1904.

The son of a worker, Shumilov himself was a worker. During the Revolution of 1905–07, he was a member of the Zlatoust committee of the RSDLP, commander of a fighting *druzhina* (armed detachment of workers or other democratic elements), and a member of the Kurgan committee of the RSDLP. In 1913 he was sentenced to permanent exile in Eastern Siberiá.

After the February Revolution of 1917, Shumilov served on the Tashkent party committee, and in September he became a member of the executive committee of the Tashkent soviet. In 1918 he was deputy people's commissar of railroads of the Turkestan Republic, a member of the local revolutionary military committee, and chairman of the Tashkent soviet. Shumilov died during the Tashkent Anti-Soviet Revolt of 1919.

REFERENCE

Revoliutsionery, vozhaki mass. Tashkent, 1967. Pages 54–68.

[29–1541–2]

SHUMILOV, PETR PAVLOVICH. Born 1901 in Bobrinets, in what is now Kirovograd Oblast; died Aug. 17, 1942, in Moscow. Soviet specialist in hydromechanics and a founder of the theory of turbodrilling. Member of the CPSU from 1940.

Upon graduating from Moscow State University in 1929, Shumilov joined the staff of the State Research Institute of Petroleum, where he remained until 1934. He organized and directed an experimental turbodrilling office in Baku between 1934 and 1939 and was a member of the People's Commissariat of the Petroleum Industry from 1939 to 1942.

Between 1934 and 1936, Shumilov developed a theory for the use of small multistage, axial-flow turbines in turbodrills. He and R. A. Ioannesian, E. I. Tagiev, and M. T. Gusman invented a multistage turbodrill that operated without the use of reduction gears and a technique for turbodrilling vertical and inclined wells. In 1941, Shumilov began work on the development of a rocket-firing antitank weapon; he died during testing.

Shumilov received the State Prize of the USSR once in 1942 and twice in 1947; he was also awarded the Order of Lenin.

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[29–1541–3]

SHUMSHU, an island in the northern part of the Kuril Islands, situated between the Kamchatka Peninsula and Paramushir Island, separating the First and Second Kuril Straits. The maximum elevation is 189 m. The island has thickets of dwarf alder and cedar, as well as oceanic meadows. [29–1546–4]

SHUMSKII, IAKOV DANILOVICH. Year of birth unknown; died 1812. Russian actor.

Shumskii, a close associate of F. G. Volkov, helped organize a theater in Yaroslavl in the 1740's. In 1752 he and the other actors of the theater were summoned to St. Petersburg to perform in the court troupe. In 1756, Shumskii joined the first permanent Russian public theater. Shumskii's simple and straightforward style of acting, in particular his brilliant flair for comedy, was linked with the Russian folk theater. He mainly played humorous servants and young rakes, for example, Vasilii in Lukin's *The Spendthrift by Love Reformed* and Sosie in Molière's *Amphitryon*. He also played humorous old women, creating the role of Eremeevna in Fonvizin's *The Minor* (1782).

Shumskii retired in 1785 and thereafter appeared on the stage only occasionally. He also worked as a teacher and director. In the 1760's he directed performances at the School for the Nobility.

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[29–1546–1]

SHUMSKII, IURII VASIL'EVICH (real surname, Shomin). Born Nov. 5 (17), 1887, in Tiraspol'; died June 7, 1954, in Kiev. Soviet Ukrainian actor. People's Artist of the USSR (1944). Member of the CPSU from 1942.

Shumskii took an active part in the revolutionary movement. He appeared with a workers' drama group, and from 1917 to 1920 he headed an amateur Ukrainian theater and studio in Kherson. From 1925 to 1934 he performed with the Ukrainian Derzhdrama (now the Odessa Theater of the October Revolution), and in 1934 he joined the Kiev I. Franko Theater. He played the roles of Shvandia in Trenev's *Liubov' Iarovaia*, Gaidai in Korneichuk's *Destruction of the Squadron*, Khlestakov and the Mayor in Gogol's *The Inspector-General*, the title role in Korneichuk's *Bogdan Khmel'nitskii*, Philip II in Schiller's *Don Carlos*, and the title role in Pushkin's *Boris Godunov*. Shumskii also played Marshal Vasilevskii in the motion pictures *The Third Strike* (1948) and *The Battle of Stalingrad* (1949).

Shumskii, a recipient of the State Prize of the USSR in 1950 and 1951, was awarded the Order of Lenin, two other orders, and several medals. [29–1545–2]

SHUMSKII, SERGEI VASIL'EVICH (real surname, Chesnokov). Born Oct. 7 (19), 1820, in Moscow; died there Feb. 6 (18), 1878. Russian actor.

In 1841, Shumskii graduated from the Moscow Theatrical School, where he was a student of M. S. Shchepkin. He performed with the Malyi Theater from 1841 until 1878, and to gain experience he appeared with the Odessa Theater from 1847 to 1850. At first he appeared mainly in vaudevilles. Being impossible to type-cast, Shumskii played many different roles. He created his best characterizations in the 1850's and 1860's, for example, as Kochkarev and Khlestakov in Gogol's *Marriage* and *The Inspector-General*, Count Liubin in Turgenev's *The Provincial Lady*, Krechinskii in Sukhovo-Kobylin's *Krechinskii's Wedding*, Zhadov and Krutitskii in Ostrovskii's *A Profitable Post* and *Even a Wise Man Stumbles*, Ivan the Terrible in A. K. Tolstoy's *The Death of Ivan the Terrible*, and Scapin in Molière's *The Cheats of Scapin*.

Shumskii was outstanding for his mastery of acting techniques, artistry, sincerity, and simplicity and for the careful thought he devoted to the smallest details. In the late 1860's he taught acting at the Moscow Conservatory, where in 1869 he staged Glinka's opera *A Life for the Tsar* (*Ivan Susanin*).

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[29–1545–1]

SHUMSKII, an urban-type settlement in Nizhneudinsk Raion, Irkutsk Oblast, RSFSR. It is situated on the right bank of the Uda River, in the Enisei River basin. Shumskii has a station (Uda II) on the Transsiberian Railroad, 500 km from Irkutsk. Enterprises include a lumber enterprise and a plant for sorting gravel. [29–1546–2]

SHUMSKOE, an urban-type settlement and the administrative center of Shumskoe Raion, Ternopol' Oblast, Ukrainian SSR. Shumskoe is situated on the Viliia River (a tributary of the Goryn'), 32 km from the Lepesovka railroad station on the Shepetovka-Ternopol' line. The settlement has a butter factory and a peat-blocking plant. [29–1546–3]

SHUNKOV, VIKTOR IVANOVICH. Born Apr. 6 (19), 1900, in the city of Kuznetsk, in what is now Kemerovo Oblast; died Nov. 9, 1967, in Moscow. Soviet historian. Corresponding member of the Academy of Sciences of the USSR (1962). Member of the CPSU from 1942.

A student of S. V. Bakhrushin's, Shunkov graduated from the department of social sciences of Moscow University in 1925. From 1936 to 1941 and again from 1946 to 1949 he was on the staff of the Institute of History of the Academy of Sciences of the USSR. He fought in the Great Patriotic War of 1941–45. From

1949 to 1967, Shunkov was director of the V. P. Volgin Fundamental Library of Social Sciences, and from 1955 to 1960 he was editor in chief of the journal *Istoricheskii arkhiv*. In 1959 he became deputy academician-secretary of the Division of History of the Academy of Sciences of the USSR.

Shunkov's most important works dealt with the history of peasant colonization of Siberia, Siberian local lore, archaeography, the study of sources, bibliography, and library science. Shunkov was awarded the Orders of the Great Patriotic War First and Second Class and various medals.

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SHUNT, an electrical or magnetic conductor connected in parallel with an electric or magnetic circuit to divert part of the electric current or magnetic flux when it is undesirable or impossible to pass all the current or flux through the circuit. For example, when a shunt is used to extend the measuring range of an ammeter, the current I_x being measured is divided between the shunt and the ammeter in inverse proportion to their respective resistances, R_S and R_A; in this case $I_x = I_A(1 + R_A/R_S) = I_A k_S$, where I_A is the value of the current as determined from the ammeter readings and k_S is the shunting factor. For convenience in making current measurements, the resistance of the shunt is chosen so that k_S is equal to 10, 100, or 1000.

Shunts are manufactured in the form of plates, bands, and wires, primarily of manganin or constantan (for electrical shunts) or of a soft magnetic material (for magnetic shunts). [29–1549–2]

SHUR, IAKOV SHEBSELEVICH. Born Apr. 7 (20), 1908, in the village of Dubrovno, in what is now Vitebsk Oblast. Soviet physicist. Corresponding member of the Academy of Sciences of the USSR (1970). Member of the CPSU since 1940.

Shur graduated from Leningrad State University in 1932. The same year, he joined the staff of the Institute of Physics of Metals of the Urals Scientific Center of the Academy of Sciences of the USSR.

Shur's main works deal with the physics of magnetic effects. Shur discovered thermomagnetic hysteresis. He discovered and studied the anisotropy of the magnetic hysteresis of ferromagnetic crystals. He also discovered magnetoelastic hysteresis and explained the nature of magnetization and hysteresis processes in hard magnetic materials. Shur developed new magnetic and magnetostrictive materials, low-loss high-permeability electrical steels, and magnetic thin films.

Shur received the State Prize of the USSR in 1967. He has been awarded four orders and various medals.

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S. V. VONSOVSKII [29–1550–1]

SHURAB, a city (since) 1952 in Isfara Raion, Leninabad Oblast, Tadzhik SSR. Shurab, which is situated in the foothills of the Turkestan Range, is the terminal point of a branch line of the Khavast-Kokand line. Brown coal is mined nearby. Enterprises include a repair plant. [29–1550–2]

SHURABASHAT, the site of a fortified settlement that existed from the fourth century B.C. to the first centuries of the Common Era. Shurabashat, located 8 km northwest of Uzgen, Osh Oblast, Kirghiz SSR, is the center of an oasis in the valley of the Iassy River. It was excavated between 1954 and 1957. The area exceeds 70 hectares. The site is enclosed by an earthen wall and is divided into three parts by inner earthen walls. It has a citadel in the northeast. Remains of pisé structures with hearths and household pits have been discovered, as well as burials in the walls. The principal finds have been modeled ware, tinted or painted red against a light background. Hearthstones, poles for drying hay, bone plates for bows, and beads have also been found.

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SHURA-I-ISLAM (Council of Islamists), a counterrevolutionary bourgeois-nationalist organization in Turkestan in 1917 and 1918.

Shura-i-Islam, founded in early March 1917 in Tashkent, was the de facto representative of the Turkestan Committee of the Provisional Government. Headed by the Jadidist leader M. K. Abdurashidkhanov, the organization comprised members of the national bourgeoisie, the bourgeois-nationalist intelligentsia, the feudal aristocracy, and the Muslim clergy. By the end of March 1917, branches of Shura-i-Islam had been formed in nearly every city in Turkestan.

Reflecting the interests of local capitalists and landowners, Shura-i-Islam advocated national and religious autonomy for Turkestan, which it wished to remain part of bourgeois Russia; it stood for the preservation of private ownership, including the private ownership of land. The organization's congress of Apr. 16–23, 1917, which was attended by delegates from 42 branches, adopted a resolution on cultural and political self-government for Turkestan and declared its support for the Provisional Government. At the congress, the Regional Council of the Muslims of Turkestan was elected.

From its inception, Shura-i-Islam was plagued by a struggle for leadership between the Jadidists and the Ulemists, or higher clergy; in June 1917 the Ulemists split from the organization and formed their own group, Shura-i-Ulema (Council of the Clergy). After the October Revolution of 1917, Shura-i-Islam resisted the establishment of Soviet power—its leaders helped organize and direct the counterrevolutionary Kokand Autonomy.

In late 1917 and during the first half of 1918 the Council of People's Commissars of the Turkestan Republic and local soviets disbanded all organizations of Shura-i-Islam for engaging in anti-Soviet activity. The leaders of Shura-i-Islam went underground and, in alliance with Russian White Guards, Ulemists, and foreign imperialists, continued the struggle against Soviet power (*see* BASMACHI REVOLT).

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KH. SH. INOIATOV [29–1550–4]

SHURA-I-ULEMA (Council of the Clergy), a counterrevolutionary pan-Islamic organization in Turkestan in 1917 and 1918.

Shura-i-Ulema, which was formed when a split occurred in the organization Shura-i-Islam, comprised the higher Muslim clergy, local feudal lords, and the most reactionary segment of the national bourgeoisie. At its congress of Sept. 17–20, 1917, in Tashkent, the delegates declared their opposition to the soviets and demanded Turkestan's secession from Russia, the unification of all Muslims in a single Muslim state under the aegis of Turkey, and the creation of branches of Shura-i-Ulema in cities throughout Turkestan.

At the third congress of the soviets in the region, which was held in 1917, the Ulemists opposed the establishment of Soviet power in Turkestan; they subsequently helped organize the counterrevolutionary Kokand Autonomy and inspired the Basmachi revolt. In their struggle against Soviet power the Ulemists acted in concert with Russian White Guards and foreign imperialists. [29–1551–1]

SHURUKHIN, PAVEL IVANOVICH. Born Nov. 5 (18), 1912, in the village of Solenyi Erik, in what is now Bykovo Raion, Volgograd Oblast; died Nov. 3, 1956, in Moscow. Twice Hero of the Soviet Union (Oct. 23, 1943, and Mar. 24, 1945). Major general (1953). Member of the CPSU from 1940.

After joining the Red Army in 1931, Shurukhin graduated from the Ordzhonikidze Military School in 1934 and completed courses for rifle-division commanders at the M. V. Frunze Military Academy in 1950. He commanded a battalion of ski troops in the Soviet-Finnish War of 1939–40. During the Great Patriotic War of 1941–45 he commanded a rifle battalion on the Western Front in 1941 and a partisan detachment in Gomel' Oblast in 1941 and 1942. In 1942 and 1943 he led a force made up of partisan detachments in Orel Oblast. From July 1943 until the end of the war, Shurukhin was commander of a rifle regiment on the Voronezh, First Ukrainian, and Second Ukrainian fronts.

Shurukhin was a deputy to the second convocation of the Supreme Soviet of the USSR. He was awarded two Orders of Lenin, two Orders of the Red Banner, two Orders of the Red Star, and various medals. A bust of Shurukhin has been placed in the village of Novonikol'skoe, in Volgograd Oblast. [29–1551–4]

SHURUPPAK (present-day Tall Far'ah), an ancient city in Sumer. According to Sumerian legend, Shuruppak was the native city of Ziusudra, a mythological figure corresponding to the Babylonian Utnapishtim, who survived the great flood on an ark he built upon the command of a god.

By the end of the third millennium B.C., Shuruppak had become an insignificant settlement. Excavations there by a German archaeological expedition in 1902 uncovered an archive of economic and legal documents and teaching materials from around the 26th century B.C., as well as sculputured monuments.

[29–1551–3]

SHUSHA, a city and the administrative center of Shusha Raion, Nagorno-Karabakh Autonomous Oblast, Azerbaijan SSR. Situated in the foothills of the Karabakh Range, on the Evlakh-Goris-Nakhichevan highway, 11 km south of Stepanakert and 37 km southwest of the Agdam railroad station.

Shusha was founded in the mid-18th century as a defensive fortress of the Karabakh Khanate and achieved renown for its heroic defense against the Persian Army in 1795. The city became part of Russia in 1805 and played an important role in Azerbaijani trade. During the Russo-Persian War of 1826–28, the small garrison of Shusha held out heroically for some 40 days against the Persian forces of Abbas-Mirza (*see* RUSSO-PERSIAN WARS OF THE 19TH CENTURY). Shusha became a district capital of Elizavetpol' Province in 1840 and the administrative center of a raion of Nagorno-Karabakh Autonomous Oblast in 1923.

Industry is represented by a production combine, a weaving shop of the Karabakh Silk Combine, and a factory that produces Oriental musical instruments; the city is also known as an ancient carpet-weaving center. An agricultural technicum and pedagogical school are located in Shusha, whose cultural institutions include a museum of the history of Shusha and a memorial house-museum devoted to the composer U. Gadzhibekov. Architecture of the 18th century is represented by two castles and the remains of fortress walls. The city has numerous stone houses of the 18th and 19th centuries that are characterized by the use of decorative painting and *shebeke* (ornamental window grills).

Shusha is a climatic health resort. Summers are warm, with a mean July temperature of 19°C, and winters are mild, with a mean January temperature of −2°C; the annual precipitation is 645 mm. The city has sanatoriums, houses of rest, Pioneer camps, and a tourist center.

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SHUSHENSKOE, an urban-type settlement and the administrative center of Shushenskoe Raion, Krasnoiarsk Krai, RSFSR. Shushenskoe is situated near the confluence of the Bol'shaia Shush' and Enisei rivers, 60 km southeast of the Minusinsk railroad station on the Abakan-Taishet line. Industry is represented by a milk-canning combine, a brewery, a poultry farm, and a souvenir factory. The settlement has a sovkhoz-technicum.

Shushenskoe was founded by Russian cossacks in the first half of the 18th century. In the late 19th and early 20th centuries, it was the administrative center of a *volost* (small rural district) in Minusinsk District, in Enisei Province, and had a population of 1,382. The tsarist regime used Shushenskoe as a place of political exile, and Decembrists, Polish revolutionaries, and Narodniki (Populists) were settled there. V. I. Lenin was in exile in Shushenskoe from May 8, 1897, until Jan. 29, 1900. On May 7, 1898, he was joined by N. K. Krupskaia and her mother, E. V. Krupskaia. While living in the settlement, Lenin wrote more than 30 works.

On Nov. 7, 1930, a historical-revolutionary division of the Minusinsk Museum of Local Lore was opened in Shushenskoe. In 1938 the division was reorganized as an independent entity and was named the V. I. Lenin House-Museum. To mark the centennial of Lenin's birth, the Central Committee of the CPSU and the Council of Ministers of the USSR passed a resolution to reconstruct the settlement, and in 1970 the Memorial Museum-Preserve of the Siberian Exile of V. I. Lenin was opened in Shushenskoe. The museum includes two buildings in which Lenin and Krupskaia lived; 25 peasant *usad'by* (complexes of buildings), some of which contain documentary historical exhibits; and other buildings that have been restored to their former appearance.

The general plan for the reconstruction of Shushenskoe was drafted by the architects L. A. Petrov and K. M. Gubel'man. The plans for the reconstruction of the memorial houses were drawn up by the architects B. V. Gnedovskii (project head) and A. N. Klimanov, and the plans for the complexes of peasant houses were done by the architects M. N. Semenov, L. M. Shuliak, and E. A. Chernikov.

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[29–1557–2]

SHUSHERIN, IAKOV EMEL'IANOVICH. Born 1753 in Moscow; died there 1813. Russian actor.

Shusherin joined M. Groti's troupe in 1772 and the Petrovskii Theater in Moscow in 1780; from 1786 to 1793 and from 1800 to 1810 he acted on the imperial stage in St. Petersburg. Originally Shusherin played in comedies and comic operas, for example, as Filimon in Ablesimov's *The Miller—Magician, Swindler, and Matchmaker* (to Sokolovskii's music). In the 1780's he turned to tragic roles displaying a perfect command of the technique of the classical theater. His roles included Khorev and Truvor in Sumarokov's *Khorev* and *Sinav and Truvor* and Iarb in Kniazhnin's *Dido*.

Shusherin revealed his gifts most fully in the years 1793–1800, when he was performing in Moscow. In that period his repertoire included roles in sentimental plays, mainly bourgeois dramas and *comédies larmoyantes*, such as Ksuri and Meinau in Kotzebue's *The Parrot* and *Misanthropy and Repentance* and Count Clarendon in Beaumarchais's *Eugenia*. He also played the title role in Ozerov's *Oedipus in Athens* and Zarutskii in Kriukovskii's *Pozharskii*. Shusherin was one of the first Russian actors to try to turn away from classical acting conventions and to strive for a simple, natural style.

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[29–1558–1]

SHUSHUN, a short outer garment for women; a felted-fabric or linen jacket formerly worn in northern and, sometimes, central Russia. The *shushun* narrowed at the waist and sometimes had gathers in the back. The collar, skirts, and sleeves were usually ornamented with braid. In the north the term *shushun* was also applied to a *sarafan* (a type of sleeveless dress) made of red calico or linen, with a collar and sleeves that hung down in the back.

[29–1559–2]

SHUST, IVAN. Year of birth unknown; died December 1670 near the city of Koz'modem'iansk. Participant in the Peasant War of 1670–71 under the leadership of S. T. Razin.

A *posadskii chelovek* (merchant or artisan) from the city of Koz'modem'iansk, Shust led the uprising that broke out in the city in October 1670 upon the approach of a detachment of Razin's troops. He became one of the group of five people elected by the inhabitants of Koz'modem'iansk to govern the city. He established communication with the rebellious peasants of the neighboring villages and detachments of Mari troops. In November 1670 the forces of the tsarist *voevoda* (military commander) Prince D. A. Bariatinskii took Koz'modem'iansk. Shust was taken prisoner and executed with a group of his supporters.

[29–1552–3]

SHUSTER MISSION, an American financial mission in Iran from May 1911 to January 1912. The mission was headed by M. Shuster, an official of the American colonial administration in Cuba from 1899 to 1901 and in the Philippines from 1906 to 1909. Shuster, whom the Iranian Majlis had named financial adviser and treasurer general in June 1911, tried to use his broad powers to draw Iran into the orbit of American imperialism. His activities displeased the imperialist rivals of the USA in Iran. After the tsarist government issued an ultimatum on Nov. 29, 1911, that was supported by Great Britain, Shuster was dismissed; he left for the USA in January 1912.

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[29–1552–4]

SHUSTOV, a family of large-scale 17th-century merchants and salt producers descended from court peasants of the village of Dedinovo in Kolomna District.

In the mid-17th century, the *gost'* (privileged merchant) Iakov Shustov traded salt along the Volga and the Oka. The *gosti* Grigorii Fedorovich and Vasilii Fedorovich Shustov established a saltworks between the 1670's and the 1690's on the Lenva River, in Solikamsk District. By September 1696, the Shustovs owned 32 salterns, 16 brine pipes, 13 salt storehouses, several granaries, and more than 110 *dvory* (homesteads) for "working people." The annual output of the Lenva saltworks reached 2 million poods of salt in the 1690's.

The Shustovs used their own ships to deliver salt via the Kama and the Volga to Nizhny Novgorod, where part of their cargo was sold on the local market. The rest of the salt continued, via the Oka, to Kaluga, from which it was shipped for sale in western and southwestern cities.

Between 1695 and 1697, the saltworks on the Lenva were turned over to G. D. Stroganov. Some Shustov *gosti* are known to have lost their capital to the state in the early 18th century.

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SHUSTOV, SMARAGD LOGINOVICH. Born 1789; died Apr. 17 (29), 1870, in St. Petersburg. Russian architect.

Shustov graduated from the St. Petersburg Academy of Arts in 1810. Beginning in 1827 he worked for a department of the Board of St. Petersburg Imperial Theaters. He built primarily in St. Petersburg and in its suburbs and nearby districts. Shustov built several buildings in the finest traditions of classicism, including the wooden Kamennoostrovskii Theater (1827; rebuilt 1844 by A. K. Kavos) and the Dolgorukov summer home, now a student dormitory on Kirov Prospect (1831–32).

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SHUTOV, STEPAN FEDOROVICH. Born Jan. 17 (30), 1902, on the estate of Dvorets, now the village of Dvorets, in Bobruisk Raion, Mogilev Oblast; died Apr. 17, 1963, in Kiev. Twice Hero of the Soviet Union (Jan. 10, 1944, and Sept. 13, 1944). Colonel (1944). Member of the CPSU from 1924.

The son of a farmhand, Shutov joined the Red Army in 1918. He graduated from the All-Russian Central Executive Committee Combined Military School in 1927, advanced armored courses for command personnel of the Workers' and Peasants' Red Army in 1932 and in 1933, and advanced academic courses for command personnel in 1937 and 1943. Between 1941 and 1944, during the Great Patriotic War, he commanded a tank battalion, a regiment, and a tank brigade. In September 1944 he was appointed deputy commander of a mechanized corps that fought on the Western, Volkhov, Voronezh, First Ukrainian, and Second Ukrainian fronts. Shutov was seriously wounded in 1944, and his left arm was amputated. He retired in 1945.

Shutov was a deputy to the second convocation of the Supreme Soviet of the USSR. He was awarded two Orders of Lenin, two Orders of the Red Banner, and various medals. A bronze bust of Shutov has been placed in the settlement of Glusha in Bobruisk Raion, Mogilev Oblast. [29–1553–2]

SHUTTERS, metal, reinforced-concrete, or wooden beams arranged in sets and designed to close off the opening of a water passage in a hydraulic engineering installation. Beams placed horizontally one on top of the other form a wall, which serves as the movable part of the gate that is usually used during construction or repair of an installation. Shutters may also be used as permanent gates in irrigation, flooding, and drainage systems.

[29–832–3]

SHUTTLE. (1) In weaving, the working element of a loom that interlaces the weft yarns with the warp yarns to weave cloth. It is a streamlined body with a cavity, in which a bobbin for the weft is located. Shuttles may be made of hard wood (hornbeam, boxwood, and acacia), compressed wood, or plastic. In order to increase the durability and smoothness of the external walls, shuttles may be covered with vulcanized fiber 2 mm thick. The ends are clad with steel tips. The design of a shuttle depends on the design and purpose of the loom, the weight-to-length ratio of the weft yarn, and the size of the weft yarn package.

(2) In sewing, the working element of a lockstitch sewing machine, which inserts the bottom thread into the stitch. [29–136–2]

SHUUBIYAH, a cultural and political movement among the non-Arab peoples in the Arabian Caliphate that rejected the Arabs' claims to dominance in the cultural, and sometimes political, life of Islamic countries. The movement, which began in the eighth century, was most active in Iran, where the principal figures were the writer and translator Abu Muhammad Abdallah ibn al-Muqaffa, the historian Hamzah al-Isfahani, and the scholar and encyclopedist al-Biruni. The *shuubiyah* movement was associated with opposition to the political hegemony of the Arabs or with heretical sects, such as the Shiites and Kharijites; it was especially linked with the effort to revive local literary languages, notably Farsi. The poets Bashshar ibn-Burd and Abu Nuwas introduced Farsi expressions and poems into their works. [29–1553–3]

SHUVAEV, DMITRII SAVEL'EVICH. Born Oct. 12 (24), 1854; died 1937. Russian military figure; general of the infantry (1912).

Shuvaev was from a family of respected citizens of Orenburg Province. He graduated from the Alexander Military School in 1872 and the Academy of the General Staff in 1878. He taught at military educational institutions and served in staff positions. Shuvaev was a division commander in 1905 and a corps commander in 1907 and 1908.

In 1909, Shuvaev was appointed chief quartermaster and head of the Main Quartermaster Directorate. He served as chief field quartermaster from December 1915 to March 1916. Shuvaev was minister of war from March 1916 to January 1917, when he was named a member of the Council of State.

After the October Revolution, Shuvaev taught at Red Army military educational institutions, including the school for command personnel, Vystrel. Shuvaev retired in the late 1920's as a personal pensioner. [29–1519–2]

SHUVALOV, IVAN IVANOVICH. Born Nov. 1 (12), 1727, in Moscow; died Nov. 14 (25), 1797, in St. Petersburg. Russian state figure. Adjutant general (1760).

Shuvalov obtained a position at the court in 1742, and in 1749 he became a *kamer-iunker* (lowest title at the tsarist court) and a favorite of Empress Elizaveta Petrovna's. Shuvalov, who influenced the foreign and domestic policy of Russia in the mid-18th century, promoted the development of Russian science and art and acted as a patron for Russian scholars, writers, and artists. He supported many of M. V. Lomonosov's ideas, including the plan to establish Moscow University; after the university opened its doors, he became its first curator. In 1757 the Academy of Arts was established at the initiative of Shuvalov, who served as its president until 1763.

After Catherine II Alekseevna was crowned, Shuvalov fell from favor. From 1763 to 1777, while on leave abroad "for reasons of health," he carried out various diplomatic and other missions for the Russian government. He sent collections of art he gathered in Western Europe to the Academy of Arts and the Hermitage. After his return to Russia, Shuvalov did not play a major role in politics.

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SHUVALOV, PAVEL ANDREEVICH. Born Nov. 13 (25), 1830, in St. Petersburg; died Apr. 7 (20), 1908, in Yalta. Russian military figure and diplomat. General of the infantry, adjutant general, member of the Council of State (1896). Count. Brother of Petr Andreevich Shuvalov.

Pavel Andreevich Shuvalov took part in the Crimean War and the Russo-Turkish War of 1877–78. He was chief of staff of the guard troops and the St. Petersburg Military District. From 1885 to 1894 he served as ambassador in Berlin and helped negotiate, in addition to the Reinsurance Treaty of 1887, the trade agreement of 1894, which put an end to the "customs war" between Russia and Germany. Shuvalov became governor-general of Warsaw in 1894 and retired in 1896. [29–1519–4]

SHUVALOV, PAVEL PETROVICH. Born 1847; died 1902. Reactionary Russian political figure. Guards colonel and aide-de-camp. Count.

Shuvalov was a member of the group close to Alexander II that defended the privileges of the upper nobility. A founding leader of the Sviashchennaia Druzhina (Holy Host), Shuvalov carried on negotiations, on behalf of the fictional Zemstvo League, with the People's Will members M. N. Oshanina and L. A. Tikhomirov for purposes of provocation. [29–1519–5]

SHUVALOV, PETR ANDREEVICH. Born June 15 (27), 1827, in St. Petersburg; died there Mar. 10 (22), 1889. Russian statesman and diplomat. Adjutant general; general of the cavalry. Member of the Council of State (1874). Count.

After graduating from the Corps of Pages, Shuvalov served in the guards cavalry. He became an adjutant to the minister of war in 1854 and fought in the defense of Sevastopol'. In 1857 he was appointed chief of police in St. Petersburg. Shuvalov was named director of a general affairs department of the Ministry of Internal Affairs in 1860 and chief of staff of the Corps of Gendarmes and director of the chancery of the Third Section in 1861.

In 1864, Shuvalov became governor-general of Livonia, Estonia, and Courland. He was made chief of the gendarmerie and head of the Third Section in 1866. His almost dictatorial power earned him the nickname "Peter IV." Shuvalov was Emperor Alexander II's closest adviser.

Shuvalov was a member of reactionary circles that advocated serfdom and was an opponent of bourgeois reforms. He served as ambassador in London from 1874 to 1879. On May 30, 1878, he and British foreign secretary Lord Salisbury signed the secret Anglo-Russian agreement that anticipated the principal determinations of the Berlin Congress of 1878.

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SHUVALOV, PETR IVANOVICH. Born 1710; died Jan. 4 (15), 1762, in St. Petersburg. Russian state and military figure. General field marshal (1761). Count (1746). First cousin of I. I. Shuvalov.

P. I. Shuvalov took part in the palace coup of Nov. 25, 1741, which resulted in the accession of Empress Elizaveta Petrovna. He directed the domestic policy of Russia in the 1750's and worked out a program of government action that was in the spirit of enlightened absolutism. He was the author of plans for such economic and financial reforms as the abolition of internal customs, the creation of a protectionist foreign-trade policy, the establishment of banks for merchants and for the nobility, the implementation of a general land survey, and the modification of the system of money circulation. Shuvalov was one of the initiators of the sixth legislative commission (1754–66).

Shuvalov took an active part in the reorganization of the army and its administrative system on the eve of the Seven Years' War of 1756–63. After becoming head of an armaments office in 1757, he did a great deal to modernize artillery. He developed the "secret" howitzer and the "unicorn" howitzer, which was used by the Russian Army for more than 100 years. Several artillery plants were built on Shuvalov's initiative.

Shuvalov engaged in trade and manufacturing and in liquor and tobacco tax farming. He held monopolies on fishing and seal hunting in the White and Caspian seas and on foreign trade in timber. Shuvalov was also the owner of several ironworks.

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SHUVELIAN, an urban-type settlement in the Azerbaijan SSR, under the jurisdiction of the Azizbekov raion soviet of the city of Baku. The Severnaia State Regional Electric Power Plant and the Baku Aluminum-Rolling Plant are located in Shuvelian. The settlement also has a sovkhoz for flower raising. [29–1520–3]

SHUVYR (also *shyabur*), a Mari folk wind instrument in which the sound is produced by a reed. A type of bagpipe, the *shuvyr* consists of an air reservoir (an animal bladder) and three pipes: one to blow the air and two chanters, which are cradled in a wooden gutter and terminate in a common bell of cow's horn. The chanters have a range of a third and a fifth, respectively. One has two finger holes, and the other four; it is possible to perform two-part melodies. The *shuvyr*, which is tuned to the diatonic scale, produces a loud tone with a shrill, buzzing timbre. Known since antiquity, the instrument was used to accompany folk songs and dance melodies; it is rarely heard today.

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Nikiforov, P. N. *Mariiskie narodnye muzykal'nye instrumenty*. Ioshkar-Ola, 1959. Pages 48–58. S. Ia. Levin [29–1520–4]

SHVANVICH, BORIS NIKOLAEVICH. Born Nov. 14 (26), 1889, in Poltava; died Dec. 5, 1957, in Leningrad, Soviet zoologist.

Shvanvich graduated from St. Petersburg University in 1913. In 1915 he began working at Petrograd University; in 1919 he became an assistant, in 1927 a privatdocent, and in 1931 head of a subdepartment. From 1928 to 1930 he was a professor at the University of Perm'. In the period 1954–57 he was vice-president of the All-Union Entomological Society. He was also chairman of the zoological department of the Leningrad Society of Natural Scientists.

Shvanvich established the existence of dwarf male mollusks. However, his main works dealt with general entomology. Shvanvich related the morphology of insect-wing designs to the theory of protective coloring and ecology. He also studied various aspects of insect taxonomy and silkworm acclimatization as well as insect pollinators, including the honeybee.

Shvanvich was awarded the Order of Lenin and various medals.

WORKS
Kurs obshchei entomologii, Moscow-Leningrad, 1949.
Vvedenie v entomologiiu. Leningrad, 1959. [29–925–5]

SHVARTS, ANTON ISAAKOVICH. Born Jan. 24 (Feb. 5), 1896, in Moscow; died there Feb. 21, 1954. Soviet performer of *estrada* (the variety stage). Honored Artist of the RSFSR (1947). Master of Dramatic Reading.

Shvarts graduated from the University of Petrograd in 1922 and became a lawyer. He performed in drama theaters in Rostov-on-Don and Petrograd. Influenced by A. Ia. Zakushniak, he devoted himself to solo performances of dramatic readings, beginning in 1929. Among his best works were Pushkin's *The Queen of Spades* (1936) and *Ruslan and Liudmila* (1947) and a version of Gogol's *Dead Souls* (1935).

Shvarts helped popularize Soviet poetry, notably the works of V. V. Mayakovsky, S. A. Esenin, N. N. Aseev, E. G. Bagritskii and I. L. Sel'vinskii.

WORKS
V laboratorii chtetsa. Moscow, 1960.
REFERENCE
Verkhovskii, N. Iu. *Kniga o chtetsakh*. Moscow-Leningrad, 1950. [29–927–3]

SHVARTS, EVGENII L'VOVICH. Born Oct. 9 (21), 1896, in Kazan; died Jan. 15, 1958, in Leningrad. Soviet Russian writer.

The son of a physician, Shvarts studied at the law faculty of Moscow University from 1914 to 1916. He was first published in 1923; he contributed to the magazines *Ezh* and *Chizh*. A subtle understanding of the psychology of children, a fine sense of humor, and a keen perception of the poetry of childhood are evidenced in his novellas *The Adventures of Shura and Marusia* (1937), *Somebody Else's Girl* (1937), and *The Girl in the First Grade* (1949).

Shvarts displayed an original imagination in his early plays—*Underwood* (staged 1929, published 1930), *The Treasury* (staged 1933, published 1934), and the satirical comedy *The Adventures of Hohenstaufen* (1934). These works contain a number of witty plays on the meaning and sound of words. Shvarts made use of plots from folktales and H. C. Andersen's stories to create living, original characters and his own fictional world in the plays *The Naked King* (1934, published 1960), *Little Red Riding Hood* (1937), *The Snow Queen* (1938), and *The Shadow* (1940). During the war he wrote the antifascist play *The Dragon* (1944, staged 1962, director N. P. Akimov, Leningrad Theater of Comedy), one of the most profound and original works of Soviet satirical drama.

In the postwar years Shvarts focused on the psychology of contemporary life and on details of everyday reality in such plays as *An Ordinary Miracle* (1956) and *A Tale of a Young Couple* (1958). Shvarts wrote the screenplay for such films as *Cinderella* (1947), *The Girl in the First Grade* (1948), and *Don Quixote* (1957, based on the novel by Cervantes).

WORKS
Skazki, povesti, p'esy, 2nd ed. Leningrad, 1969.
P'esy: Klad, Snezhnaia koroleva, Krasnaia shapochka. Leningrad, 1972.
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Akimov, N. "Skazka na nashei stsene." In his *O teatre*. Leningrad-Moscow, 1962.
My znali Evgeniia Shvartsa. Leningrad-Moscow, 1966.
Kalmanovskii, E. "Shvarts." "In *Ocherki istorii russkoi sovetskoi dramaturgii*, vol. 3: *1945–1967*. Leningrad, 1968.
Rakhmanov, L. "Zhizn' druga—eto i tvoia zhizn'." In his *P'esy, povesti, vospominaniia*. Leningrad, 1972. A. A. NINOV [29–929–1]

SHVARTS, ISAAK IZRAILEVICH (party pseudonym, Semen). Born Jan. 6 (18), 1879, in Nikolaev; died Oct. 26, 1951, in Moscow. Russian revolutionary and party figure. Member of the Communist Party from 1899.

The son of a worker, Shvarts in 1892 obtained a job as a worker and became active in Social Democratic circles. He was exiled to Yakutia, from which he fled to Switzerland; he later helped rebuild various Bolshevik organizations, including the Ekaterinoslav committee of the RSDLP in 1905 and the Urals party organization in 1906. In 1911 he attended lectures at the party school in Longjumeau, served as a commissioner of the Organizational Commission Abroad for Convening a Party Conference, and was a member of the Russian Organizational Commission for Preparing the Sixth (Prague) All-Russian Conference of the RSDLP(B), which was held in 1912. Seven times he was arrested and exiled to Eastern Siberia, from which he escaped six times.

After the February Revolution of 1917 he engaged in party work in the Ukraine and served on the bureau of the oblast committee of the RSDLP(B) of the Donbas and the Krivoi Rog region. During the Civil War of 1918–20, he was a leader of the party underground and the partisan movement in the Ukraine. In 1918 he was a delegate to the First Congress of the Communist Party (Bolshevik) of the Ukraine, a member of the Central Committee, and chairman of the All-Ukrainian Extraordinary Commission; he served as a commissioner of the Central Committee of the RCP(B) in the Donbas. Shvarts became chairman of the Central Committee of the Miners' Union in 1921 and a member of the Presidium of the All-Union Central Council of Trade Unions in 1925. In 1930 he undertook administrative work.

Shvarts was a delegate to the Ninth and the Eleventh through Seventeenth Party Congresses. At the Tenth and Twelfth Congresses he was elected a member of the Central Control Commission. He was elected a member of the Central Committee by the Thirteenth through Sixteenth Congresses and a candidate member of the Central Committee of the ACP(B) by the Seventeenth Congress. In 1946 he became a personal pensioner. Shvarts was awarded the Order of the Red Star.

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Partiia shagaet v revoliutsiiu, 2nd ed. Moscow, 1969. Pages 420–32. [29–929–2]

SHVARTS, STANISLAV SEMENOVICH. Born Apr. 1, 1919, in Ekaterinoslav, now Dnepropetrovsk; died May 12, 1976, in Sverdlovsk. Soviet zoologist. Academician of the Academy of Sciences of the USSR (1970; corresponding member, 1966). Member of the CPSU from 1958.

Shvarts graduated from Leningrad State University in 1942. In 1946 he began working at the Urals Branch of the Academy of Sciences of the USSR, and from 1955 to 1976 he was director of the Institute of Plant and Animal Ecology (the original name of the Institute of Biology). In 1952 he organized the laboratory of animal population ecology and became its director.

Shvarts' main works dealt with animal ecology. Shvarts developed a system of morphophysiological indicators for determining the state of animal populations and for predicting their growth; he also introduced new concepts concerning the ecological mechanisms of the evolutionary process in nature and the metabolic regulation of the rate of growth and development in animal populations. He made major contributions to the development of animal population ecology (the concept of the biological distinctiveness of seasonal generations of animals) and the chemical ecology of aquatic animals. Shvarts directed a multifaceted investigation of the nature of the far north.

Shvarts was awarded the Order of Lenin, the Order of the October Revolution, and various medals. He received the A. N. Severtsov Prize of the Academy of Sciences of the USSR.

WORKS
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Puti prisposobleniia nazemnykh pozvonochnykh zhivotnykh k usloviiam sushchestvovaniia v Subarktike. Sverdlovsk, 1963.

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Evoliutsionnaia ekologiia zhivotnykh. Sverdlovsk, 1969.
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SHVARTS, VIACHESLAV GRIGOR'EVICH. Born Sept. 22 (Oct. 4), 1838, in Kursk; died there Mar. 29 (Apr. 10), 1869. Russian painter.

Shvarts studied at the St. Petersburg Academy of Arts from 1859 to 1863 under B. P. Villeval'de. He perfected his painting technique in Germany (1861) and France (1863–64, 1867). The founder of the historical genre in Russian painting, he strove to depict historical events realistically, to reveal the life-style and national character of the Russian people of past ages, and to impart deep significance to landscape in the imagery of a picture.

Works by Shvarts include *Ivan the Terrible by the Body of the Son He Has Slain* (1864, Tret'iakov Gallery, Moscow), illustrations for A. K. Tolstoy's novel *Prince Serebrianyi* (pen and ink, 1863–65, Tret'iakov Gallery), and *Scene From the Domestic Life of the Russian Tsars* (1865, Russian Museum, Leningrad).

REFERENCE
Vereshchagina, A. G. *V. G. Shvarts: 1838–1869*. Leningrad-Moscow, 1960. (Contains bibliography.) [29–928–1]

SHVARTSEVSKII, an urban-type settlement in Kireevsk Raion, Tula Oblast, RSFSR; located 2 km from the Obolenskoe railroad station on the Uzlovaia-Tula line. Shvartsevskii has a chemical combine that produces vitamins and synthetic intermediates. The Bolokhovo Chemical-Mechanical Technicum is located in the settlement. [29–931–2]

SHVARTSMAN, OSHER MARKOVICH. Born Oct. 6 (18), 1889, in the village of Vil'nia, near Zhitomir; died August 1919, in the *stanitsa* (large cossack village) of Palitsa, near Sarny. Soviet Jewish poet.

Shvartsman served in World War I, and in late 1918 he joined the Red Army as a volunteer. He was killed in a skirmish with the White Poles. Shvartsman was first published in 1913. His poetry is characterized by optimism and revolutionary romanticism. His best postrevolutionary poems are "Youth" (1917), "Vision" (1918), "My Brother" (1919), and "The Gray Mother-Night" (1919). Shvartsman's poetry is pervaded by a love for working people and for his native countryside. Considered the first Soviet Jewish poet, he deeply influenced the development of Soviet Jewish poetry. Some of Shvartsman's poems have been translated into Russian, Ukrainian, and other languages.

WORKS
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In Russian translation:
Stikhi. [Foreword by P. Usenko.] Moscow, 1968.
Samoe zavetnoe: Pesni, stikhi i poemy raznykh let. Moscow, 1976. [29–932–1]

SHVEDOV, FEDOR NIKOFOROVICH. Born Feb. 14, 1840; died Dec. 12, 1905, in Odessa. Russian physical chemist.

Shvedov graduated from the University of St. Petersburg in 1863. In 1870 he became a professor at Novorossiia University in Odessa, and from 1895 to 1903 he was rector of the university; under his direction the institution was greatly expanded.

Shvedov was one of the founders of the rheology of disperse systems. In 1889, using a rotatory viscometer of his own invention, he became the first to observe the elastic form and anomalous viscosity of colloidal solutions. Shvedov studied the relaxation of stress in colloids and established an equation to express the viscoelastic flow of disperse systems.

REFERENCE
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SHVEIKIN, GENNADII PETROVICH. Born Aug. 29, 1926, in the city of Karabash, Cheliabinsk Oblast. Soviet chemist. Corresponding member of the Academy of Sciences of the USSR (1976). Member of the CPSU from 1955.

Shveikin graduated from the S. M. Kirov Urals Polytechnical Institute in 1951. In the same year he joined the staff of the Institute of Chemistry of the Urals Branch of the Academy of Sciences of the USSR; in 1972 he was appointed director of the institute.

Shveikin's principal works deal with the chemistry of refractory metals and their compounds. He proposed a method of preparing metallic niobium. He also developed methods of synthesizing the carbides and nitrides of the metals in groups IVa through VIa of the periodic table of elements.

WORKS
Fiziko-khimicheskoe issledovanie okislov, karbidov i oksikarbidov vanadiia, niobiia i tantala. Sverdlovsk, 1970. [29–936–3]

SHVEINAIA PROMYSHLENNOST' (Clothing Industry), a scientific, technical, and trade journal; organ of the Ministry of Light Industry of the USSR and the Central Board of the Scientific and Technical Society of Light Industry. The journal has been published in Moscow since 1940 (until 1959, under the title *Legkaia promyshlennost'* [Light Industry]); it is issued six times a year. The journal reports on the advances of science and technology in the clothing industry, problems of the industry's economy, the scientific organization of labor, quality improvements in clothing, and production innovations. Circulation, approximately 30,000 (1980). [29–941–1]

SHVEITSER, BOGDAN IAKOVLEVICH. Born Jan. 29, 1816, in Wil, Zürich Canton, Switzerland; died June 24, 1873, in Moscow. Russian astronomer.

Shveitser was a member of the staff at the Pulkovo Observatory from 1841 to 1845, when he left to take a position at the observatory at Moscow University. He was named director of the university's observatory in 1856.

A number of observations Shveitser made with a transit instrument became the basis for the Pulkovo Catalog of 1845. Shveitser organized the investigation of the Moscow gravity anomaly and discovered four comets.

REFERENCE
Blazhko, S. N. "Istoriia Astronomicheskoi observatorii Moskovskogo universiteta." *Uchenye zapiski MGU: Iubileinaia seriia*, 1940, issue 58. [29–997–1]

SHVEITSER, MIKHAIL ABRAMOVICH (Moisei Abramovich Shveitser). Born Mar. 16, 1920, in Penza. Soviet motion-picture director. People's Artist of the RSFSR (1977).

In 1944, Shveitser graduated from the department of film direction at the All-Union State Institute of Cinematography, where he studied in S. M. Eisenstein's workshop. His first work was *Path of Glory* (1949, in collaboration with B. A. Buneev and A. M. Rybakov).

Shveitser's most significant motion pictures have been film versions of well-known works of classical and Soviet literature. They include *Someone Else's Relatives* (1956, based on V. F. Tendriakov's story "Not to the Yard"), *Resurrection* (1960–62, based on the L. N. Tolstoy novel), *Time, Forward!* (1966, in collaboration with S. A. Mil'kina; based on the novel by V. P. Kataev), *The Golden Calf* (1968, based on the novel by Il'f and Petrov), and *The Flight of Mister McKinley* (1976, based on a screenplay by L. M. Leonov).

Shveitser was awarded the State Prize of the USSR in 1977. [29–997–3]

SHVERNIK, NIKOLAI MIKHAILOVICH. Born May 7 (19), 1888, in St. Petersburg; died Dec. 24, 1970, in Moscow. Soviet state and party figure. Hero of Socialist Labor (1958). Member of the CPSU from 1905.

The son of a worker, Shvernik became a metalworker in 1902. Between 1905 and 1917 he was a member of the St. Petersburg, Nikolaev, Tula, and Samara committees of the RSDLP, and in

1910 and 1911 he served on the administrative board of the union of metalworkers in St. Petersburg. After the February Revolution of 1917 he was chairman of the plant committee of the pipe plant in Samara, and in October 1917 he became chairman of the All-Russian Committee of Artillery Plant Workers. After the October Revolution of 1917, Shvernik became chairman of the Samara soviet. From 1918 to 1920 he was a commissar on the Eastern and Southern fronts and deputy extraordinary commissioner of the Council of Defense for supplying the armies of the Caucasian Front.

From 1921 to 1923, Shvernik engaged in trade union work. From 1923 to 1925 he was a member of the Presidium of the Central Control Commission of the RCP(B) and people's commissar of the Workers' and Peasants' Inspectorate of the RSFSR. In 1925 and 1926 he was secretary of the Leningrad oblast committee and the Northwestern Bureau of the Central Committee of the ACP(B). In 1926 and 1927 he was a secretary of the Central Committee of the ACP(B). Shvernik was secretary of the Ural'sk oblast party committee in 1927 and 1928. In 1929 he served as chairman of the central committee of the metalworkers' trade union, and from 1930 until 1944 he was first secretary of the All-Union Central Committee of Trade Unions (AUCCTU).

Between 1944 and 1946, Shvernik served as first deputy chairman of the Presidium of the Supreme Soviet of the USSR and chairman of the Presidium of the Supreme Soviet of the RSFSR; from 1938 to 1946 he was chairman of the Soviet of Nationalities of the Supreme Soviet of the USSR. During the Great Patriotic War of 1941–45 he also served as chairman of the Extraordinary Commission to Establish and Investigate the Crimes of the German Fascist Aggressors. From 1946 to 1953, Shvernik was chairman of the Presidium of the Supreme Soviet of the USSR, and from 1953 until 1956 he served as chairman of the AUCCTU. From 1956 to 1962 he was chairman of the Party Control Committee of the Central Committee of the CPSU. From 1962 to 1966 he was chairman of the Party Commission of the Central Committee of the CPSU.

Shvernik served as a delegate to the Fourteenth through Twenty-third Party Congresses. Having become a member of the Central Committee in 1925, he served as a member of the Organizational Bureau of the Central Committee in 1926 and 1927 and again from 1930 to 1946; a candidate member of the Politburo of the Central Committee from 1939 to 1952, he was a candidate member of the Presidium of the Central Committee of the CPSU from 1953 to 1957 and a member of the Presidium in 1952 and 1953 and again from 1957 to 1966. From 1927 to 1938, Shvernik was a member of the All-Union Central Executive Committee and from 1935 to 1938 he was a member of the Presidium of the Central Executive Committee of the USSR. He was a deputy to the first through sixth convocations of the Supreme Soviet of the USSR.

Shvernik, who was awarded five Orders of Lenin, is buried on Red Square near the Kremlin wall. [29–999–1]

SHVETSOV, ARKADII DMITRIEVICH. Born Jan. 12 (24), 1892, in the settlement of Nizhnie Sergi, in what is now Sverdlovsk Oblast; died Mar. 19, 1953, in Moscow. Soviet aircraft-engine designer; doctor of technical sciences (1940). Lieutenant general of the engineering and technical service (1948). Hero of Socialist Labor (1942).

After graduating from the Moscow Higher Technical School in 1921, Shvetsov worked in the aviation industry. In 1934 he was made chief designer at an aircraft-engine plant.

In 1926, Shvetsov developed the M-11, the first Soviet lot-produced air-cooled aircraft engine, for use in such aircraft as the Po-2 (U-2), the AIR-6, the UT-2, and the Iak-18. Later, in the 1930's, the M-22, M-25, M-62, and M-63 engines were developed under Shvetsov's supervision to power such fighters as the I-15 and the I-16.

In the 1940's, Shvetsov guided the development of a number of ASh air-cooled radial engines, each more powerful than its predecessor: namely, the ASh-62IR, which was used in the Li-2 and An-2 transports; the ASh-82 and ASh-82FN, which powered the La-5 and La-7 fighter planes, the Tu-2 bomber, and the Il-12 and Il-14 passenger planes; and engines for the Mi-4 helicopter, designed by M. L. Mil'. Shvetsov can be said to have founded a school in the design of air-cooled engines.

Shvetsov was a deputy to the second and third convocations of the Supreme Soviet of the USSR. He received the State Prize of the USSR in 1942, 1943, 1946, and 1948. Shvetsov was awarded five Orders of Lenin, three other orders, and various medals.

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Grin, B. D. *General'nyi konstruktor A. D. Shvetsov*. Perm', 1964.
Grin, B. D. *Vysokoe nebo*. Perm', 1973.

S. Ia. Makarov [29–1060–1]

SHVETSOV, MIKHAIL SERGEEVICH. Born Oct. 17 (29), 1885, in Moscow; died there July 22, 1975. Soviet geologist. Honored Scientist of the RSFSR (1956).

Shvetsov graduated from Moscow University in 1910. He taught there and at the Moscow Mining Academy from 1918 to 1930. In 1930 he became a professor and head of the subdepartment of sedimentary rocks at the Moscow Geological Prospecting Institute. Shvetsov's main works dealt with the petrography of sedimentary rocks, stratigraphy, and paleontology (belemnites, brachiopods). In 1923, Shvetsov began teaching the first course on the petrography of sedimentary rocks in the USSR at Moscow University. He is the author of the textbook *The Petrography of Sedimentary Rocks* (1934), which has been translated into many languages.

Shvetsov was awarded the Order of Lenin and various medals.

REFERENCE

Tikhomirov, B. V. "Mikhail Sergeevich Shvetsov." *Biul. Mosk. ob-va ispytatelei prirody: Otd. geologicheskii*, 1976, no. 6. [29–1060–2]

SHVETSOV, PETR FILIMONOVICH. Born Jan. 14 (27), 1910, in the village of Kazanskaia, in what is now Iglino Raion, Bashkir ASSR. Soviet permafrost specialist and hydrogeologist. Corresponding member of the Academy of Sciences of the USSR (1953). Member of the CPSU since 1940.

After graduating from the Moscow Geological Prospecting Institute in 1935, Shvetsov worked in the Main Administration of the Northern Sea Route. In 1941 he began working at the Institute of Geocryology, serving as its director from 1956 to 1958. In 1962 he became head of a laboratory at the All-Union Scientific Research Institute of Hydrogeology and Engineering Geology (VSEGINGEO).

Shvetsov's main works deal with groundwaters and the geothermal conditions of permafrost layers. Shvetsov was scientific director and editor of the collective work *Fundamentals of Geocryology* (1959). He received the State Prize of the USSR in 1952 and has been awarded the Order of the October Revolution, two other orders, and medals.

WORKS

Zakonomernosti gidrogeotermicheskikh protsessov na Krainem Severe i Severo-Vostoke SSSR. Moscow, 1968.
Geotermicheskie usloviia mezozoisko-kainozoiskikh neftenosnykh basseinov. Moscow, 1974.

REFERENCE

"K 60-letiiu P. F. Shvetsova." *Sovetskaia geologiia*, 1970, no. 2.

[29–1061–1]

SHVI. (1) One of the names of an Armenian folk wind instrument, a type of ocarina. The *shvi*, also known as a *pepuk, kavits*, or *blul*, is a clay whistle in the shape of a fantastical bird or an animal with two bodies. It has a whistle head and two finger holes in the lower part of the instrument. The *shvi* is also used as a child's toy.

(2) An Armenian whistle flute, also called a *tutak*. [29–1061–2]

SHVIADAS, IONAS IZIDORJAUS (also Jonas Izidoriaus Švedas). Born Sept. 26 (Oct. 9), 1908, in Liepāja, now in the Latvian SSR; died Oct. 15, 1971, in Vilnius. Soviet composer, choral director, and teacher. People's Artist of the USSR (1954).

In 1929, Shviadas graduated from the Klaipėda School of Mu-

sic, where he had studied trombone and, under S. Šimkus and J. Žilėvičius, composition. From 1930 to 1935 he played in the orchestra of the Kaunas Theater. In 1940 he founded the Lietuva State Song and Dance Ensemble of the Lithuanian SSR, which he headed until 1962. Until 1970 he was the principal conductor at the festivals of song.

Shviadas notated and arranged examples of folk music. Many of his songs and compositions for folk instruments are based on elements of national folklore and have become widely known. Among Shviadas' most important compositions are his cantata in honor of the tenth anniversary of Soviet Lithuania (1949) and the cantata *Flourish, Soviet Lithuania* (1960). With B. Dvarionas he wrote the music for the national anthem of the Lithuanian SSR.

Shviadas began teaching trombone at the Kaunas Conservatory in 1935. In 1945 he became head of the subdepartment of folk instruments at the State Conservatory of the Lithuanian SSR in Vilnius, where he was appointed a professor in 1967. He received the State Prize of the USSR in 1950. Shviadas was awarded the Order of Lenin, the Order of the Red Banner of Labor, and various medals. M. M. Iakovlev [29–1063–2]

SHYIUEDI CHI (Banner of October), a Dungan-language newspaper circulated in several republics of the USSR. *Shyiuedi chi* has been published in Frunze, Kirghiz SSR, since 1957; it appears twice a week. Circulation, more than 4,400 (1977). [29–1561–1]

SHYN (Pravda), a Tuvinian-language newspaper of the Tuva ASSR. *Shyn* was founded Aug. 31, 1925, under the name *Erge cholee bukhii Tuva* (Liberated Tuva), and in September of the same year it was renamed *Tyvanyn arattyn shyny* (Pravda of the Tuvinian *Arat*). Since 1931 it has been called *Shyn*. The newspaper, which was published in Mongolian until 1930, comes out in Kyzyl six times a week. Circulation, 1,700 (1977). *Shyn* was awarded the Order of the Badge of Honor in 1975. [29–1561–2]

ŠIAULIAI (until 1795, Saule; until 1917, Shavli), a city under republic jurisdiction and administrative center of Šiauliai Raion, Lithuanian SSR. A junction of railroad lines to Riga, Vilnius, and Liepāja. Population, 115,000 (Jan. 1, 1977).

Šiauliai has been known since the 15th century. It became a city in 1569. Beginning in 1795, it was part of Russia, and in 1843 it was made a district capital in Kovno Province. It was part of bourgeois Lithuania from 1919 to 1940, when it became part of the Lithuanian SSR and the administrative center of Šiauliai Raion.

In 1236, not far from Šiauliai, Lithuanian troops commanded by Prince Vykintas defeated an army of Teutonic knights at the source of the Dubysa River. During the Great Patriotic War (1941–45), the area around the city was the scene of the Šiauliai offensive operation, in the course of which on July 27, 1944, Šiauliai was liberated from the fascist aggressors.

The principal enterprises are the Vairas motor bicycle plant, a machine-tool plant, an experimental electrical design plant, a television plant, a tire-repair plant, and plants for the production of reinforced-concrete structural elements, construction elements, and leather goods. The city also has meat, milk, bread and macaroni, beer-brewing, and home-building combines and factories for the production of leather clothing accessories and nonwoven fabrics. Located in the city are the Verpstas knitted goods factory, the Rūta confectionery production association, the Elnias leather footwear production association, and the Venta furniture production association. The Rekiva State Regional Electric Power Plant and a peat enterprise are located nearby. Heavily damaged during the Great Patriotic War, the city has been rebuilt according to the old grid plan of 1774–83.

Architectural monuments include the Renaissance Church of Sts. Peter and Paul (1595–1625). The city is being developed according to the 1963 general plan (architect K. Bučas). New residential developments have been built (the Druzhba development; architects A. Rätnikas, P. Marengolcas, E. Raupis, and B. Semashka; 1959), and new developments are under construction (Dainiai; architects A. Kuosa and V. Naujėkas; begun 1975). A pedestrian mall (architect V. Taujanskenė) was built in the center of the city in 1976. Notable public buildings include the Palace of Culture (architects A. Rätnikas and I. Cjuta; 1961–71), the Institute of Water Management Planning (architect A. Kuosa; 1966), the parking building (architect A. Rätnikas; 1966), and the building of the planning institute (architect A. Sprindis; 1974). There are several stone and bronze monuments, including the monument to V. I. Lenin (sculptors A. Toleikis and D. Lukoševičius; architect S. Staponkus; 1970), the Victory Monument (sculptor A. Penkov; architect E. Budreika; 1947), the Komsomol monument (sculptors A. Toleikis and D. Lukoševičius; architect S. Staponkus; 1968), and the monument to F. Žemaitis (sculptor D. Lukoševičius; architect V. Gabrjunas, 1976). Šiauliai has a pedagogical institute, an evening department of the Kaunas Polytechnical Institute, a secondary specialized polytechnic, and secondary music and medical schools. It also has a historical-ethnographic museum and a drama theater.

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ŠIAULIAI OPERATION OF 1944, an operation by Soviet forces of the First Baltic Front, commanded by General of the Army I. Kh. Bagramian, conducted between July 5 and Aug. 29, 1944, during the Great Patriotic War of 1941–45.

By July 4, the forces involved in the Byelorussian Operation of 1944 (the Sixth Guards and Forty-third armies) had reached the line extending from Druia, to an area west of Voropaevo, to Lake Naroch' and were then to advance in the direction of Švenčionys and Kaunas, as well as on Panevėžys and Šiauliai. The Thirty-ninth Army, which was supposed to concentrate on the left flank of the front by July 10, was transferred to the front, as were the Second Guards and Fifty-first armies from the General Headquarters reserve, which were to arrive in the front zone only in the latter part of July.

The offensive was launched on July 5 by two rifle corps of the Sixth Guards Army and three rifle corps of the Forty-third Army and by a small force of the I Tank Corps. The fascist German forces comprised two corps operating on adjacent wings of Army Groups North and Center. The Thirty-ninth Army was introduced into combat on July 10, striking toward Kaunas. By July 12, the width of the front of the three advancing armies increased to 200 km. The enemy forces of Army Group North offered stubborn resistance.

In view of the situation, the General Headquarters of the Supreme Command changed the direction of the front's main thrust from Kaunas to Šiauliai. On July 14, the Thirty-ninth Army and its zone of attack were transferred to the Third Byelorussian Front, from which the III Guards Mechanized Corps was transferred to the First Baltic Front. On July 20, the Second Guards and Fifty-first armies were brought into combat along the Šiauliai axis to develop the offensive, and by July 22 they had taken the city of Panevėžys, the communications center of Army Group North. On July 27, the III Guards Mechanized Corps, in cooperation with combined-arms units of the Fifty-first Army, liberated the city of Šiauliai. Units of the right wing of the front, in cooperation with the forces of the Second Baltic Front, liberated the city of Daugavpils. Developing the offensive, the forces of the front captured the strongpoints and road junctions of the cities of Biržai and Bauska on July 30 and Jelgava (Mitava) on July 31. At this time, mobile units of the front took the city of Tukums, reached the coast of the Gulf of Riga near Klapkalns, and cut off the land communications of Army Group North.

In late July and early August, the forces of the front repulsed enemy counterstrikes in the vicinity of Biržai (as many as four infantry divisions and 100 tanks and assault weapons) and Raseiniai (one infantry division and one tank division). Between August 16 and August 29, the Germans launched powerful counterstrikes (as many as seven tank divisions and three infantry divisions with more than 800 tanks and assault weapons) to the west and northwest of Šiauliai. In repulsing the enemy counterstrikes, the ground forces were supported by the Third Air Army. On Au-

gust 20, the enemy's counterstrikes from areas west of Tukums and Sloka and his naval landing operations had succeeded in pushing back the Soviet troops from the coast to the south and restoring the coastal communications lines of the Riga grouping. By August 29, the forces of the front were entrenched on the line Plavinas, Lielupe River, Jelgava, Dobele, Auce, and areas west of Zagare, west of Šiauliai, and east of Raseiniai.

During the Šiauliai Operation, the forces of the First Baltic Front defeated the enemy's Panevėžys-Šiauliai grouping and created conditions for completing the liberation of the Soviet Baltic region from fascist German forces. The operation was characterized by a swift offensive, considerable maneuvering, and successful repulses of strong counterstrikes by enemy tank forces.

M. A. POLUSHKIN [29–1566–1]

ŠIBENIK, a city and port in Yugoslavia; situated on the Adriatic Sea, in Croatia. Population, 32,000 (1975). Šibenik, a center for the production of ferroalloys, is also important for the aluminum industry, including smelting in Lozovac and metal-rolling in Ražina. The metalworking industry uses energy from a hydroelectric power plant on the Krka River and bauxite from local deposits. The city also manufactures textiles and food products, mainly wine and canned fruit and fish. Ships are repaired in the port.

Šibenik, which is laid out in the form of an amphitheater, has an old section with an irregular medieval network of streets. Noteworthy buildings include remains of stone fortifications and Gothic churches, including the Church of St. Barbara (1447–51), as well as palaces with elegant carved ornamentation. Renaissance structures include the Cathedral of St. Jakov (1431–1555; architects included Juraj Dalmatinac and Nikola Firentinac; sculpted heads on the eastern facade by Juraj Dalmatinac), the town hall (1534–42), and the New Church (16th century, interior frescoes by local craftsmen, 17th century). The Church of St. Lovre (17th century) is in the baroque style. Outside the old city there are 20th-century buildings, including new residential areas and the Solaris Hotel (1969). Šibenik is popular with tourists.

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SIBERIAN SKETCHBOOK, the first Russian geographic atlas. It summarized the results of geographic discoveries of the 17th century.

In 1695, S. U. Remezov made copies of maps that had been sent to Moscow from Siberia and sketched a number of original maps. In 1696 and 1697, sketch maps of various parts of Siberia were compiled in Tobol'sk, Irkutsk, and other cities. Remezov compiled sketch maps of Western Siberia and an atlas of Siberian rivers. Between 1699 and 1701, Remezov, together with his three sons, compiled the *Siberian Sketchbook*.

The *Siberian Sketchbook* comprised a preface and 23 large maps that encompassed the entire territory of Siberia and were outstanding for the abundance and detail of their information. The maps had no graticule and were oriented with south rather than north on top. Nevertheless, the book was an important achievement of early Russian cartography.

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ŠILALĖ, a city and administrative center of Šilalė Raion, Lithuanian SSR; located 30 km northwest of the Tauragė railroad station on the Šiauliai-Sovetsk line. The city has a clothing factory and a butter factory. [29–1184–4]

ŠILFS, JĀNIS (party pseudonym, Jaunzems). Born Sept. 8 (20), 1891, in Riga; died there, June 11, 1921. Figure in the revolutionary movement in Latvia. Member of the Communist Party from 1908.

The son of a worker, Šilfs was himself a worker. He was instrumental in establishing underground printshops, and he helped with the publication of newspapers of the Social Democracy of the Latvian Territory (SDLT). Šilfs was arrested several times for his underground activities. In 1912 he became a member of the Bolshevik organization of the SDLT, and in 1914 he became a member of the Central Committee of the SDLT. He continued to serve on the Central Committee of the party after it was renamed the Social Democracy of Latvia in 1917 and the Communist Party of Latvia (CPL) in 1919.

In August 1917, Šilfs began underground party work in Riga, which was then occupied by German troops. In December 1918 he became a member of the Latvian Military Revolutionary Committee and the Provisional Soviet Government of Latvia. After helping to establish Soviet power in Riga in January 1919, he became a secretary of the government of Soviet Latvia. Šilfs went underground in May 1919; he served as secretary of the Central Committee of the CPL and editor of the newspaper *Cīņa* (Struggle).

Šilfs was arrested by the bourgeois secret police and subsequently shot. [29–1195–5]

SILK, a natural textile fiber of animal origin, produced by ejection from the silk glands (sericteries) of silkworms spinning cocoons. The principal commercial silkworm is the larva of the Asiatic mulberry silkworm moth (*Bombyx mori*), which is raised commercially on special farms. The larvae eject silk in the form of two filaments consisting of a protein substance called fibroin (70–80 percent by weight) surrounded by another protein substance called sericin (20–30 percent), which cements the filaments into what is called the cocoon thread (bave). In addition to fibroin and sericin, the cocoon threads contain waxes and fats (1–1.5 percent) as well as minerals, such as potassium, sodium, and calcium salts (1–1.5 percent). From the cocoon thread the silkworm shapes a solid silk shell—the cocoon—which is the raw material from which silk is obtained.

Silk is noted for its thinness, high hygroscopicity, dyeability, and pleasing, moderate luster. It has good mechanical properties: a tensile strength of the order of 40 kg-force per mm^2 (1 kg-force per $mm^2 = 10^7$ newtons per m^2) and an extension at break of 14–18 percent. When silk is wet the first figure decreases by 10 percent, but the second increases by the same amount. Silk has little resistance to alkalis and breaks down rapidly in a 5-percent solution of NaOH. It is more resistant to the action of mineral acids, and does not dissolve in ordinary organic solvents. Silk exhibits low resistance to the effect of light; after 200 hr of exposure to sunlight it loses half its strength.

When the cocoons are reeled (unwound) a continuous silk thread up to 1,200 m long is obtained. However, the cocoon threads obtained by reeling individual cocoons are too thin to be used in industry; several must be combined to form the raw silk threads used as commercial threads. Unreeled cocoons (defective cocoons and those remaining after the moth emerges) and waste from all the processes of silk production are broken into short segments, and the fibers are processed in silk spinning.

The production of silk requires considerable labor, which makes silk one of the most expensive textile materials. As a result, silk has been replaced by various chemical fibers in the production of a number of fabrics (in particular, linings and industrial fabrics), stockings, and other articles.

World silk production in 1976 totaled 49,000 tons, approximately 10 percent of which was produced in the USSR.

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G. N. KUKIN [29–1103–3]

SILK FABRIC, a textile made of natural silk; in the Soviet industry the Russian term *shelkovaia tkan'* is also used to refer to silk-like fabrics made from chemical fibers.

The production of silk fabric from natural silk arose in China approximately 5,000 years ago. The Mediterranean countries began producing silk fabrics only after A.D. 555, when Constantino-

ple first imported silkworm eggs from China. In the Middle Ages the silk trade was one of the principal branches of industry in Venice (13th century), Genoa and Florence (14th century), and Milan (15th century). By the 18th century there was a well-developed silk industry in Western Europe, especially in Italy and France.

In Russia the production of silk began during the reign of Peter I the Great. By 1762 the country had 44 silk-weaving mills. However, the production of silk developed in isolation from the raw material base—80 percent of the raw silk used in 1913 and 1914 was imported.

In the USSR the volume of silk and silklike fabrics produced from natural, artificial, and synthetic fibers totaled 1.6 billion sq m in 1977, comprising approximately 600 different items.

The structure of silk fabric varies greatly because of differences in the yarns used (monofilaments, combination yarns, twisted yarns, textured yarns, fancy yarns, cut yarns, and yarns from various textile fibers) and the variety of weaves. Silk fabrics may be bleached, dyed, printed, yarn-dyed, or mélange; they can be given an embossed or glazed finish. In the finishing process the fabric surface can also be given a relief effect, and it can be impregnated with crease-resistant, shrink-resistant, and water-repellent substances. Silk fabrics are conventionally divided into the following groups according to use: dress, shirt, lining, raincoat, suit and coat, and tie fabrics, fabrics for foundation garments, and haberdashery fabrics. Individual items manufactured include scarves, tablecloths, and bedspreads, as well as industrial fabrics.

Silk dress fabrics (armures) (30–200 g/sq m in weight) vary widely in composition, structure, manufacture, and properties. Natural silk dress fabrics include crepe de chine, crepon, and Georgette crepe. Dress fabrics of acetate and triacetate combination and textured yarns are made in plain, twill, satin, small-figured, and large-figured (Jacquard) weaves. They include printed, yarn-dyed, bleached, and piece-dyed fabrics. Dress fabrics of polyamide combination and textured yarns are made with a plain weave; they may be piece-dyed or printed. Dress fabrics of polyester textured yarns include printed and yarn-dyed fabrics. Dress fabrics of viscose yarns are made in a plain weave with printed designs; those of blended yarns (viscose and synthetic fibers) include yarn-dyed and printed fabrics. Some dress fabrics have a nap.

Silk shirting (70–200 g/sq m in weight) may be made from viscose yarn, blended yarn (67 percent polyester and 33 percent viscose fiber), or a combination of such yarns with viscose and polyamide yarns in a plain small-figured, or combination weave. They include bleached, piece-dyed, printed, yarn-dyed, and mélange fabrics and fabrics with crease-resistant and low-shrinkage finishes. All exhibit moderate hygroscopicity and air permeability; special finishes diminish these properties to some extent.

Silk lining fabrics (60–150 g/sq m in weight) are made from viscose and polyamide yarns and from viscose, acetate, or polyamide warp yarns and cotton or viscose filling yarns. Plain, twill, satin, combination, and large-figured weaves are used, and the fabrics may be bleached, piece-dyed, yarn-dyed, or printed and may have a low-shrinkage finish. The face side of the fabric is smooth. The fabrics have a low coefficient of tangential resistance and high friction resistance and hygroscopicity.

Raincoat fabrics (50–200 g/sq m in weight) are used for raincoats, jackets, and umbrellas. They are of two types: fabrics made from polyamide yarn (in a plain weave; piece-dyed, yarn-dyed, or printed; and impregnated for water repellency or with a film coating) and fabrics made from viscose-polyester or viscose-polyamide yarn (in a plain or twill weave; piece-dyed; and impregnated for water repellency).

Suit and coat fabrics (200–300 g/sq m in weight) are usually made from blended yarns (such as polyester-viscose) in a plain or twill weave. They exhibit good hygroscopicity and moderate water repellency. They are sometimes impregnated to reduce shrinkage and creasing. Women's summer dress coats are made with double-layer fabrics of viscose or polyamide yarn in a large-figured weave with a relief effect on the surface. The fabrics may be piece-dyed or yarn-dyed.

Tie fabrics are made from viscose, triacetate, and polyester yarns in small-figured and large-figured weaves. They may be yarn-dyed or printed.

Fabrics for foundation garments are made in a satin weave from viscose and polyester threads in combination with viscose and blended yarns; they may be bleached, piece-dyed, or printed.

Fabrics for scarves and kerchiefs are made from natural silk, acetate, triacetate, and polyamide yarns in various weaves. They may be piece-dyed, yarn-dyed, or printed.

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SILK ROAD, the name of the caravan trade routes that connected China, through Middle Asia, with Southwest Asia and ultimately with Europe from the second century B.C. to the 16th century A.D. The main commodity transported along the Silk Road was Chinese silk.

The route began in the central regions of China and ran through Lanchou to Tunhuang, where it divided. The southern route ran through Khotan, Yarkand, and Balkh to Merv, and the northern route through Turfan, Kashgar, and Samarkand to Merv. The Silk Road then passed through Nisa, Hecatompylus, Ecbatana, and Baghdad and ended at the Mediterranean ports of Tyre and Antioch.

In the first centuries of the existence of the Silk Road, Rome and Parthia struggled for predominance in intermediary trade. In the fifth and sixth centuries, much of the Silk Road was controlled by Iranian and Sogdian merchants; in the seventh century a substantial portion of the route came under the control of Arab merchants. The importance of the Silk Road declined in the 14th century with the development of sea travel. [29–1108–1]

SILK-SCREEN PROCESS, a stenciling technique in which the image is applied with oil paints or watercolors on a mesh made of silk or other strong material stretched over a frame. The sections of the mesh corresponding to the blank areas in the image are covered with an impermeable compound; during the printing process the paint is squeezed with a doctor through the openings in the mesh onto the surface to be imprinted. The silk-screen process, which originated in the mid-20th century, is used for pictorial reproductions, including production art, and in the creation of individual works marked by an enhanced vividness and decorative coloring. [29–1108–2]

SILK SPINNING, the aggregate of production processes used in converting silk waste obtained in sericulture and various branches of the silk industry (such as cocoon reeling and silk throwing) into yarn. Three systems of spinning are used: comb spinning without carding, card and comb spinning, and condenser spinning.

Comb spinning without carding is used to produce yarns up to 2.8 tex. The raw material is sorted, scoured to remove gum and fat, separated, and stapled, after which it is combed on circular carding machines. From three to four machine transfers are usually used, during which the combings from the first machine enter the second and so on. The output from the carding machines is fed to a cross folder, where it is drawn out and formed into sliver, which is wound onto a drum. The sliver is then drawn out and doubled in several transfers on two-stage drawing frames, after which it is fed to roving frames. The roving frames produce spun roving, which is processed into twisted roving on roving machines with spindles. Spinning is accomplished on ring spinning frames.

In card and comb spinning, combings from the last carding machine are processed into yarn. The combings are sorted, separated, and carded on carding machines equipped with roller cards. The sliver is then successively processed on drawing frames, a machine that joins several slivers together, and a combing machine. The combed sliver is processed on drawing, roving, and ring spinning frames into yarn up to 6.7 tex.

Condenser spinning consists in processing the combings obtained by card and comb spinning. The combings are separated, cleaned, oiled, and carded on carding machines. The roving is then processed into yarn on ring spinning frames.

Blends of silk wastes and chemical fibers can also be processed into yarns. (*See also* SPINNING.) V. V. ZHOKHOVSKII [29–1109–1]

SILK THROWING, the aggregate of production processes by means of which raw silk or untwisted chemical filaments are converted to twisted yarns. Twisted silk and chemical yarns are classified according to their use: for weaving, knitwear manufacture, general use (sewing and embroidery), and technical purposes (surgical, insulating, and other types). Twisted silk is classified according to structure into simple, compound, and irregular-twist types.

In silk throwing, skeins of raw silk are soaked in a soap- or oil-based emulsion to soften the sericin, which promotes the best separation of filaments during reeling; it also imparts smoothness and pliability, increases the hygroscopicity of the filaments, and decreases their capacity to take and hold an electric charge. Chemical filaments are not soaked, but are subjected to sizing to give them greater toughness and smoothness and to decrease their tendency to accept and hold an electric charge. After soaking or sizing, the skeins of raw silk or chemical filaments are wrung, straightened, and dried. Before drying, skeins of raw silk are picked apart in order to separate the filaments and remove tangles. After drying, the skeins are unwound on winding machines, which permits control of the continuity of the filament and makes it possible to wind it onto spools or bobbins convenient for subsequent processing. During unwinding, weak and defective sections in the strand are removed.

In order to obtain a thicker yarn, several strands are joined together, usually on double twisters, with simultaneous loose twisting of the strands. This decreases the tendency of the strands to break during subsequent twisting, which is done on multistage or ring twisters. In order to produce twisted yarns of equal weight, that is, to decrease their tendency to ravel, the yarns are steamed in special chambers. After steaming, the twisted yarns are rewound into skeins convenient for subsequent processing.

Twisted silk is usually produced from two to five strands twisted together, with from 50 to 3,000 turns per m.

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V. V. ZHOKHOVSKI [29–1108–3]

SILKWORM BREEDING HOUSE, an installation for raising larvae of the silkworm moth. The structure is located near plantings of mulberry, on a dry site removed from roads, dumping grounds, and manure storage areas. The walls are of brick or pisé, the floors are of packed earth, and the ceilings are heated. The premises are equipped with heating units (radiators, furnaces, and the like) and forced-air ventilation. Where egg incubation is not centralized, a section of the installation is partitioned off by the main wall and used for egg incubation. Provision is also made for feed storage. Racks or shelves are erected in tiers of four or five. The temperature is kept at 24°–28°C, and the relative humidity at 65–75 percent. One or two rows of tall trees are planted around the installation for shade.

Breeding houses are built in two sizes to accommodate silkworms hatched from 300 or 750 g of eggs (3 cu m per g of eggs). On some farms the larvae are segregated according to age. Younger silkworms are reared in heated premises; older ones may be raised in less substantial structures, including those with collapsible frameworks covered with a plastic film.

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ŠILUTĖ, a city and center of Šilutė Raion, Lithuanian SSR. Situated on the Šyša River, a right tributary of the Nemunas River, 50 km southeast of Klaipėda. Railroad station on the Klaipėda-Pagėgiai line. Industrial enterprises include the Gidroprivod plant, a furniture combine, a logging and timber distribution establishment, a peat-blocking enterprise, a distillery, a cheese plant, and the textile factory of the Drobė Kaunas Production Association. The city also has a sovkhoz technicum and a museum of local lore. [29–1195–4]

SILVERFISH (*Lepisma saccharinum*), a wingless insect of the subclass Apterygota of the order Thysanura. The narrow body reaches 11 mm in length. It has three long caudal bristles and is covered with fine silvery scales after the third molting. Silverfish reach sexual maturity after ten moltings; development from the egg to adult takes about three years. Adults are able to molt as well. Silverfish are thermophile but can be found everywhere. The insects prefer moist and dark places. They are nocturnal. Silverfish inhabit houses, food storehouses, stores, mills, libraries, and other places. They can infest sugar, bread, flour, groats, paper, wallpaper, and leather. [29–530–1]

ŠIMKUS, STASYS. Born Jan. 23 (Feb. 4), 1887, in the village of Motiškiai, near Kaunas; died Oct. 15, 1943, in Kaunas. Lithuanian composer, conductor, and public figure.

In 1908 Šimkus graduated from the Warsaw Institute of Music, where he had studied organ; in 1914 he graduated from the St. Petersburg Conservatory, where he had studied composition with A. K. Liadov, M. O. Shteinberg, and J. Vitol. He pursued advanced study at the Leipzig Conservatory in 1921 and 1922. In 1923, Šimkus founded in Klaipėda a school of music that played a major role in musical education in Lithuania; among his students were J. Švedas and A. Baužinskas.

Šimkus made his most important contribution to the development of a national musical culture by directing choruses and by collecting, arranging, and popularizing folk songs. His own songs for solo voice and for chorus are based on folk music and have become part of the repertoire of many musical ensembles in the republic. Šimkus' most important compositions include the opera *The Village Near the Estate* (1942), the cantata *Farewell to the Homeland* (1916), and the symphonic poem *Nieman* (1930). The Klaipėda School of Music has been named in honor of Šimkus. [29–1201–3]

SIMON, ISTVÁN. Born Sept. 16, 1926, in Bazsi, in the *megye* (county) of Veszprém; died July 7, 1975, in Budapest. Hungarian poet.

Simon graduated from the philology department of the University of Budapest in 1952. From 1964 to 1974 he was editor of the journal *Kortárs*, and in 1974 he became secretary of the Hungarian Writers' Union.

Even Simon's early poetry, including the collection *Ripening Days* (1953; A. József Prize, 1954), was characterized by a harmoniously integrated perception of the world. Civic spirit and a striving for a philosophical interpretation of life are combined in his collections of lyric poetry, for example, *No, It Is Not Enough* (1955; L. Kossuth Prize, 1955), *February Rainbow* (1959), *Grapes and Chestnuts* (1966; A. József Prize, 1967), *In an Endless Circle* (1973), and *An Amazing Burden* (1976). Simon was the author of many essays, the monograph *Hungarian Literature* (1973), and the collection of articles *In the Writer's Study* (1976).

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ŞİNASİ, İBRAHİM. Born 1826 in Istanbul; died there Sept. 13, 1871. Turkish writer and publicist. Father of modern Turkish literature. Prominent figure of the Tanzimat period.

Şinasi was educated in France and took part in the Revolution of 1848. He returned to Istanbul in 1853. He published the newspaper *Tercüman-i ahval* there in 1860 and the first secular Turkish newspaper, *Tasvir-i efkâr*, from 1862 to 1865; the latter became a platform for the westernizing ideas of Turkish Enlightenment writers. In his publicist articles Şinasi stressed the importance of political independence and called for the Europeanization of Turkish literature, the introduction of new literary forms, the utilization of folklore, and the purification of the Turkish language.

Şinasi wrote the first Turkish drama, the one-act satirical comedy *The Poet's Marriage* (1860). The first Turkish translations of

J. Racine, A. de Lamartine, and J. de La Fontaine were made by him and published in the collection *Translations* (1859). Şinasi published one of the first collections of Turkish proverbs and sayings in 1863 and a collection of qasidas and ghazals in 1862.

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A. A. BABAEV [29–1205–2]

ŞINCAI, GHEORGHE. Born Mar. 11, 1754, in Rîciu, Transylvania; died Nov. 2, 1816, in Şinca, Transylvania. Rumanian historian and educator. Doctor of theology and philosophy.

Şincai studied at educational institutions in such cities as Rome and Vienna. From 1782 to 1794 he was the director of the Uniate primary schools in Transylvania. In his historical works, including *A Chronicle of the Rumanians and Other Peoples* (vols. 1–3, 1853–54), he upheld the concept of the Rumanians' autochthony in the areas they inhabited; he also opposed serfdom. Şincai compiled the textbooks *The History of Nature* and *A Natural Study on the Eradication of Popular Superstitions*, in which he expounded the achievements of science from the standpoint of metaphysical materialism.

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Opere, vol. 1 [Bucharest] 1967. [29–1206–4]

SINN FEIN, an Irish political party founded in 1905 that united nationalists from the petite and middle bourgeoisie and the radical intelligentsia. The party advocated the emancipation of Ireland from English colonial supremacy.

In 1919, after the party won 73 of the 105 Irish seats in the British Parliament, the Sinn Feiners met in Dublin and formed an Irish parliament (Dáil), which proceeded to proclaim Ireland's independence. Subsequently independence was achieved through the compromise Anglo-Irish Treaty of 1921. The right-wing leaders of the Sinn Fein concluded the treaty, which led to a split in the Irish national liberation movement and to the civil war of 1922–23. After being defeated in the war, many of the Sinn Feiners, refusing to acknowledge the treaty, went underground.

It was not until the 1950's that the Sinn Feiners reentered the political arena, reconstructing a party that promoted an anti-imperialistic program for the unification of Ireland. In the early 1970's the party split into the official wing, which favors the reunification of Ireland by political means, and the provisional wing, which adheres to methods of armed terrorism. In January 1977 the official wing adopted the name Sinn Fein Workers' Party. [29–1207–2]

SIÓFOK, a city in Hungary, in the *megye* (county) of Somogy, on the south shore of Lake Balaton, at the place where the Sió River flows into the lake. Population, 15,000 (1972). One of the centers of the Balaton resort region, Siófok has a moderate continental climate: summers are warm, with an average July temperature of 22°C; autumns are sunny; and winters are mild, with an average January temperature of −2°C. Precipitation totals about 700 mm annually.

Siófok has a fine-sand beach. There are houses of rest, hotels, and motels in the city. The season in Siófok lasts from April to September. [29–1214–2]

ŠIROKÝ, VILIAM. Born May 31, 1902, in Bratislava; died Oct. 6, 1971, in Prague. Czechoslovak party and state figure. Member of the Communist Party of Czechoslovakia from 1921.

The son of a railroad worker, Široký was a member of the Central Committee of the CPC from 1929 to 1963, and from 1948 to 1963 he was a member of the Presidium of the Central Committee. From 1945 to 1953 he was deputy prime minister of Czechoslovakia, and from 1950 to 1953 he served concurrently as minister of foreign affairs. Široký was prime minister of Czechoslovakia from 1953 to 1963. [29–1228–1]

ŠIRVINTOS, a city and the administrative center of Širvintos Raion, Lithuanian SSR. Širvintos is located 48 km northwest of Vilnius on the Vilnius-Riga highway. The city has a butter factory and a swine-raising complex. [29–1223–5]

ŠIŠIĆ, FERDO. Born Mar. 9, 1869, in Vinkovci; died Jan. 21, 1940, in Zagreb. Croatian historian. Academician of the Yugoslav Academy of Sciences and Arts (1910).

Šišić studied at the universities of Zagreb and Vienna; he received the degree of doctor of philosophy in 1900. From 1906 to 1939 he was a professor of national history at the University of Zagreb. Šišić was a member of the alliance of bourgeois liberal parties known as the Croat-Serbian Coalition, which was established in 1905. He was elected a deputy to the Croatian Diet in 1908 and a delegate to the Hungarian-Croatian Sabor in 1910; in 1911 he withdrew from political life. Šišić wrote many works on the history of Croatia and published various historical sources, including the *Chronicle of Father Dukljanin* in 1928.

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[29–1245–1]

ŠIŠKA, KAROL. Born Mar. 19, 1906, in Serenča, Yugoslavia. Czech surgeon. Academician of the Czechoslovak Academy of Sciences (1965). Member of the Communist Party of Czechoslovakia since 1945.

Šiška graduated in 1932 from the medical school of Charles University in Prague. He took part in the Slovak national uprising of 1944. He became chief of the surgery clinic of Komenský University of Bratislava in 1950 and director of the Institute of Experimental Surgery of the Slovak Academy of Sciences in 1955. His work has dealt mainly with experimental and clinical surgery of the heart and lungs and with artificial blood circulation.

Šiška is a foreign member of the Academy of Sciences of the USSR (1971) and the Academy of Medical Sciences of the USSR (1969). He also is an honorary member of the J. Purkinje Society and the Society of Polish Surgeons. Šiška was vice-president (1961–65) and president (1970–74) of the Slovak Academy of Sciences and vice-president (1970–74) of the Czechoslovak Academy of Sciences. He was a member of the central committee of the Communist Party of Slovakia (1958–62) and of the Communist Party of Czechoslovakia (1962–76). Since 1969 he has served as deputy of the Slovak National Council. Šiška has been awarded five orders and several medals. [29–1245–2]

SISKIN (*Spinus spinus*), a bird of the family Fringillidae of the order Passeriformes. The body length is about 12 cm, and the weight, 12 to 14 g. The plumage is yellowish green with dark streaks. Siskins are distributed in Eurasia; in the USSR they are found in the zone of coniferous forests, in the forests of the Crimea and the Caucasus, and the pine forests of Kazakhstan. In the winter they wander in flocks, particularly along river valleys with thickets of hardwood trees. Siskins usually nest in spruces or pines. The clutch contains four or five eggs, which are incubated by the female for 12 days. Sometimes siskins nest twice in one summer. The diet consists of seeds of coniferous and hardwood trees, particularly alders, and aphids and other tiny insects. Siskins are often kept in cages. [29–550–3]

SIVA (also Shiva), one of the principal gods in Hinduism and the principal god in Sivaism. The worship of Siva is based on ancient Indian tribal fertility cults. Along with a number of other great gods of Hinduism, Siva personifies the destructive powers of nature. However, he is not only a punisher of sins but also a bestower of blessings and a defender, not only a destroyer but also a

creator. The creative nature of Siva is symbolized by images of the male genitalia—the lingam, or phallus. In iconography, Siva is portrayed as an ascetic immersed in contemplation, or as a figure in a frightening pose, or as a figure performing a sacred dance. [29–1174–1]

SIVAISM (also Shivaism), one of the two main branches of Hinduism, named for its principal divinity, Siva. Sivaism is rooted in the beliefs of the indigenous pre-Aryan population of India. The emergence of Sivaism as a separate current in Hinduism dates to the first centuries of the Common Era. Vestiges of the oldest fertility cults have survived in Sivaism; religious notions of Shakti—the creative basis of all living things—are associated with Sivaism. Veneration of the symbolic image of the genitalia of the male (the lingam) and of the female (the yoni) is to this day an indispensable part of the cult of Siva.

A major role in Sivaism is played by worship of the mother goddess, whose cult is identified primarily with Siva's female hypostasis—his wife Durga (also called Kali, Devi, and other names). At the same time, Siva is regarded in the Trimurti as the destroyer, and his coterie includes evil spirits that inflict misfortunes on people. Bloody sacrifices, including human ones, survived in Sivaism longer than anywhere else.

A peculiarity of the pantheon in Sivaism is its family character. Siva's spouse Durga is the personification of the female creative principle; Siva's sons are Ganesha, the patron of wisdom and the bestower of a good beginning on any undertaking, and Skanda (Karttikeya), the god of war.

Sivaism has a multitude of sects (Lingayats, Shaktas, Smartas) and is practiced throughout India. The sacred literature of Sivaism consists mainly of Sivaist puranas and agamas written in the early Middle Ages. [29–1175–2]

SIVAJI (also Shivaji). Born Apr. 6, 1627, or Feb. 19, 1630, in the region of Poona; died Apr. 3, 1680, in Rajgarh. Founder of the Maratha state in India in 1674. Leader of the Maratha struggle for independence.

Sivaji was the son of the prominent feudal lord (jagirdar) and military commander Shahji, who served the sovereigns of Ahmadnagar and Bijapur. Between 1646 and 1655 he captured, by conquest, cunning, and bribery, northwestern Maharashtra and part of northern Konkan. During a war with Bijapur (1658–61) he carried out a series of successful raids, but he was defeated in his war with the Great Moguls (1660–65), notwithstanding several triumphs, notably the sacking of the important Mogul port of Surat in 1664.

Under the Treaty of Purandhar of 1665, Sivaji surrendered the greater part of his territory and most of his fortresses, and he acknowledged himself a vassal of the Moguls. He then traveled to the court of Aurangzeb in Agra, where he was taken into custody. In 1666 he escaped; resuming his struggle against the Moguls in 1670, he recovered his fortresses and lands. Sivaji raided Bijapur, Berar, Telingana (Andhra), Khandesh, and Gujarat and again sacked the port of Surat.

In 1674, Sivaji had himself crowned in Rajgarh, with great pomp and ceremony, the supreme ruler of Maharashtra. Between 1675 and 1678 he carried out successful campaigns in Kanara, Mysore, and the Carnatic. At the time of his death, he ruled all western Maharashtra, northern and southern Konkan, western Kanara, a number of regions in Mysore, and part of the Carnatic (the region of Tanjore).

Initially nothing more than a military commander blessed with success in various internecine feudal conflicts, Sivaji came to inspire the Marathas with the dream of achieving independence from the Moguls. His mobile army was built up by recruiting peasants. By compiling a land cadastre, eliminating the intermediate levels of the feudal hierarchy, putting an end to internecine feudal strife, and creating a centralized administration, he substantially eased the burden of feudal exploitation borne by the Marathas.

On the other hand, Sivaji's army ruthlessly plundered the population of the conquered territories, sending on the wealth thus obtained to the treasury. Threatened by raids and pillage, the Mogul governor of the Deccan was compelled to pay Sivaji a *chauth* (one-fourth of tax revenues). Sivaji played a major role in weakening the Mogul state, which fell in the first half of the 18th century. As the liberator of the Marathas from the Mogul yoke, the creator of an independent Maratha state, and a defender of Hinduism, Sivaji is honored as a national hero of the Marathas.

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[29–1174–2]

SIX, LES, a name applied in 1920 to a group of innovative French composers. The group included L. Durey, D. Milhaud, A. Honegger, G. Auric, F. Poulenc, and G. Tailleferre. The members, who possessed distinctive creative individualities, were united by a striving for a new simplicity and structural clarity in musical language and by a renunciation of the aesthetics of impressionism. After the 1920's Les Six lost the significance of a distinctive group.

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SIX-MEMBER DUMA, the executive body of a municipal duma in Russia from 1785 until 1870. The membership of the body consisted of the *gorodskoi golova* (mayor) of the city and six councilmen, who were chosen from among the members of the general duma for a term of three years. The six-member duma was in charge of the maintenance of public order in marketplaces, the construction and preservation of city buildings and squares, and the collection and expenditure of city revenues. [29–1157–1]

SIXTEENTH ALL-RUSSIAN CONGRESS OF SOVIETS OF WORKERS', PEASANTS', AND RED ARMY DEPUTIES, a congress held from Jan. 15 to Jan. 23, 1935, in Moscow. The congress was attended by 1,748 delegates, 1,293 of whom were voting delegates. Industrial workers made up 39.2 percent of the delegates, peasants, 22.9 percent, and nonindustrial workers, 37.9 percent; 71.3 percent of the delegates were members of the ACP(B), 4.9 percent were Komsomol members, and 23.8 percent were not party affiliated. The delegates represented 48 nationalities.

The agenda of the congress consisted of a number of reports, the election of the All-Russian Central Executive Committee, and the election of the RSFSR's representatives in the Soviet of Nationalities of the Central Executive Committee of the USSR. D. E. Sulimov delivered the report of the government of the RSFSR, N. P. Komarov spoke on the state and development of the communal services system in the RSFSR, and G. N. Kaminskii apprised the congress of achievements and tasks in the area of public health. G. G. Baichurin gave the report of the Central Executive Committee of the Tatar ASSR on soviet, economic, and cultural construction, and A. S. Kiselev discussed amendments to the Constitution of the RSFSR.

The congress approved the activities of the Council of People's Commissars of the RSFSR and noted that the first five-year plan (1929–32) had been fulfilled ahead of schedule. It also pointed out that the first two years—1933 and 1934—of the second five-year plan had been completed successfully. The congress directed the government to promote rapid development of sectors of local industry and industrial cooperation. The completion of collectivization in the RSFSR and the extension of MTS (machine-tractor station) service to all kolkhozes were set as goals in agriculture. A decree was passed on the training of medical personnel and on the improvement of health services in rural areas.

After hearing the report of the Central Executive Committee of the Tatar ASSR, the congress called upon the governments of the RSFSR and the Tatar ASSR to provide for the further economic and cultural development of the Tatar republic. The decree of the All-Russian Central Executive Committee converting the Kara-Kalpak, Mordovian, and Udmurt autonomous oblasts into autonomous soviet socialist republics was ratified. A new All-Russian Central Executive Committee, with 401 members, was elected, and five persons from the RSFSR became members

of the Soviet of Nationalities of the Central Executive Committee of the USSR.

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SIXTEENTH CONFERENCE OF THE ALL-UNION COMMUNIST PARTY (BOLSHEVIK), a conference held from Apr. 23 to Apr. 29, 1929, in Moscow. The conference was attended by 254 voting delegates and 679 delegates with observer status. There were several topics on the agenda. A. I. Rykov, G. M. Krzhizhanovskii, and V. V. Kuibyshev reported on the five-year plan for the development of the national economy. M. I. Kalinin spoke on ways of improving agriculture and of lightening the tax burden borne by middle peasants, Ia. A. Iakovlev summarized the results and immediate tasks of the struggle against bureaucracy, and E. M. Iaroslavskii addressed the delegates on the purge and review of members and candidate members of the ACP(B).

The principal business of the conference was the discussion and adoption of the first five-year plan for the development of the national economy of the USSR. The formulation of the plan and the plan's discussion at the conference were carried out in the midst of a struggle with a right-wing deviation in the ACP(B). The leaders of the deviation—N. I. Bukharin, Rykov, and M. P. Tomskii—cast doubt on the plan's feasibility and insisted on the adoption of the "minimal" version. (The first five-year plan was written in two versions—the initial, or "minimal," version and the "optimal" version, which was based on full mobilization of the entire resources and the potential inherent in the Soviet social order. The goals of the optimal version were approximately 20 percent higher than those of the initial version.) The conference rebuffed the right-wing opportunists and ratified the optimal version.

The first five-year plan emerged as a broad program for the economic, social, and cultural transformation of society. Signaling an expanded socialist offensive to be conducted on all fronts, the implementation of the plan was to lead to the construction of the foundations of a socialist economy. It would also expose capitalist elements, which would then be eliminated.

After defining the tasks associated with the organization of large-scale socialist agriculture, the conference outlined measures designed to assist poor-peasant and middle-peasant family farms. The delegates approved a new agricultural-tax law that exempted the farms of poor peasants from taxation, reduced taxes on the farms of middle peasants, and shifted the primary burden of taxation to the kulaks.

The conference devoted special attention to new production methods for linking the city and the countryside. In addition to expanding commodity circulation between industry and agriculture, it was necessary to give production assistance to the rural poor and the middle peasants. This assistance would take the form of the establishment of new machine-equipped sovkhozes and kolkhozes, the development of large-scale contracting of agricultural products, the encouragement of production cooperation among peasant farms, and the creation of a broad network of machine-tractor stations. A crucial factor in the development of the new methods of linkage was the organization of ■ heavy industry that would be capable of reequipping agriculture. The conference censured the right-wing deviationists, who aimed at disrupting collectivization, and branded their views as "a direct shift to the kulak position" (*KPSS v rezoliutsiiakh*, 8th ed., vol. 4, 1970, p. 213). The delegates called on the party to combat the deviationists, who represented a serious threat to its ranks.

In the resolution On the Results and Immediate Tasks of the Struggle Against Bureaucracy, the conference pointed out that the struggle against bureaucratic distortions in the activities of the state administrative apparatus was becoming one of the most important forms of class struggle (*ibid.*, p. 222). The delegates called for an improvement of the review of the performance, selection, and placement of personnel, for ■ reduction in the size and expense of administrative bodies, and for a purge of unsuitable elements. The conference stressed the need to involve the working masses in the management of production, to introduce scientific methods in all sectors of production and administration (especially in planning), and to encourage criticism and self-criticism. After hearing Iaroslavskii's report, the conference adopted a resolution recommending a purge to strengthen party ranks during preparations for the socialist offensive on all fronts.

At the end of the conference, V. M. Molotov delivered a report on the united plenum of the Central Committee and the Central Control Commission of the ACP(B) held in April of that year. A resolution that was passed unanimously by the conference approved the decision of the plenum to censure Bukharin's right-wing opportunist group. The conference also urged the party to support the Central Committee and to struggle against deviations from the Leninist party line, particularly against the right-wing deviation. The conference adopted the appeal "To All Workers and Working Peasants of the Soviet Union," in which it called for an expansion of socialist competition.

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Istoriia KPSS, vol. 4, book 1. Moscow, 1970.
G. D. Komkov [29–1157–4]

SIXTEENTH CONGRESS OF THE ALL-UNION COMMUNIST PARTY (BOLSHEVIK), a congress held from June 26 to July 13, 1930, in Moscow. The congress was attended by 1,268 voting delegates and 891 delegates with observer status. The delegates represented 1,260,874 party members and 711,609 candidate members. The agenda consisted of a number of reports as well as elections to central party institutions. J. V. Stalin delivered the political report of the Central Committee, L. M. Kaganovich, the organizational report of the Central Committee, and M. F. Vladimirskii, the report of the Central Auditing Commission. The report of the Central Control Commission was given by G. K. Ordzhonikidze, and that of the ACP(B) delegation to the Executive Committee of the Communist International, by V. M. Molotov. V. V. Kuibyshev addressed the congress on the fulfillment of the five-year plan for industry, Ia. A. Iakovlev spoke on the kolkhoz movement and on the improvement of agriculture, and N. M. Shvernik outlined the tasks facing trade unions in the period of reconstruction.

The summary report of the Central Committee and the resolution adopted on the issues it covered presented an analysis of the international and domestic situation of the USSR and defined the principal tasks associated with the new stage of the building of socialism. The Soviet Union had entered a period of rapid economic growth and of massive expansion of socialist construction. The capitalist countries were undergoing major political upheavals and an economic crisis that accelerated the development of fascism within some countries and hastened preparations for new imperialist wars. The congress called on the party and the people to affirm a policy of peace throughout the world and to strengthen the defense capability of the USSR in every way possible.

Encouraged by the advances made by the country in industrialization, the congress adopted a domestic-policy line of stepping up socialist construction. Industry had provided 53 percent of the national economy's output in 1929 and 1930, and the socialist sector had accounted for 99.3 percent of large-scale industry in 1930. Although the USSR had surpassed the leading capitalist countries in rate of industrial development in the early years of the five-year plan, it continued to trail them considerably in level of industrial output. The congress directed the Central Committee to ensure a high rate of socialist construction and the fulfillment of the five-year plan in four years.

The progress of socialist construction in rural areas was apparent in the mass kolkhoz movement. By the time the congress had convened, 40–50 percent of the peasant farms in the principal grain-growing regions had been consolidated into kolkhozes, and the kolkhoz peasantry had become a bulwark of Soviet power. The congress approved the change to a policy of total collectivization to eliminate the kulaks as a class.

Although some successes had been achieved in the cultural revolution, the congress declared the revolution's rate of development to be inadequate. It was decided to institute universal compulsory elementary education in the near future and to eliminate illiteracy among the people.

Successful socialist construction was to be achieved by rigid adherence to the party's general line and by a resolute struggle on two fronts, that is, against Trotskyism and against the right-wing deviation in the ACP(B). Declaring the views of the right-wing opposition to be incompatible with membership in the ACP(B), the congress pointed to the need to struggle against deviations on the nationalities question—that is, against great-power chauvinism and local nationalism. The congress approved the political line and practical work of the Central Control Commission–Workers' and Peasants' Inspection and took note of this body's resolute efforts to implement the general line of the party and to purge the party's ranks of alien elements.

Directing attention to the need for continued improvement and cost reduction in the operation of the state administrative apparatus, the congress called for the continuation of the purge of administrative bodies, an intensification of the fight against bureaucracy, and precise execution of party and government decrees. After approving the activities of the ACP(B) delegation in the Executive Committee of the Communist International, the congress acknowledged the considerable service performed by the Comintern in crushing Trotskyism and right-wing opportunism and gave its support to the organizational measures developed by the Comintern to purge Communist parties of right-wing and "left" opportunists.

After discussing the report on fulfillment of the five-year plan for industry and after noting that the party had succeeded in bringing about overfulfillment of plan indexes, the congress increased the original goals of the plan. Particular emphasis was placed on the need for comprehensive expansion of heavy industry, accelerated development of ferrous and nonferrous metallurgy, the introduction of advanced technology, and the production of the new machines and equipment necessary for the modernization of all sectors of the economy. The congress adopted a resolution to establish in the near future the country's second coal and metallurgical base, the Urals-Kuznetsk Combine, in the eastern part of the country. The congress called for accelerated development of the industrial sectors associated with strengthening the defense capability of the USSR and decided that more economic and engineering personnel would be trained in order to help fulfill the five-year plan.

Thoroughly reviewing the kolkhoz movement, the congress denounced distortion of the party line in kolkhoz construction. It demanded that in bringing peasants into cooperatives the Leninist principle of voluntary membership be strictly observed, the degree of preparedness of regions for collectivization be taken into account, and the agricultural artel be considered the basic form of collective farm. Since the five-year plan had been overfulfilled with respect to collectivization, the congress felt it necessary to revise the plan for agricultural development. The principal goal consisted in essentially completing the socialist transformation of the countryside and in strengthening the kolkhozes economically.

The congress stressed the need to enlarge the role of the trade unions in socialist construction. The immediate goals of the trade unions were defined as developing socialist competition and the shock-worker movement, raising the qualifications of the workers, and combating the problems of inertia and bureaucracy. The congress advanced the injunction "Trade unions, focus on production!"

A Central Committee of 71 members and 67 candidate members was elected at the congress, as well as a Central Auditing Commission of 13 members and a Central Control Commission of 187 members.

The Sixteenth Congress of the All-Union Communist Party (Bolshevik) went into history as the congress of the full-scale socialist offensive on all fronts. The congress set the goal of accelerating the creation of the material and technical base for socialism and of eliminating the capitalist elements in the country.

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Istoriia KPSS, vol. 4, book 2. Moscow, 1971.
G. D. Komkov [29–1159–2]

SIXTH CONGRESS OF SOVIETS OF THE USSR, a congress held from Mar. 8 to Mar 17, 1931, in Moscow. The congress was attended by 2,403 delegates, 1,570 of whom were voting delegates. Industrial workers made up 54.4 percent of those in attendance, peasants, 25.6 percent, and nonindustrial workers, 20 percent. Of the delegates, 72.8 percent were ACP(B) members, 2.4 percent were Komsomol members, and 24.8 percent were not party affiliated. The congress represented 66 nationalities.

The agenda of the congress included several reports. V. M. Molotov delivered the report of the government of the USSR, and Ia. A. Iakovlev, the report on sovkhoz development from the People's Commissariat of Agriculture of the USSR, the Grain Trust, and the livestock-sovkhoz trusts. Iakovlev also presented the report on kolkhoz development from the People's Commissariat of Agriculture of the USSR, the All-Union Council of Kolkhozes, and the All-Union Center for Machine-tractor Stations, and A. S. Enukidze addressed the congress on questions pertaining to the Constitution of the USSR.

The congress approved in its entirety the foreign and domestic policy of the Soviet government. It directed the government to continue to adhere unswervingly to a policy of peace and to strengthen relations with other nations. In view of the growing threat of war, however, the congress called upon the government to increase the defense capability of the country in every way possible.

The congress devoted considerable attention to issues of the socialist reorganization of agriculture. The decree On Sovkhoz Development emphasized the importance of the sovkhozes as large, model farms from which the kolkhozes would receive various kinds of assistance. The decree On Kolkhoz Development summarized the results of the mass kolkhoz movement of 1929 and 1930 and called for the elimination of deficiencies in the organization and operation of the kolkhozes. The congress noted that the agricultural artel was the "fundamental structure in the kolkhoz movement in the current stage of development." It also approved the government's decision to eliminate okrugs, or districts, and to establish the raion as the basic unit of operation in the socialist reconstruction of rural areas.

In the election of a new Central Executive Committee, 473 members were voted into the Union Soviet, and 138 members, into the Soviet of Nationalities.

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[29–1165–1]

SIXTH CONGRESS OF THE RUSSIAN SOCIAL DEMOCRATIC LABOR PARTY (BOLSHEVIK), a congress held from July 26 to Aug. 3 (Aug. 8–16), 1917, in Petrograd. The congress was attended by 157 voting delegates and 110 delegates with observer status. More than 176,000 of the 240,000 party members were represented at the congress.

The agenda included a number of reports. Ia. M. Sverdlov delivered the report of the Organizational Bureau. The Central Committee's political report was given by J. V. Stalin; its organizational report, by Sverdlov; and its financial report, by I. T. Smilga. In addition to regional reports, the congress heard reports on current problems: N. I. Bukharin spoke on the war and the international situation, and Stalin and V. P. Miliutin apprised the congress of the country's political economic situation. Also on the agenda was the discussion of various issues, among them the revision of the party program, organizational questions, the Constituent Assembly elections, the International (this point was withdrawn at the 15th session), party unification, and the trade union movement. Finally, the agenda included elections and miscellaneous matters.

A number of questions on the agenda were sent to sections for further study (the results of the sections' work were discussed at plenary sessions of congresses). M. M. Kharitonov reported to the congress for the organizational section, N. P. Glebov-Avilov, for the trade union section, and R. S. Zemliachka, for the propaganda and agitation section. The congress heard V. N. Podbel'skii's report from the section that studied revision of the party program, as well as that of B. Z. Shumiatskii from the section that examined the issue of the Constituent Assembly elections. Kharitonov delivered a report for the subsection that reviewed the question of youth organizations, and Smilga read a supplementary report from the subsection. The report on the work of the military section was published in the newspaper *Rabochii i soldat* on August 6 (19).

Meeting after the July Days of 1917, the congress began its sessions in a "semilegal" status; that is, the press reported its convocation but did not reveal its location. Beginning on July 29 (August 11), threatened with the arrest of its delegates, the congress conducted its business illegally. On that day, 21 members and 10 candidate members were elected to the Central Committee of the RSDLP(B). V. I. Lenin directed the work of the congress from the locality of Razliv, where he was in hiding. He sent his theses on the political situation to the congress and maintained constant communication with the body's presidium.

One of the first issues discussed at the congress was whether Lenin should appear in court to answer a summons issued by the Provisional Government for his arrest and to confront the slanderous campaign against the Bolshevik party and its leader. The congress decided unanimously that Lenin should not appear and expressed its protest against the government's harassment of the leader of the proletariat.

The political report noted that the Central Committee was following the path of socialist revolution adopted by the Seventh (April) All-Russian Conference of the RSDLP(B) under the slogan "All power to the soviets!" It was adhering as well to the positions of worker control of production and distribution, confiscation of the lands of the *pomeshchiki* (landowning gentry) and the transfer of those lands to the peasants, and withdrawal from the imperialist war. An account was given of the party tactics during the June and July crises and of the leading role the Bolsheviks were playing in the struggle against counterrevolution. The organizational report of the Central Committee reviewed the principal forms and methods of leadership of local party organizations, the distribution of party forces in the country, and the role of the Central Committee's central organ, the newspaper *Pravda*.

The congress devoted special attention to a review of current problems and to the development of a new political course for the party. The report on the war and the international situation presented a broad picture of foreign political conditions contributing to the development of the revolution. The speaker, however, made fundamental errors in his assessment of the revolution's driving forces and of its prospects. He asserted that the peasants were unified with the bourgeoisie and would not follow the working class. Bukharin did not agree with Lenin's conclusion that a socialist revolution could be victorious in one country alone; rather, he believed that the mission of Russian revolution was to "kindle the flames of world socialist revolution." Looking upon the Russian revolution as merely a "stimulus" to revolution in the West, he denied in essence the possibility of achieving a revolutionary victory in Russia without the aid of proletarian revolutions in Western Europe. The congress rejected Bukharin's erroneous statements and those of E. A. Preobrazhenskii, who supported him.

The congress clearly defined in a resolution the domestic and foreign conditions necessary for the Russian proletariat to carry out its struggle. It was noted that international imperialism was acting in concert with the Russian counterrevolution. The course of development of the revolution and the positions of the classes and parties in the political crises experienced by the country were analyzed, and it was pointed out that compromising with the policies of the Provisional Government and supporting the offensive at the front had inevitably placed the Menshevik and SR (Socialist Revolutionary) parties on the side of counterrevolution. It was also noted that, with the end of dual power, the soviets headed by the Mensheviks and the SR's were no longer agencies of power, for that power was now concentrated in the hands of the counterrevolutionary bourgeoisie.

The report on the political situation revealed the current alignment of class forces and outlined ways to intensify the revolution. Analysis of the preceding period showed that had the soviets decided to take power before the July political crisis there would have been no one to oppose them. Since the counterrevolution had organized and strengthened itself during the July events, however, the soviets could no longer take power peacefully. Following Lenin's instructions, Stalin argued for a temporary retreat from the slogan "All power to the soviets!" At the same time, he emphasized the need to use the soviets as agencies of the revolutionary mobilization of the masses. Recording in a resolution that a painless transition of power to the soviets had become impossible, the congress temporarily withdrew the slogan. The resolution asserted that "the right slogan at the present time can only be the complete abolition of the dictatorship of the counterrevolutionary bourgeoisie" [*Shestoi s"ezd RSDLP(b): Protokoly*, 1958, p. 256]. The congress chose the path of an armed uprising and of preparing the masses for a nationwide crisis and a profound revolutionary upsurge, which together would create the conditions for victory.

The report on the economic situation pointed out that the country was on the brink of disaster as a result of the ruling class's policies, which were detrimental to the people's interests. A resolution emphasized that a socialist revolution was the only way out of economic devastation and the imperialist war and would guarantee preservation of Russia's national independence and self-reliance. The resolution substantiated the party's economic program and defined the prerequisites for renewal of the country's economic life on a socialist foundation.

The congress gave its support to the decisions of the April Conference of the RSDLP(B), including the decision to call a special congress for the purpose of revising the party program. The congress also adopted new party Rules.

In the resolution On Unification of the Party, the congress advanced a "revolutionary class slogan calling for unity of all internationalists who have broken with the Menshevik imperialists" (*ibid.*, p. 269). In addition, the congress approved the admission of the Mezhraiontsy to the party.

On the issue of the trade union movement, the congress urged the trade unions of Russia to take the initiative in reestablishing an international organization of the trade unions that rejected the imperialist war and supported the class struggle. The congress pointed to the need to bolster party influence in the trade unions in order to transform them into fighting organizations of the working class in the struggle for communism.

Methods and techniques for working among the masses and a program to prepare the party for the decisive battles ahead were formulated in the recommendation of the military section, in the resolution On Propaganda, and in the resolutions pertaining to the tasks of the party in the trade union movement, to youth leagues, and to the election campaign for the Constituent Assembly. Special attention was devoted to setting up socialist class organizations of young people—the forerunners of the Lenin Komsomol—and to work among the soldiers and sailors. The great importance of agitation among toiling peasants was also pointed out.

The decisions of the congress were aimed at developing revolutionary initiative and independent action among the popular masses and were permeated with the Leninist idea that an alliance between the working class and the poor peasants would be a deciding factor in the victory of the socialist revolution. These decisions are a model of creative Marxism and of the development of revolutionary strategy and tactics in a concrete historical situation.

The congress demonstrated the readiness of the Bolshevik party to lead the masses in the assault on capitalism and in the struggle to establish a dictatorship of the proletariat. Commissioned by the congress, and on its behalf, the Central Committee of the RSDLP(B) issued a manifesto to "all the working people and to all workers, soldiers, and peasants of Russia." Its concluding lines rang out a powerful appeal: "A new movement is approaching and the hour of death for the old world will come. Prepare for new battles, our fighting comrades! Steadfastly,

courageously, and calmly, not giving in to provocation, collect your strength and form fighting columns! Proletarians and soldiers, gather under the banner of the party! Oppressed villages, gather under our banner!" (*ibid.*, p. 276).

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A. M. SOVOKIN [29–1162–3]

SIXTH (PRAGUE) ALL-RUSSIAN CONFERENCE OF THE RUSSIAN SOCIAL DEMOCRATIC LABOR PARTY, a conference held from Jan. 5 (18) to Jan. 17 (30), 1912, in Prague. The conference was attended by voting representatives of more than 20 party organizations from the major centers of the working-class movement in Russia—St. Petersburg, Moscow, Kazan, Saratov, Tbilisi, Baku, Nikolaev, Kiev, Ekaterinoslav (Dnepropetrovsk), Dvinsk (Daugavpils), Vilnius, and the central industrial provinces. Attending with observer status were representatives from the editorial staff of the party's central organ, the newspaper *Sotsial-demokrat*, from the editorial staff of *Rabochaia gazeta*, and from the Foreign Organization Committee of the RSDLP. With the exception of two Mensheviks, the delegates were Bolsheviks. For various reasons, the elected delegates from Rostov-on-Don, Samara (Kuibyshev), Nizhny Novgorod (Gorky), Sormovo, Lugansk (Voroshilovgrad), and the Urals did not attend, nor did the invited leaders of foreign groups and national organizations.

Convened as a general party conference of the RSDLP, the conference functioned as the supreme body of the party and bore the significance of a congress. There were 15 points on the agenda: (1) reports, among which were regional reports, the report of the Russian Organizational Commission for Calling the Conference, and the report of the party's central organ; (2) the role of the conference; (3) the current situation and the tasks facing the party; (4) elections to the Fourth State Duma; (5) the Duma fraction; (6) state insurance for workers; (7) the strike movement in the trade unions [a resolution, On the Nature and Organizational Forms of Party Work, was passed on this point, which had been combined with point (12)]; (8) the "petition campaign"; (9) Liquidationism; (10) the tasks facing the Social Democrats in the struggle against famine; (11) party literature; (12) organizational questions; (13) party work abroad; (14) elections; and (15) miscellaneous matters.

The conference was held under the direction of V. I. Lenin, who represented the editorial staff of *Sotsial-demokrat*. He reported on such topics as the current situation and the party's responsibilities, the role of the conference, and the International Socialist Bureau. The draft resolutions and the resolutions adopted by the conference were written by Lenin. After G. K. Ordzhonikidze's report on the work of the organizational commission, the conference passed a resolution that noted the enormous importance of the commission's work in rebuilding and strengthening party organizations during the preparations for the conference.

A resolution on the regional reports indicated that vigorous work to strengthen illegal party organizations and groups was under way in all areas. It also noted that the need to coordinate illegal work and the work of various legal societies had been widely recognized and was now being met. The conference declared that a new revolutionary upsurge had begun, which indicated that a bourgeois democratic revolution was still forthcoming in Russia. The minimum demands of the RSDLP—the creation of a democratic republic, the introduction of an eight-hour workday, and the confiscation of the lands of the *pomeshchiki* (landowning gentry)—remained the principal watchwords of the party. These demands were to be the planks of the party's campaign platform in the elections to the Fourth State Duma.

After discussing the responsibilities of the Social Democrats in the struggle against famine, the conference stressed the need to explain to the people the connection between the famine and the failure of the agrarian policies of tsarism. It was suggested that the discontent aroused by the famine be taken advantage of to organize political meetings and demonstrations against the autocracy. The conference noted that the bill adopted by the Third State Duma in January 1912 to provide state insurance for the workers made a mockery of the workers' vital interests. The delegates called for broad agitation against the bill among the masses.

Denouncing the Menshevik Liquidators' and Trotskyists' petition campaign for freedom of coalition, the conference resolved to explain to the workers that freedom of coalition could not be achieved without overthrowing the autocracy. It was decided that party building during the revolutionary upsurge should follow a course of strengthening illegal party organizations and forming around them a broad network of legal organizations that would serve as bases for work among the masses.

The most pressing problem was the purge of opportunists from the party. Lenin called for a resolute struggle against those who would destroy the party, namely, the Liquidators and the Trotskyists. In the resolution On Liquidationism and on the Group of Liquidators, the conference declared that such persons had placed themselves outside the party once and for all. This declaration signaled the complete triumph of Lenin's call for a final break with the opportunists. The conference stressed that foreign groups that did not recognize the authority of the Central Committee could not use the name of the RSDLP.

The work of the editorial staffs of *Sotsial-democrat* and *Rabochaia gazeta* was approved. *Rabochaia gazeta* was declared the official organ of the Central Committee, and a decision was made to publish a legal daily newspaper.

International issues were also reviewed. In its resolution On the Chinese Revolution, the conference announced its support of the struggle of the Chinese people and stressed the great significance of that struggle in the liberation of Asia. The conference condemned the predatory policies of British imperialism and Russian tsarism in Persia and expressed complete solidarity with the Social Democratic Party of Finland, which was fighting against the Russian autocracy. A congratulatory message was sent to the German Social Democratic Party on its victory in the Reichstag elections.

A new Central Committee was elected, and Lenin was chosen as its chairman. Among the members elected were F. I. Goloshchekin, G. K. Ordzhonikidze, S. S. Spandarian, and D. M. Shvartsman. Upon being given the right to co-opt members, the Central Committee chose I. S. Belostotskii and J. V. Stalin as new members. A. S. Bubnov, M. I. Kalinin, A. P. Smirnov, E. D. Stasova, and S. G. Shaumian were named as candidates for co-optation in the event that any of the members of the Central Committee were arrested. The Russian Bureau of the Central Committee of the RSDLP was reestablished to direct the practical work of the party in Russia, and V. I. Lenin was chosen as the RSDLP representative in the International Socialist Bureau.

The Sixth Party Conference determined the political line and tactics to be used by the party in the new revolutionary upsurge and consolidated the victory of Bolshevism. The expulsion of the Menshevik Liquidators was a decisive factor in the subsequent development of the RSDLP as a new type of party. The decisions of the conference provided all revolutionary elements in the international social democratic movement an example of uncompromising struggle with and organizational demarcation from opportunism.

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Istoriia KPSS, vol. 2. Moscow, 1966. S. S. SHAUMIAN [29–1154–3]

SIZING, the application to warp yarns of a thin layer of adhesive material (size) in order to increase the yarns' resistance to abrasion and repeated stretching during weaving. During sizing the individual fibers that form the warp yarn are cemented to one another. Sizes are prepared from chemical materials, such as polyvinyl alcohol or a polyacrylamide, and foodstuffs such as starches; water is used as a solvent.

Sizing is performed on slashers. The warp yarns are unwound from back beams, immersed in the size in a vat, squeezed between rollers, passed to a dryer to remove excess moisture, and finally wound onto the warp beam of a loom. Doubled yarns are not usually sized, nor are yarns made from synthetic fibers or natural silk, which possess adequate smoothness and strength. [29–1300–2]

SIZING, a finishing operation in the production and repair of metal articles, accomplished by squeezing the article to produce smooth surfaces and correct dimensions and to eliminate superficial cracks and gaps between assembled parts.

It also implies surface treatment of cast products of art or of sculpture after drawing them off a mold: smoothing of roughness and joints, final finishing of components.

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SJAHRIR, SUTAN. Born Mar. 5, 1909, in Sumatra; died 1966, in Switzerland. Indonesian political figure, right-wing socialist leader.

The son of a feudal lord, Sjahrir received his education in Indonesia and the Netherlands. One of the leaders of the Socialist Party of Indonesia, he served several times as prime minister between 1945 and 1947. In 1948 he headed the group of right-wing socialists that split from the SPI to form the Indonesian Socialist Party (Partai Sosialis Indonesia). Sjahrir was known for his anti-Communist views. He supported the separatist rebellions in Indonesia in the late 1950's. In 1962, Sjahrir was imprisoned, but he was soon freed and permitted to go to Europe. [29–857–4]

SJARIFUDDIN, AMIR. Born 1907 on the island of Sumatra; died Dec. 19, 1948, in the village of Ngaliang, on the island of Java. Figure in the Indonesian national liberation and communist movements.

Sjarifuddin studied in the Netherlands and graduated from the law institute in Batavia (Jakarta). A leader of the national revolutionary party Partindo (founded 1931), he was arrested by the Dutch colonial authorities in 1933 and remained in prison until 1935. He helped found the Gerindo in 1937 and became its chairman, as well as the general secretary of the Indonesian Political Union.

During the Japanese occupation of Indonesia (December 1941 to 1945), Sjarifuddin was a leader of the resistance movement; in 1943 he was arrested and condemned to death, a sentence that was commuted to life imprisonment. Released after Indonesia declared its independence in 1945, he became minister of information in the first government of the Republic of Indonesia, established that year.

During the Indonesian people's difficult struggle against the Dutch colonialists, who from 1945 to 1949 tried to regain control over Indonesia, Sjarifuddin served as minister of defense from late 1945 to January 1948 and head of the government from July 1947 to January 1948. From 1945 to 1948 he held the posts of chairman and vice-chairman of the Socialist Party. After the Socialist Party and the Workers' Party (Labor Party) merged with the Communist Party of Indonesia in 1948, Sjarifuddin was elected to the Politburo of the Central Committee of the CPI. In 1948 he became chairman of the Popular Democratic Front, a bloc of leftist parties and organizations influenced by the CPI. During the Madiun incidents of 1948, Sjarifuddin was captured by punitive forces and shot without a trial.

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SJÖBERG, ALF. Born June 21, 1903, in Stockholm. Swedish stage and motion-picture director.

In 1925, Sjöberg graduated from the acting school of the Royal Dramatic Theater in Stockholm. He became an actor with the company in the same year and became a stage director there in 1930. Sjöberg, an innovator in the use of space, scenery, and lighting in the theater, is attracted to epic spectacles with impressive mass scenes as well as to more intimate works. His productions have included Värnlund's *The Holy Family* (1934), a dramatization of Dostoevsky's *Crime and Punishment* (1941), Shakespeare's *Richard III* (1947) and *Romeo and Juliet* (1953), Strindberg's *Miss Julie* (1949) and *Master Olof* (1972), Gogol's *The Inspector-General* (1959), and Brecht's *Schweik in the Second World War* (1963) and *Mother Courage and Her Children* (1965).

Sjöberg's first film, *The Strongest* (1929), continued the romantic traditions of the Swedish silent film. His films of the 1940's include *With Life as the Stakes* (1940), *Home From Babylon* (1941), *The Road to Heaven* (1942), *Torment* (1943), *The Royal Hunt* (1944), and *The Return* (1945). Although these films belong to various genres, they share a common theme: the struggle against fascism and the problem of Sweden's neutrality in World War II. In 1951, Sjöberg made one of the best Swedish films, *Miss Julie*, based on the play by Strindberg. He has also directed the films *Only a Mother* (1949), *Karin Månsdotter* (1954), *The Judge* (1960), and *The Island* (1966). O. V. GARIBOVA [29–1065–1]

SJÖGREN, ANDERS JOHAN (also Andrei Mikhailovich Shegren). Born Apr. 15 (26), 1794, in Iitti, Finland; died Jan. 6 (18), 1855, in St. Petersburg. Russian philosopher and ethnographer, of Swedish origin. Academician of the St. Petersburg Academy of Sciences (1844).

Sjögren graduated from the University of Åbo in 1819. He became director of the Ethnographic Museum of the St. Petersburg Academy of Sciences in 1845. From 1824 to 1829 he made a trip to the northern part of European Russia to study the Finno-Ugric languages and peoples. He also carried out research on the history, archaeology, and toponymy of the Russian north. From 1835 to 1837, Sjögren traveled throughout the Caucasus studying the languages and ethnography of the Ossets, Georgians, and other Caucasian peoples.

Sjögren collected field material in Livonia and Courland from 1846 to 1852. He compiled a grammar and a dictionary of the Livonian language that were published after his death by Academician F. I. Videman. Sjögren also compiled the first grammar of Ossetic—*Ossetic Grammar with a Short Ossetic-Russian and Russian-Ossetic Dictionary* (parts 1–2, 1844).

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R. A. AGEEVA [29–1077–3]

SJÖSTRÖM, VICTOR DAVID (also known as Victor Seastrom). Born Sept. 20, 1879, in Silbodal; died Jan. 3, 1960, in Stockholm. Swedish motion-picture director and actor.

Sjöström began acting at the Vasa Theater in Stockholm in 1896. He made his debut in motion pictures in 1912, appearing in

The Vampire, and the same year he made the film *The Gardeners*. His early films tended toward melodrama, but *Ingeborg Holm* (1913), *The Strike* (1914), *One of Many* (1914), and *Third Way* (1916) are noteworthy for their treatment of social problems. Sjöström's films are outstanding for their powerful visual images and their portrayal of extraordinary men struggling against social injustice and the forces of nature. Of special interest is their innovative montage. They established Sjöström as the founder of the classical Swedish school of film-making.

Sjöström developed a new style in his films *The Outlaw and His Wife* (1917), *The Girl From Stormytorpet* (1917), *The Sons of Ingmar* (1918), *Karin, Daughter of Ingmar* (1919), and *The Phantom Carriage* (1920), in which he also played the leading roles. He worked in Hollywood from 1923 to 1930, subsequently returning to his homeland. In 1930 he made one of the first Swedish sound films, *The Markurells From Wadköping*.

Sjöström's last work as a director was the historical drama *Under the Red Robe* (1937; released in the USSR as *Under the Cardinal's Robe*). His last role was that of Professor Borg in I. Bergman's *Wild Strawberries* (1957). [29–1166–2]

SKELLEFTEÅ, a city in northern Sweden, in the *län* (county) of Västerbotten. Population, 72,400 (1976). Port on the Skellefteå River near its influx into the Gulf of Bothnia of the Baltic Sea. Industry includes nonferrous metallurgy (copper and lead) and pulp manufacture. A hydroelectric power plant is located in the city. [29–1111–3]

SKELLEFTEÄLVEN, a river in northern Sweden. The Skellefteälven is 410 km long and drains an area of 11,600 sq km. It issues from Lake Ikesjaure near the border of Sweden and Norway and flows from northwest to southeast along the Norrland Plateau. The river passes through a series of lakes, including Hornavan, Uddjaur, and Storavan, and forms rapids and waterfalls. In its lower course it flows through the coastal plain and empties into the Gulf of Bothnia of the Baltic Sea.

The Skellefteälven is fed primarily by snow; the water level is high in summer and low in winter. The mean flow rate is approximately 160 cu m per sec. The river is used for floating timber. A series of hydroelectric power plants is located on the Skellefteälven. The seaport of Skellefteå is situated on the river near its mouth. [29–1111–4]

SKERRY, a rocky island separated by narrow straits and inlets from the intricately dissected coasts of seas and lakes in regions of ancient continental glaciation, such as the Kola Peninsula of the USSR, Finland, Sweden, Norway, and Canada. The islands are composed of crystalline rocks with traces of glacial activity, such as sheepback rocks, and various moraine formations, such as drumlins, eskers, and moraine hills. The islands have an area of several square kilometers and elevations of only a few meters. Many hundreds of skerries occur in certain regions of a sea or lake. [29–1560–5]

SKIEN, a city and port in southern Norway, on the Skien River, near the place where the Skien flows into Bohus Bay of the Skagerrak. Administrative center of the *fylke* (county) of Telemark. Population, 47,000 (1976). Skien has footwear, food-processing, machine-building, and pulp and paper industries. It is the birthplace of the writer H. Ibsen. [29–1178–3]

ŠĶILTERS, GUSTAVS (Gustav Ianovich [Ivanovich] Shkilter). Born Nov. 16 (28), 1874, in Renzen Volost, in what is now Valmiera Raion; died Sept. 24, 1954, in Riga. Latvian sculptor and graphic artist, one of the first representatives of the Latvian school of sculpture of the 20th century.

Šķilters studied under M. A. Chizhov at the Shtiglits Central School of Technical Drawing in St. Petersburg from 1893 to 1899 and perfected his technique at A. Rodin's studio between 1900 and 1905. From 1906 to 1907 he drew political caricatures for St. Petersburg's Latvian-language satirical journal *Svari* (Scale). He taught at the Shtiglits School from 1905 to 1918 and at the Latvian Academy of Arts from 1924 to 1932.

Thorough precision of form is frequently combined with a picturesque treatment of the medium in Šķilters' free-standing figures and easel portraits. His works include portraits in bronze of R. Kaudzīt (1902) and M. Kaudzīt (1912), both housed in the Art Museum of the Latvian SSR in Riga, and one of K. Baumanis (1928, Opera and Ballet Theater of the Latvian SSR, Riga). In 1974 the G. Šķilters Memorial Museum was opened in Riga.

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SKINNING MACHINE, a unit for the continuous or batch removal of skins from animal carcasses, used in meat-packing plants as a component of mechanized production lines for cattle slaughter and carcass processing. Depending on the design, the output of series-produced skinning machines ranges from 75 to 150 carcasses per hr for cattle, from 125 to 360 carcasses per hr for smaller stock, and up to 100 carcasses per hr for hogs. [29–1271–3]

ŠKODA, JOSEF. Born Dec. 10, 1805, in Pilsen; died June 13, 1881, in Vienna. Czech doctor of internal medicine.

Škoda moved to Vienna in 1825, and in 1831 he graduated from the medical faculty of the University of Vienna. From 1846 to 1871 he was a professor at the university. Škoda and K. Rokitansky were the leading representatives of the new Vienna school, which emphasized the advantages of observing the patient at his bedside and studying the physical symptoms of disease and the underlying changes in organs. The school played a prominent role in the development of clinical medicine. Škoda developed and substantiated the concepts of percussion and auscultation and helped promote these techniques of physical examination in clinical practice. He also showed the dependence of heart sounds not only on anatomical lesions of the valves but also on the rate of blood flow, and he described several symptoms revealed by auscultation. His activities and research contributed greatly to the development of cardiology, pulmonology, and dermatology. Škoda founded a clinical school (F. von Hebra and others).

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[29–1257–3]

ŠKODA WORKS, one of the largest heavy machine-building works in Europe, located in the city of Plzeň (Pilsen), Czechoslovakia; the works originated in a factory that was founded during the 1860's to produce agricultural implements. The works underwent a major expansion before World War II. In the postwar years the production of the Škoda works played a major role in the reconstruction of Czechoslovakia's economy and in the development of economic cooperation between Czechoslovakia and other socialist countries. In 1951 the name of V. I. Lenin was added to the works' name.

During the mid-1970's more than 45,000 industrial and nonindustrial workers were employed by the Škoda Works. The production program of the works encompasses more than 50 branches of machine building. The main products manufactured are steam turbines, turbogenerators, hydroelectric generators, compressors, transformers, rolling mill and foundry equipment, hoisting cranes, large metalworking machine tools, electric locomotives, trolleybuses, and other equipment. About 40 percent of the total production is exported, mainly to the USSR and other socialist countries. During the early 1970's the expanding cooperation of the COMECON member countries in the development of nuclear sources of electric power resulted in the works' undertaking the production of equipment for nuclear power plants.

N. N. Pusenkov [29–1257–4]

SKÖVDE, a city in Sweden, in the *län* (county) of Skaraborg, between Lakes Vänern and Vättern. Population, 45,400 (1976). Skövde has an engine-building industry (a plant of the Volvo firm) and a clothing industry. Uranium is mined near Skövde at the Ramstad Mine. [29–1068–1]

ŠKRÉTA, KAREL (full name, Karel Škréta Šotnovský ze Závořic). Born 1610 in Prague; buried there Aug. 1, 1674. Czech painter; one of the most outstanding representatives of Bohemian baroque.

Because his family was involved in the Reformation, Škréta was forced to flee from Bohemia to Freiburg, Saxony, in 1628. He studied painting in Italy and in 1638 returned to Prague. He produced religious and mythological works of masterly technique, often incorporating genre motifs, as well as highly expressive portraits, drawings, and illustrations.

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[29–1270–2]

ŠKROUP, FRANTIŠEK JÁN. Born June 3, 1801, in Osice, near Pardubice; died Feb. 7, 1862, in Rotterdam. Czech composer, conductor, and singer.

Škroup studied music and law simultaneously. Under the influence of the Buditeli, he organized in Prague the first national Czech opera circle, which in 1823 began staging performances in Czech of German and Italian classical operas at the Estates Theater. He became second conductor at the theater in 1827 and was chief conductor from 1837 to 1857; he was the first to stage the operas of such composers as R. Wagner and G. Verdi in Prague. In 1860 he became conductor with a German opera company in Rotterdam.

Škroup composed nine operas, including *The Dráteník* (1826), the first national opera with a Czech libretto. Among his other works are an overture, string quartets, a piano trio, music for the theater, and songs, notably the popular song "Where is My Home?" (from the music to J. Tyl's play *Fidlovačka*, 1834), which became the first (Czech) part of the national anthem of the Czechoslovak Republic in 1918.

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Z. K. GULINSKAIA [29–1270–3]

SKULL (also cranium), the skeleton of the head of vertebrates, including man. A distinction is made between the axial cranium and the visceral cranium. The axial, or cerebral, cranium is the anterior continuation of the axial skeleton of the trunk that grows around the brain, olfactory organs, and inner ear. The visceral, or facial, cranium is the skeleton of the anterior part of the intestine (pharynx), which originally consisted of branchial, or visceral, arches separating gills.

In animals. The cranial changes that evolved in organisms were caused by progressive development of the brain and sense organs, replacement of gill respiration by pulmonary respiration, and change in feeding habits resulting from the emergence of organisms onto land from water. The cerebral cranium consists of a brain case, nasal capsules (surrounding the olfactory organs), and auditory capsules (enclosing the inner ear). The brain case is divided into anterior (prechordal) and posterior (chordal) portions. The former embraces the orbital and nasal regions of the skull, and the latter embraces the occipital and aural portions. The anterior portion develops from trabecular cartilages and orbital cartilages situated above them. In embryos the posterior portion develops around the fore end of the chord from the parachordal cartilages and auditory capsules. The parachordal cartilages correspond to the fused neural arches of the most anterior vertebrae, hence the "vertebral" origin of the posterior portion. Both portions remain independent in crossopterygians but grow together in the embryos of other vertebrates. The anterior portion usually contains only the forebrain (the cerebral hemispheres), with the posterior portion containing the greater part of the brain. In the adult cranium the boundary between the portions passes through the hypophysis and the opening by which the trigeminal nerve emerges from the cranium. The nasal capsules fuse with the anterior portion. Crossopterygians and terrestrial vertebrates have, in addition to nostrils, internal nares (choanae) that open into the anterior part of the oral cavity.

Platybasic and tropibasic types of brain case structure are distinguished according to the structure of the orbital portion. In a platybasic skull the prechordal portion has a wide base, and the brain extends into the orbital region. This type of cranium characterizes cyclostomes, sharks, lungfishes, recent amphibians, and mammals. All other vertebrates have a tropibasic skull, whose anterior portion has a narrow base and whose cerebral hemispheres are situated behind the orbital region.

The visceral cranium serves as a support for the anterior part of the digestive tract. It consists of metamerically arranged cartilaginous arches that encircle the initial portion of the digestive tract like hoops. The anterior visceral arches are transformed into jaws in all vertebrates except the most primitive organisms—the Agnatha. The cartilaginous base of the upper jaw, the palatoquadrate cartilage, was formed by the fusion of the upper portions of the two anterior arches, the premaxillary and the maxillary proper. The cartilaginous base of the lower jaw—Meckel's cartilage—corresponds to the lower portion of the second visceral, or maxillary, arch. The upper portion of the third visceral arch, or hyoid arch, was transformed in fish into an appendage that usually attaches the jaws to the axial cranium. In most fish the maxillary arch is joined to the axial cranium only by an appendage (hyostylic). The palatoquadrate cartilage in chimeras, lungfishes, and terrestrial vertebrates is directly joined to the axial cranium without an appendage (autostylic). In extinct shelled and primitive bony fishes and some sharks the maxillary arch is joined to the axial cranium both directly and by means of an appendage (amphistylic).

In terrestrial vertebrates, the appendage is transformed into an auditory ossicle that conducts sounds from the tympanic membrane to the inner ear; the posterior visceral arches (gill arches proper) are transformed into the hyoid bone and laryngeal cartilages. Mammals have additional auditory ossicles, the incus and the malleus, which arose from detached posterior elements of the palatoquadrate and Meckel's cartilages—the quadrate and articular bones.

In higher fishes and terrestrial vertebrates, the embryonic cartilaginous cranium more or less ossifies and becomes invested with dermal bones formed in the deep layers of the skin. On the outside the dermal bones form the calvaria, which is made up of nasal, frontal, parietal, squamous, and other bones. Originally the calvaria had openings only for the eyes and nostrils (anapsid skull), but most terrestrial vertebrates now have openings behind the orbits—temporal windows separated by the temporal, or zygomatic, arches. The function of the upper jaws was transferred to the premaxillary and maxillary dermal bones. The palatal and pterygoid dermal bones of the palatoquadrate cartilage form the palatal surface of the bony cranium. In some reptiles and mammals these bones form a secondary palate, which separates the choanal region from the main part of the oral cavity.

L. P. TATARINOV

In man. The human cerebral cranium is made up of six flat curved bones: the unpaired frontal and temporal bones, the paired parietal and temporal bones, and the sphenoid and ethmoid bones (situated at the base of the skull and possessing air spaces). The bones are connected by sutures. The upper part of the skull is called the skullcap, and the lower part is the base. The latter is divided from within into three fossae: anterior, middle, and posterior. The posterior cranial fossa contains the cerebellum. Nerves and blood vessels pass through the base of the skull by way of numerous canals and openings. The ear is housed in the temporal bone.

The shape and size of the skull vary: the circumference ranges from 52 to 64 cm, the length from 15 to 18 cm, and the width from 12 to 15 cm. Three basic shapes have been determined according to the cranial index. The shape of the skull changes with growth. An infant is born with incompletely developed bones, between which are remnants of the membranous cranium in the form of fontanelles and wide sutures.

The facial cranium consists of 14 comparatively small bones and the hyoid bone. The largest of these bones are the upper and lower jaws, which bound part of the oral cavity. The bones of the facial cranium as a whole determine the shape of the face. The lacrimal, zygomatic, and maxillary bones contribute to the formation of the orbit. The nasal, palatine, maxillary, vomer, and inferior turbinate bones form the nasal cavity, which communicates with the frontal, maxillary, and sphenoidal air sinuses. Other important topographical formations of the cranium include the infratemporal and pterygoid fossae, through which blood vessels and nerves pass. V. V. KUPRIANOV

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Anthropological significance. Study of variations in the size and shape of the cranium and of the cranium's individual constituent bones is important in all branches of anthropology. Certain cranial indexes can be determined by measurement (craniometry) or from descriptive characteristics (cranioscopy). Human morphology investigates normal sex- and age-related cranial variations in different population groups and explains the relationship between such variations and types of body build, hormonal status, social and environmental living conditions, and heredity. It has been found that men have larger skulls and cranial bones than women; male skulls are also marked by more expressed bone configuration (superciliary arch, the lines of attachment of muscles to the temporal, occipital, and lower jaw bones). Important age-related variations are changes in the correlation of the cerebral and facial portions; changes in the development, succession, and structure of teeth; and changes in the overgrowth of sutures.

Particularly important is the study of cranial transformations in the course of anthropogenesis, during which the skull gradually lost its "simian" features and acquired the structure characteristic of modern man. The cerebral portion of the skull enlarged, thereby dominating the maxillary portion. The highly developed supraorbital ridges in fossil man diminished and converted into superciliary arches, and the longitudinal crest of the cranium disappeared. The skullcap enlarged markedly: its frontal portion became wider and higher, and the occiput became round and lost the ridge and other bone growths (pronounced in ancient people) that served as sites of attachment of powerful neck muscles. The rearrangement of the cerebral portion was closely related to the enlargement and complication of the structure of the brain in the course of anthropogenesis.

The size of the brain averages 500–600 cc in the extinct higher primate *Australopithecus*, 1,000 cc in the oldest human beings (Archantropinae), 1,350 in ancient peoples (*Palaeoanthropus*), and 1,500 cc in modern man. These evolutionary changes in the calvaria, particularly the increased size of the fornix and the development of a high and almost straight forehead, were caused by active enlargement of the frontal and parietotemporal regions of the brain, where the specific cortical zones associated with man's work and speech are located.

In the course of anthropogenesis, the facial portion of the skull became less protrusive, and paired nasal bones whose lower part protrudes beyond the vertical plane of the face developed. The mandibular teeth were arranged in a horseshoe fashion rather than in the form of a U, as in anthropoid apes. The mental protuberance lacking in apes and some fossil humans developed in front, and the shape of the upper jaw and hard palate changed.

The structural characteristics of the cerebral and, to a greater extent, facial portions of the skull are used in raciology to identify racial types in modern and, especially, ancient populations. The vertical profile of the face, the degree of flatness of the upper and middle parts of the face, the shape of the nostrils and orbital cavities, and the protrusion of the nasal bones are among the features of the major races. Characteristics of the cerebral portion of the skull, for example, the cephalic and cerebral indexes, are used to distinguish smaller units of anthropological classification within major races. Craniological data are an important historical source for study of the formation of ethnic communities (nations, nationalities). The data are particularly useful in the study of peoples lacking a written history. The results of anthropometry of ancient peoples in a given region, together with archeological, historical, linguistic, ethnographic, and anthropological data on modern peoples, are used to explain the ethnogeny of large and small groups of people in the USSR.

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Pathology. Diseases of the skull include osteomyelitis, tumors, and congenital cerebral hernias. Injuries to the skull may be limited to soft tissues of the head but frequently affect the cranial bones and the brain. The term "craniocerebral trauma" is applied to the most important combined or isolated closed (with the skin intact) and open (with a wound) injuries to the skull and brain. The extent of bone damage varies with the force of the traumatic agent: depression or fracture of one or more bones at the base of the skull. Brain trauma is manifested by contusion, compression, or concussion.

A closed craniocerebral injury is associated with brief or prolonged unconsciousness, headache, nausea, and vertigo. If severe, there may also be mental, respiratory, and circulatory disorders combined with a variety of neurological symptoms. Such disorders are not pronounced in brain concussion. With cerebral hermorrhaging, there are signs of compression (two-stage loss of consciousness with a "lucid" interval, state of inhibition, prolonged headaches). If the base of the skull is fractured, signs of irritation of the meninges appear against a background of severe general brain symptoms. Treatment may be conservative or surgical. Conservative treatment is possible in cases not associated with compression of the brain. Bed rest and pain relievers are prescribed for skull fractures with no signs of brain injury and for mild brain concussions and contusions. More severe cases call for spinal taps and drugs that reduce intracranial pressure. Surgery is required for skull fractures with bone depression, brain compression by an intracranial hematoma, and increasing brain edema. Surgery involving opening of the cranial cavity is performed under local or general anesthesia.

Open craniocerebral trauma occurs less often than closed trauma in peacetime. It may be nonpenetrating (without injury to the dura mater) or penetrating (with injury to the dura mater). The clinical signs of general cerebral disorders are less pronounced than in closed trauma, but there is a much greater danger of infection or development of meningitis, encephalitis, or other complications. Treatment is only by surgery (surgical treatment of a wound, trephination, and plastic surgery for large defects in bone).

The sequelae of craniocerebral trauma may be diseases of the brain, including arachnoencephalitis, psychological disorders (for example, twilight state), and, in the long term, asthenia, encephalopathy, traumatic epilepsy, and mental deficiency.

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SLAG, FURNACE, furnace residues resulting from the combustion of solid fuel in the fireboxes of steam boilers as well as ash particles that have caked or fused into sinter. [29–1273–1]

SLAG, METALLURGICAL, a melt (after solidifying, a rocklike or glasslike substance) usually covering the surface of molten metal in metallurgical processes, as the smelting of raw material,

the processing of molten intermediates, and the refining of metals. Slags are alloys of oxides of various compositions. The major components of slags are the acidic oxide SiO_2 and the basic oxides CaO, FeO, and MgO, as well as the neutral Al_2O_3 and (less often) ZnO. Slags are classified as acidic or basic depending on the predominant oxides. They play an important role in the physicochemical processes of metallurgical production: they remove undesirable impurities in metals and protect metals from the harmful effects of the gaseous medium in the furnace (that is, from oxidation and gas saturation). Slags are formed from waste rock of ores (or ore materials), fluxes, combustion ash, oxidation products of processed materials, and the lining of smelting units. In steel smelting, slags are sometimes prepared in special furnaces (synthetic slags) and then used to process steel upon its removal from the furnace or converter to the ladle. Previously prepared slags are used in the electroslag remelting of metals.

In ferrous metallurgy, slags are usually by-products. They are secondary raw materials for the production of building materials (such as slag sitalls) and lime and phosphorus fertilizers; they are also used as a recycle in metallurgy. Blast-furnace slag is used to prepare granulated slag (used in the production of cement and slag blocks), pumice (a lightweight aggregate in concrete), gravel, rock castings, and slag wool. Steel-smelting slag is used in the production of gravel for road construction; in sintering blast furnaces and cupola furnaces it is used to extract the manganese, iron, and calcium oxide present in the slag. Ferroalloy slags are processed into ground limestone, gravel, and slag sand for construction as well as a powder used in foundry production; a portion of such slags is used in the production of alloys. Special slags used in the production of ferroalloys are produced by the integrated processing of ores and pig iron. Oxidation is an efficient method of transferring vanadium, manganese, niobium, and other metals from naturally alloyed pig iron into slag; the slag is then used for the production of such metals or their alloys.

In nonferrous metallurgy, a distinction is made between reduction slags and waste slags. Reduction slags contain a higher content of valuable metals and are formed as a by-product in metal production or refining. For example, converter slags are a by-product of nickel and copper production, and anode slime is a by-product of copper refining. Reduction slag may be the major product of a production process in which an extracted metal is concentrated, for example, titanium and vanadium slag. Slag yields are extremely high in nonferrous metallurgy. Up to 100–120 tons of slag is produced per ton of metal in the processing of poor ores. Thus, even a small amount of the nonferrous metal in the slag leads to significant losses. Metals may be extracted from reduction slags by recycling the slags to one of the primary production stages or by subjecting them to special processing, such as fuming, electrosmelting with the addition of a reducing agent and a sulfidizer, and flotation. Metal oxides not suitable for extraction in metallurgical processing are concentrated in waste slags, as are various admixtures and small amounts of valuable metals, the extraction of which is not economically feasible at the present level of technology. Waste slags are used partially for the production of slag wool and other building materials.

The complete and integrated use of slags ensures a waste-free production process and less pollution of the environment.

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SLAG CAR, a ladle of cast steel mounted on a railroad car for transporting molten metallurgical slag. In order to pour the slag off, the slag car is tipped in the required direction by means of an electric drive. The most common slag cars for blast-furnace and steel-smelting plants in the USSR have capacities of 11 and 16 cu m. [29–1273–6]

SLAG CEMENT, the common name for various cements produced by crushing pellets of blast-furnace slags together with activator additives (lime, construction-grade gypsum, and anhydrite) or by mixing the components after they have been ground separately. A distinction is made between lime-slag cement, with a content of 10–30 percent lime (by weight) and up to 5 percent gypsum, and sulfate-slag cement, with 15–20 percent gypsum or anhydrite and up to 5 percent portland cement or up to 2 percent lime. Slag cement is used in the production of mortars and concretes intended primarily for underground and underwater structures. Lime-slag cement is most suitable for the production of autoclave materials and articles. [29–1273–7]

SLAG CONCRETE, a lightweight concrete, in which the aggregate consists of metallurgical or furnace slag that has been crushed, dispersed, and purified of contaminants. It is used in the erection of cast-in-place wall structures (mainly building walls, ceilings, and floors) and in the prefabricated manufacture of concrete, stone, blocks, and panels. [29–1273–2]

SLAG INCLUSION, a defect in metal intermediate and finished products made primarily by rolling or forging. Slag inclusions are elongated accumulations of nonmetallic inclusions, from several millimeters to several centimeters in length; they usually form in the metal during pouring. They are arranged in the direction of the predominant flow of the metal upon deformation (mainly, on the surface of the metal or in the adjacent layers). Slag inclusions are removed mechanically, for example, by chiseling, flame treatment, and other methods. [29–1273–4]

SLAG POT, a metal ladle for collecting molten slag flowing from the taphole of a steel-smelting furnace during smelting. It is positioned under the furnace on a car that moves along a special trestle. [29–1273–5]

SLAG REMOVAL, the removal from steam boiler fireboxes of residues resulting from the combustion of solid fuels.

A distinction is made between fireboxes in which the slag is removed in thin streams in the molten state into a vat with water and fireboxes in which solid slag drops from the firebox hopper into a bin, from which it is periodically removed through a gate. Usually the slag is subsequently transported together with the fly ash (*see* ASH REMOVAL) collected by gas-purification devices. In older boilers the slag and ash were removed by cars. In modern electric power plants slag is ordinarily removed by a hydraulic system. The slag is transferred to a slag-washing shaft and then (in the case of coarse slag) to a grinder, from which it passes through a grate and metal catchers into dredger pumps or to hydraulic ejector pumps, which transfer the slurry (a mixture of slag and ash with water) to an ash dump. The two materials are often removed individually—the slag by a hydraulic system, and the ash by a pneumatic system. The vacuum removal of ash and slag is used in small boilers.

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Kuznetsov, P. M. *Udalenie shlaka i zoly na elektrostantsiiakh*. Moscow, 1970. I. N. ROZENGAUZ [29–1274–3]

SLAG RESISTANCE, the capacity of refractory materials to resist the destructive action of molten slags. Slag resistance is determined by the loss in volume or weight of a refractory material upon the action of a slag and, in part, by the depth of penetration of the slag into the refractory material. Both static methods (dissolving of a refractory material in a fixed amount of slag) and dynamic methods (the action of a moving and removable slag) are used to determine slag resistance; a combination of the two methods may also be used. Slag resistance depends on the chemical nature of the slag and the refractory material as well as the density and structural features of the refractory material.

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SLAG SITALLS, devitrified glass produced by the controlled, catalyzed crystallization of glass made from metallurgical, furnace, and other slags or from mineral and synthetic raw materials. Nu-

cleation and growth of crystals of the major crystalline phases on the nuclei occur simultaneously throughout the glass during heat treatment. Slag sitalls consist of tiny crystals with lengths from fractions of a micrometer to several micrometers in combination with residual vitreous glass (less than 40 percent by volume). They have high chemical resistance and resistance to wear. Slag sitalls were first synthesized in 1959 as a result of joint investigations by the Avtosteklo Factory in Konstantinovka, Donetsk Oblast, and the Mendeleev Moscow Institute of Chemical Engineering.

Slag sitalls are produced as continuous ribbons and pressed plates. They are white or gray and may be coated with colored ceramic dyes. Articles made of slag sitalls are used in construction, the chemical industry, and mining to protect structures and equipment from corrosion and abrasive wear. Slag sitalls are also used for floor coverings and exterior and interior wall facings.

REFERENCE
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K. T. BONDAREV [29–1274–2]

SLAG WOOL, a material for thermal insulation, a type of mineral wool manufactured from melts of metallurgical slags by converting them into glasslike fibers. It is used mainly in the form of finished sheets, mats, and shells made with a synthetic binder.

[29–1273–3]

SLIP, a thick, paste-like mass composed of a mixture of finely ground silicate raw materials and water. It is used in the manufacture of shaped refractory blocks, porcelain and faïence wares, ceramic tiles, and the like. M. P. SMIRNOV [29–1289–1]

SLIT TRENCH, a short trench dug 1.5–2 m deep and designed to provide shelter during a nuclear explosion, an artillery bombardment, an air raid, or a tank attack. A slit trench may adjoin a fire trench and may be open at the top or have a splinter-proof covering made of wood and sod. [29–1589–2]

SLOOP. (1) A three-masted, square-rigged sailing vessel of the 18th and 19th centuries that was also called a sloop of war. Smaller than a corvette and larger than a brig, the sloop had an open battery and was designed for reconnaissance, patrol, or dispatch service.

(2) The Russian term for a quiet-running vessel used by some modern foreign navies as an escort for transport convoys.

(3) The name of the most widely used rig on small- and medium-sized single-masted sporting yachts. In addition to its Bermuda or gaff mainsail, the sloop rig also includes a staysail or a jib, or both. [29–1305–4]

SLOT ANTENNA, an antenna in which apertures, or slots, for the radiation or reception of radio waves are cut in the conducting surface. A slot antenna may be a metallic wave guide, a rigid coaxial line, a cavity resonator, or a flat metal sheet.

In a slot antenna, radiation results from the excitation of the slots. In wave guides, resonators, and coaxial lines, the slots are excited by an internal electromagnetic field; in flat sheets, they are excited by means of a radio-frequency cable connected directly to the slot edges. In the general case, the calculation of a slot antenna's field is a complex diffraction problem. However, the problem may be simplified considerably by introducing a fictitious "magnetic" current that flows along a slot and representing a slot radiator as a magnetic antenna (*see* RADIO WAVES, RADIATION AND RECEPTION OF). Thus, for example, when the vectors **E** and **H** are replaced by the vectors **H** and $-\mathbf{E}$, respectively, the field due to a slot cut in a flat sheet is identical to the field of a sheetlike dipole, which is the complement of the slot. This method of designing slot antennas, which is called the duality principle, was first proposed by A. A. Pistol'kors in the early 1940's.

Slot antennas are distinguished by a relatively simple design. Such an antenna may not contain protruding components. The lack of protruding components is an important advantage of slot antennas in a number of cases, for example, when they are mounted in aircraft.

The most widely used metric-wave or decimetric-wave slot antennas are omnidirectional slot antennas, which are based on cavity resonators. In terms of the shape of the slots, such antennas are analogs of various flat wire antennas. The main difficulty in designing such an antenna is the matching of a high-impedance slot and a relatively low-impedance cable. The input impedance of a slot may be as high as 10^3 ohms (Ω), while the characteristic impedance of a cable is usually 50–75Ω.

For centimeter waves, directional slotted-guide antennas (see Figure 18 in ANTENNA) are mainly used. Such an antenna is matched with a wave guide by using a large number of radiators and by choosing the lengths and arrangement of the slots. An important advantage of slotted-guide antennas is the possibility of beam steering, or scanning, by varying the phase velocity of the wave in the wave guide. As early as the 1940's, slot antennas were developed in which scanning was carried out by varying the distance between the narrow walls of a rectangular wave guide or by inserting a longitudinal plate into the wave guide. In the 1950's and the 1960's, frequency-scanning methods were implemented, including methods for the frequency scanning of slotted-guide phased arrays.

A promising trend in the evolution of slot-antenna technology is the development of designs based on printed circuits and strip transmission lines.

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L. S. BENENSON [29–1583–2]

SLOTTED CARD, a variation of the edge-punched card, in which the perforations are slots instead of edge notches. The slots connect two or more holes punched in the card. Unlike edge-punched cards, slotted cards have all perforations cut in one direction, either vertically or horizontally across the card. Slotted cards are intended for manual sorting of data files. The absence of edge notches reduces wear on the edges of the cards and increases the cards' service life (compared with edge-punched cards). [29–1584–1]

SLUICE, in ore dressing, an inclined, rectangular trough, usually with a rough bottom of napped fabric covered with a pattern of wood planks, corrugated rubber, or the like, designed for gravity concentration of minerals. As the pulp passes through the sluice, the particles separate into layers according to their density and grain size; the heavier minerals settle to the bottom and are held by the friction created by the roughness and the bottom pattern. The vortices that form promote selective concentration. After the material has accumulated, the sluice is rinsed out by washing the concentrate into a separate receptacle with a powerful stream of water.

A distinction is made between fixed and band-type sluices. Fixed hydraulic sluices are designed to process large amounts of material. They are made of from six to eight consecutively laid boards several meters long with a slope of 0.03–0.06. They can extract 70–80 percent of the tin from ore concentrates containing 15–30 percent SnO_2; the extraction of gold is 40–60 percent. Other sluicing devices, cradles, and trommels are used for processing crude concentrates.

Band-type sluices consist of a continuous rubberized band, the upper part of which moves against the stream of pulp. The lighter fraction is unloaded in the lower section, and the heavier fraction is washed from the upper section of the band by a sprinkler. A band-type sluice 3 m long and 1.5 m wide has a productivity of 5 cu m/hr and can extract 92–95 percent of the gold in an ore.

Automatic multideck movable sluices have been in use since the 1970's. The type used in the USSR has five decks arranged in parallel above one another in tiers. The feed is stopped automatically every 4 min, the decks are tipped to an angle of 45°, and a petcock is opened for 1 min for rinsing. The use of vibration in sluices increases productivity.

REFERENCE
Spravochnik po obogashcheniiu rud, vol. 2, part 1. Moscow, 1974.
L. A. BARSKII [29–1304–1]

SLUICE, REGULATOR, a hydraulic engineering installation on irrigation, flooding, and water supply canals, designed to change the water discharge regime by means of gates.

Regulator sluices are classified according to their location: head sluices, for regulating the feed of water to the canal from the source or from a larger, trunk canal; retaining sluices, for maintaining the water level in a canal when discharge rates are low; flushing sluices, for washing away sediment that has been deposited in front of a structure in the canal; distributors, distributing the water at points where the canal branches; and overflow (spillway) sluices, for directing unused water into a drainage network.

Open regulator sluices are installed where fluctuations in water level are small; where fluctuations are greater, the sluices may be equipped with a diaphragm (retaining wall) and bottom gate underneath, or tunnel sluices may be set in the body of a dam and equipped with the same kind of gate. Regulator sluices are made primarily of reinforced concrete, often precast. [29–1305–3]

SMALTITE (also smaltine), a zonal mineral variety of the skutterudite group of the arsenide class. The chemical composition of smaltite is $(Co, Ni, Fe)As_{3\pm x}$, where x is about 0.1. The Co and Ni substitute for one another without restriction; the Fe content does not exceed 40 atomic percent of the sum of the cations. Isomorphic zonal mixtures in which Co predominates are classified as smaltite, as distinct from mixtures in which nickel predominates, which are called chloanthite.

Smaltite crystallizes in the isometric system, forming cubic or octahedral crystals. It is usually found in the form of solid granular masses. Collomorphic phenocrysts are also common. Smaltite has a tin-white or steel-gray color and a metallic luster. The hardness of individual zones is 5.5–6 on Mohs' scale; the density is 6,400–6,800 kg/m^3.

Smaltite forms during medium-temperature hydrothermal processes in association with other arsenides of cobalt, nickel, and iron and sometimes with uranium, silver, and bismuth minerals. It oxidizes readily at the earth's surface, becoming coated with crimson to pink erythrite. It is one of the most common minerals in ores of hydrothermal cobalt deposits. Smaltite is a valuable raw material of cobalt; sometimes, silver, bismuth, uranium, and gold are obtained from the same ores.

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ŠMERAL, BOHUMÍR. Born Oct. 25, 1880, in Třebíč; died May 8, 1941, in Moscow. Figure in the Czechoslovak and international working-class and communist movements.

Šmeral was the son of a teacher. A lawyer by education, he received the degree of doctor of law in 1904. In 1897 he joined the Social Democratic Labor Party of Czechoslovakia, and from 1906 to 1918 he edited its central organ, the newspaper *Právo lidu*. In 1909, Šmeral was elected to the Central Executive Committee of the SDLPC; he was a member of the Presidium of the Central Executive Committee from 1911 to 1917 and chairman from 1914 to 1917. Šmeral was a Social Democratic deputy to the Austrian Reichsrat from 1911 to 1918. He was one of the organizers of the October general political strike of 1918 in the Czech lands, and in 1919 he became a leader of the group known as the Marxist Left, the revolutionary wing of the SDLPC.

In 1920, Šmeral visited Soviet Russia and met V. I. Lenin. When he returned to Prague he published the book *The Truth About Soviet Russia* (1920), in which he stressed the international significance of the October Revolution of 1917. In May 1921, Šmeral helped found the Communist Party of Czechoslovakia, and from 1921 to 1929 he served on its Central Committee; in 1936 he was again elected to the Central Committee. He was a CPC deputy to the National Assembly of Czechoslovakia from 1920 to 1929, and a senator in the National Assembly from 1935 to 1938.

From 1922 to 1935, Šmeral served on the Executive Committee of the Communist International and was a member of the Executive Committee's Presidium. In 1935 he became a member of the International Control Commission of the Comintern. In 1938 he moved to Moscow in accordance with a decision by the Central Committee of the CPC. In Moscow, Šmeral worked for the Comintern and served on the governing central board of the CPC.

WORKS
Historické práce, 1908–1940. Prague, 1961. [29–1314–1]

ŠMIDKE, KAROL. Born Jan. 21, 1897, in Vitkovicé; died Dec. 15, 1952, in Bratislava. Czechoslovak party and state figure. Hero of the Czechoslovak Socialist Republic (1964, posthumously). Member of the Communist Party of Czechoslovakia from 1921.

Šmidke was a CPC deputy to the National Assembly from 1935 to 1938. He emigrated to the USSR in August 1939, five months after the occupation of Czechoslovakia by fascist Germany in March 1939. In 1943, Šmidke was sent by the leaders of the CPC to carry out party work in Slovakia. He served on the Central Committee of the Communist Party of Slovakia (CPS) and the Slovak National Council (SNC). During the Slovak National Uprising of 1944 he was chief of staff of the partisan detachments and chairman of the SNC. In 1944 and 1945, Šmidke was chairman of the CPS, and in 1945 and 1946 he was deputy chairman of the SNC and chairman of the Board of Commissioners, an agency of state power in liberated Slovakia. He was chairman of the SNC from 1948 to 1950, and in 1949 he became a member of the Central Committee of the CPC.

Šmidke was awarded the Order of Lenin posthumously in 1969. [29–1315–1]

SMOKE POT, a device for releasing smoke. A smoke pot consists of a cylindrical metal container with openings in its upper end. An igniter is inserted in the center hole, and the smoke that forms when the mixture in the pot burns escapes through the remaining holes. [29–920–3]

SNEEZEWORT (*Achillea ptarmica*, or *Ptarmica vulgaris*), a perennial herbaceous plant of the family Compositae. The stems are solitary and range from 20 to 125 cm in height. The biserrate and sessile leaves are entire, linear, or linear-lanceolate; they measure 1–8.5 cm in length and 1–6 mm in diameter. The hemispherical heads are about 20 mm wide and in a common corymbose inflorescence. The six to ten white marginal flowers are pistillate and ligulate; there are three curved denticles on the top. The off-white middle flowers are bisexual and tubular. Sneezewort grows in meadows, along bodies of water, and amid shrubbery in Europe, Asia Minor, and the European USSR. It occurs as an alien species in Western Siberia. The powdered dry herb causes sneezing. Varieties with double heads (with a predominance of ligulate flowers) are raised as ornamentals. [29–661–6]

SNORKEL, a special device that enables a submarine to run underwater on diesel power and to recharge its storage batteries without surfacing. Consisting of a pair of tubes approximately 10 m in length and 30–40 cm in diameter, the snorkel can be extended slightly above the surface when the vessel is submerged. One tube of the snorkel is used to provide fresh air, and the other, to remove exhaust gases. Special valves on the snorkel prevent water from entering the engines when the sea is running. [29–1329–1]

SOIL SLITTING, a method of tilling the soil by cutting slits across the slope. The slits are usually 40–60 cm deep and set 100–150 cm apart. The purpose of soil slitting is to regulate overland flow and improve the soil's capacity to retain snowmelt and cloudburst water. Five-bottom plow frames with slit cutters attached in place of the first and fifth bottoms are used for soil slitting.

REFERENCE
Zemledelie, 2nd ed. Moscow, 1972. [29–1583–1]

SOIL SMOOTHING, leveling the surface of a field and partially loosening the topsoil. Soil smoothing is done by floats and drags. The soil is smoothed out in the spring as soon as the tops of the crests formed in fall plowing dry out. The procedure is done somewhat earlier than or at the same time as harrowing. Soil smoothing is effective on soils that are not inclined to become mucky. The small-clump layer formed on the surface prevents the evaporation of moisture. To avoid crusting of topsoil, smoothing is not done on heavy clay and salinized soils. [29–1283–3]

SOLENODONTIDAE, a family of mammals of the order Insectivora. The body length is 28–32 cm, and the tail length, 17–25 cm. The weight reaches 1 kg. The facial part of the head is considerably elongated, and the nostrils open to the sides. There is a deep fissure on the second lower incisor. The feet are relatively large. The body is covered with short reddish brown or blackish fur. The tail is bare. The family comprises one genus, *Solenodon*, which has two species: the almique (*S. cubanus*), distributed in Cuba, and the agouta (*S. paradoxus*), distributed in Haiti. Both the almique and the agouta are terrestrial nocturnal animals, inhabiting forests and shrub thickets. Natural depressions and cracks serve as shelters. The diet includes animals and plants. The almique and agouta breed once a year, giving birth to three offspring. Both are rare and are included in the *Red Data Book* of the International Union for Conservation of Nature and Natural Resources. [29–1584–3]

SOLID SPHERICAL HARMONIC. A solid spherical harmonic of degree n is a homogeneous function u_n in the rectangular coordinates x, y, and z that satisfies Laplace's equation:

$$\frac{\partial^2 u_n}{\partial x^2} + \frac{\partial^2 u_n}{\partial y^2} + \frac{\partial^2 u_n}{\partial z^2} = 0$$

There are $2n + 1$ linearly independent homogeneous polynomials in x, y, and z of integral positive degree n that are solid spherical harmonics. Their linear combination represents the general form of such a polynomial of degree n. For example, the general forms of homogeneous polynomials of degree 0, 1, and 2 that are solid spherical harmonics are represented by

$$u_0 = a$$
$$u_1 = ax + by + cz$$
$$u_2 = a(x^2 - z^2) + b(y^2 - z^2) + cxy + dyz + ezx$$

where a, b, c, d, and e are arbitrary constants.

If the spherical coordinates r, θ, and ϕ are introduced instead of the rectangular coordinates x, y, and z, then solid spherical harmonics may be expressed in terms of the spherical surface harmonics $Y_n(\theta, \phi)$ according to the formula

$$u_n = r^n Y_n(\theta, \phi)$$

To every solid spherical harmonic u_n of degree n there corresponds a solid spherical harmonic $r^{-2n-1}u_n$ of degree $-n - 1$.

Solid spherical harmonics are used in finding the general solution of Laplace's equation and in solving problems of mathematical physics for regions bounded by spherical surfaces. [29–867–7]

SOMLAY, ARTHUR. Born Feb. 28, 1883, in Budapest; died there Nov. 10, 1951. Hungarian actor. People's Artist of the People's Republic of Hungary (1950).

Somlay graduated from the Vígszínház studio in 1900 and worked in many theaters in Budapest. His roles included the title roles in Shakespeare's *Hamlet* and *King Lear*, Egor Bulychov in Gorky's *Egor Bulychov and Others*, Tiborc and bán Petur in Katona's *Bánk Bán*, and Judge Sári in Móricz' *Judge Sári*. Somlay joined the National Theater in Budapest in 1946; in 1948 he became chairman of the Union of Hungarian Actors. Somlay received the Kossuth Prize in 1948 and 1951. [29–1344–3]

SOMOGY, a *megye* (district) in southwestern Hungary, in the basin of the Drava River and Lake Balaton. Area, 6,100 sq km. Population, 362,000 (1975). The administrative center of Somogy is the city of Kaposvár. Somogy is an agricultural and industrial region. A total of 41.7 percent of the gainfully employed population is engaged in agriculture, and 29.5 percent is engaged in industry and construction (1970 census). The chief crops are wheat, maize, rye, sugar beets, sunflowers, tobacco, fodder crops, and potatoes. Orchards and vineyards are cultivated, and cattle, hogs, and poultry are raised. Enterprises of the food-processing industry produce flour, butter, and sugar. Flax and hemp are also processed. Somogy manufactures machinery, crafted wooden articles, textiles, and construction materials. Natural gas is extracted near Kaposvár and in the Drava River Valley. The southern shore of Lake Balaton is a health resort.

V. V. BODRIN [29–1344–4]

SOMOGYI, JÓZSEF. Born June 9, 1916, in Félszerfalva. Hungarian sculptor. People's Artist of the Hungarian People's Republic (1970).

Somogyi graduated from the Academy of Arts in Budapest in 1941. His monumental works, such as *Mother and Child* (aluminum, 1967, Budapest), consist of dynamic figures freely positioned in space. These works are executed in a romantic spirit and are marked by expressiveness of gestures. Somogyi has also produced freestanding sculpture, including very small works.

Somogyi received the Kossuth Prize in 1954 and the Munkácsy Prize in 1956. [29–1345–1]

ŠOPOV, ACO. Born Dec. 20, 1923, in Štip. Macedonian poet, translator, and state and public figure. Member of the Macedonian Academy of Sciences and Arts (1967); corresponding member of the Serbian Academy of Sciences and Arts (1968).

Šopov served in the National Liberation War of 1941–45 in Yugoslavia. He graduated from the philosophy department of the University in Skopje and the Higher Political School in Belgrade. He was president of the Translators' Union and the Writers' Union of the Socialist Republic of Macedonia in the 1950's and 1960's, and of the Writers' Union of Yugoslavia from 1965 to 1969. From 1970 to 1977 he was a diplomat.

Šopov began his literary career during the partisan years; his first published work was *Verses* (1944). In 1950 he published *In the Grammos Mountains* and *With Our Own Hands*, which both dealt with the antifascist and nationalist struggle and the building of a new Macedonia. The collections of lyric poems *Verses on Suffering and Joy* (1952), *Imagination* (1963), and *The Birth of the Word* (1966) deal with "eternal" themes, poetic creativity, and moral self-awareness. Another of his collections is *Song of the Black Woman* (1976).

Šopov experiments with versification and the lexicon. His works are distinguished by the freshness of their poetic language and by their melodic harmony. Šopov also translates from Russian and other European languages.

Šopov was awarded the Prize of the Antifascist *veche* of the National Liberation of Yugoslavia in 1970.

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[Stikhi.] In the anthology *Poety Iugoslavii XIX–XX vv*. Moscow, 1963.

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A. D. ROMANENKO [29–1351–1]

SOPRON, a city in Hungary. Situated on the Ikva River (Danube basin), in the *megye* (county) of Győr-Sopron. Population, 53,000 (1976). Sopron is a railroad junction. Its industrial enterprises manufacture textiles, garments, metal products, wine, and beer. The city has a polytechnic institute.

The city's noteworthy Gothic structures include a Benedictine church (13th–first quarter of the 14th century, reconstructed c. 1490) and a convent with its famous Chapter Hall (first half of the 14th century) and the churches of St. Mihály (13th–15th centu-

ries) and St. György (14th century, reconstructed in the baroque style 1682–1781). The city tower (completed 1681) and various Gothic, Renaissance, and baroque houses are also of interest. The Liszt Ferenc Museum houses archaeological remains and works of the fine arts, folk art, and applied arts.

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Magyarország müemléki topográfiaja, vol. 2. Part 1: "Sopron és környéke müemlékei". Budapest, 1956. [29–1351–2]

SOUND EFFECTS, noises and sounds arranged in some definite tempo and rhythm and used in the production of theatrical performances, motion pictures, and radio and television programs.

Sound effects are achieved with special equipment. When combined with other means of expression, such as music, scenery, and lighting, sound effects help to reveal the content of a production and to create the necessary mood, tempo, and rhythm of a performance or a motion picture. Sound effects can be especially important in radio, where sound in all its diversity is the principal means of expression. Sound effects may be realistic, fantastic, arbitrary and abstract or comically absurd, depending on the style and treatment of the performance. [29–1542–6]

SOUNDING BALLOON, a rubber, usually hydrogen-filled balloon carrying a meteorograph and released in free flight to measure atmospheric parameters. The balloon bursts when it reaches a certain altitude, and the meteorograph descends to earth by parachute with a tape recording that is subsequently processed. With the introduction of radiosondes, the use of sounding balloons was virtually discontinued. [29–856–5]

SOUND-LEVEL METER, a device for measuring loudness (of noise) objectively. A sound-level meter consists of a nondirectional microphone, an amplifier, corrective filters, a detector, and an indicating meter.

The overall circuit design is such that the meter's characteristics approximate the properties of the human ear. The sensitivity of the ear is a function of the frequency of a sound, and this function varies with the intensity of the noise (or sound) being measured. Therefore, there are three sets of filters in a sound-level meter that provide the necessary contour of the frequency response at three loudness levels. Scale A conforms to the response for a low loudness level of ~40 phons (it is used in the range 20 to 55 phons); scale B, for a medium loudness level of ~70 phons (55 to 85 phons); and scale C, for a high loudness level, 85 to 140 phons. The response at the high loudness level is uniform over a frequency band of 30 to 8,000 hertz.

Scale A is also used to measure the loudness level in decibels with the notation A, that is, dB(A), at any loudness level. The value of a sound level in dB(A) is used when rating loudness in industry, dwellings, and transportation facilities. The filters are switched manually according to the loudness level of the sound (or noise) being measured. The rectified signal from the square-law detector is averaged over a time interval corresponding to the time constant of the ear—approximately 50 to 60 milliseconds (the time interval in which two separate acoustic signals are perceived as a unified signal by the ear because of its time lag). The scale on the output meter is calibrated in decibels relative to a root-mean-square sound-pressure level of 2×10^{-5} Pa on one of the three aforementioned scales—A, B, or C.

A modern sound-level meter is a compact, portable instrument powered by self-contained dry batteries. The microphone, electronic circuitry, and indicating meter should be extremely stable with respect to variations in the temperature, humidity, and barometric pressure, as well as invariant with respect to time.

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[29–1543–2]

SOUTH AMERICAN TORTOISE (*Geochelone denticulata*), a reptile of the family Testudinidae (land tortoises). The shell is elongated and flat and measures up to 55–60 cm in length; the carapace is dark brown with yellow spots. The shell of the young is more convex and more brightly colored. The head and the long fat legs are blackish. The South American tortoise is widely distributed in the tropical forests of South America east of the Andes and in the Lesser Antilles. It feeds on fruits and greenstuffs. The eggs, which number four to 12, are buried in a pile of fallen leaves. The meat and eggs of the tortoise are used for food. [29–794–2]

SOVIET CHINCHILLA, a breed of rabbits raised for meat and fur. The breed was developed at animal-breeding sovkhozes in Moscow, Saratov, Perm', Novosibirsk, and other oblasts by crossing the Chinchilla breed (a breed raised in the USA, Great Britain, Denmark, the Federal Republic of Germany, the German Democratic Republic, and other countries) with the White Giant breed. The breed was confirmed in 1957. Adult rabbits weigh about 5 kg; three-month-old individuals weigh 2.5 kg. A litter contains seven or eight young. The silvery gray-blue pelt resembles that of the chinchilla, a South American rodent. The pelt is darkest on the breast, back, sides, and croup; the neck, abdomen, lower part of the tail, and inside of the legs are almost white. There is a characteristic light gray wedge with a dark base on the back of the head. The Soviet Chinchilla is raised in various zones of the USSR. [29–1208–1]

SOYINKA, WOLE. Born July 13, 1934, in Abeokuta. Nigerian writer and playwright.

In the satiric plays *The Lion and the Jewel* (1963) and *A Dance of the Forests* (1963), Soyinka employed the grotesque to show the clash between the traditional and the modern in Africa, urging his people to reflect seriously on their past. He is the author of the picaresque comedy *The Trials of Brother Jero* (1964), the antiwar parable *Madmen and Specialists* (1971), and the novel *The Interpreters* (1965; Russian translation, 1970), in which he exposed corruption in the bureaucracy of Nigeria and criticized extreme forms of African nationalism. Soyinka's poems are pervaded with themes of disenchantment with the reality of modern-day Nigeria.

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S. P. KARTUZOV [29–1333–3]

SPACE-TIME INTERVAL, in the theory of relativity, a quantity that characterizes the relation between the spatial distance and the time interval that separate two events. From the mathematical standpoint it is the "distance" between two events in four-dimensional space-time.

In the special theory of relativity the square of the space-time interval s_{AB} between two events A and B is

$$s_{AB}^2 = c^2(\Delta t)^2 - (\Delta r)^2$$

where Δt and Δr are, respectively, the time interval and spatial distance between the events and c is the speed of light in a vacuum. The space-time interval between events remains unchanged when one inertial frame of reference is replaced by another; that is, the interval is invariant with respect to Lorentz transformations. By contrast, the quantities of Δr and Δt depend on the choice of frame of reference.

If $s_{AB}^2 > 0$, the interval is said to be timelike. In this case there

exists a frame of reference in which the events occur at a single point in space ($\triangle r = 0$), and $s_{AB} = c\triangle t$—that is, the space-time interval is equal to the product of the time interval between the events in this frame and the speed of light.

If $s^2_{AB} < 0$, the interval is said to be spacelike. In this case there exists a frame of reference in which the events occur simultaneously ($\triangle t = 0$), and the distance between them is $\triangle r = is_{AB}$, where $i = \sqrt{-1}$.

When $s_{AB} = 0$, the interval is called a null-interval. In this case the relation $\triangle r = c\triangle t$ always holds; that is, the events in any frame of reference can be connected by a light signal (*see* RELATIVITY, THEORY OF).

In the general theory of relativity, which considers curved space-time in the presence of gravitation, the space-time interval described above may be used only for infinitesimally distant events (*see* GRAVITATION). I. D. NOVIKOV [29–362–2]

ŠPÁLA, VÁCLAV. Born Aug. 24, 1885, in Žlunice; died May 13, 1946, in Prague. Czech painter.

Špála studied in 1902 at the School of Industrial Arts and from 1903 to 1908 at the Academy of Arts in Prague. Špála's work has features in common with fauvism, but the basic characteristics of his paintings, particularly his still lifes, is the stylization and development of the traditions of Czech folk art. [29–1386–1]

SPANISH FLY (*Lytta vesicatoria*), a beetle of the family Meloidae (*see* MELOIDAE). The body length is 12–20 mm. The coloration is golden green. The Spanish fly is distributed in Europe and Asia. It flies on hot days in May through July; it emits a sharp, unpleasant odor. It eats the leaves of trees and shrubs, and in large numbers causes considerable damage. It deposits its eggs in the ground; the hatched larvae crawl onto flowers, from where wild bees transport them on their bodies to their own nests. The larvae eat the bees' eggs and the honey in the honeycomb cells, then leave the nests and metamorphose into pseudopupae, which winter in the ground.

The hemolymph and sexual organs of Spanish flies contain a toxic substance called cantharidin. Dried Spanish flies were used to prepare vesicatory plasters. [29–1389–5]

SPANN, OTHMAR. Born Oct. 1, 1878, in Vienna; died July 8, 1950, in Neustift, Burgenland. Austrian idealist philosopher who developed the concept of wholeness; sociologist and economist.

Spann was a professor at the university in Brünn (Brno) from 1909 to 1919 and at the University of Vienna from 1919 to 1938. Following in the philosophical tradition of Plato, medieval realism, and German classical idealism, Spann tried to construct a philosophical-sociological system of "neoromantic universalism." One of its basic positions was that the whole in its essence precedes the parts; the parts are an expression, a mediation, of the whole; the whole, divided into pieces, conditions the existence of the parts. For Spann, wholeness is the original reality, in which causality does not function. The causal understanding of objects, as Spann proposes, is only possible based on the false assumption that the parts exist before the whole. Spann rejected atomism and materialism, claiming that they were intrinsically mechanistic. In his understanding of the essence of life, Spann was close to the vitalist views of H. Driesch.

Spann gave the central place among social institutions to the state, claiming that it had always existed and merely changed its form. Spann advocated the ideal of a social structure based on arbitrary distinctions and an extremely strict hierarchy, whose features largely reproduce those of the Hindu caste system and the medieval guilds.

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SPECIAL-ASSIGNMENTS UNIT, a type of military party detachment in party cells at industrial plants as well as in raion, city, district, and provincial party committees. In accordance with a decree issued by the Central Committee of the RCP(B) on Apr. 17, 1919, the special-assignments units were set up to perform such tasks as aiding bodies of Soviet power in the struggle against counterrevolution and guarding especially important facilities.

The leadership of the units consisted of an organizer responsible to the Central Committee of the RCP(B) as well as organizers at the local committee levels. Initially, the units were formed from among party members and candidates for party membership; later, leading Komsomol members were also admitted. The units first appeared in Petrograd and Moscow and were later organized in the central provinces of the RSFSR. By September 1919, units had been formed in 33 provinces. The special-assignments units of the Southern, Western, and Southwestern fronts fought in frontline operations.

In November 1919, the Central Committee adopted a decision to incorporate the special-assignments units into the universal military training system. The units, however, would maintain their organizational independence and would continue to be available to local party organizations. On Mar. 24, 1921, in a decree based on a decision of the Tenth Congress of the RCP(B), the Central Committee designated the special-assignments units a part of the militia units of the Red Army. The members of the special units were divided into regular-army and militia, or replaceable, personnel.

In September 1921 the national command staff and headquarters of the special-assignments units were set up. A. K. Aleksandrov was named commander of the units, and V. A. Kangelari, chief of staff. The Council of Special-assignments Units was established under the control of the Central Committee to provide the units with political leadership. The council's membership included V. V. Kuibyshev, secretary of the Central Committee, and I. S. Unshlikht, deputy chairman of the All-Russian Extraordinary Commission. The commissar of the staff of the Workers' and Peasants' Red Army and the commander of the special-assignments units were the other members of the council. Command staffs and headquarters were also organized at provincial and district levels, and councils of special-assignments units were established in the provincial and district party committees.

The regular-army personnel of the special-assignments units numbered 39,673 in December 1921, and the replaceable personnel, 323,372. Special-assignments personnel comprised infantry, cavalry, artillery, and armored units.

As a result of improvements in the country's domestic and foreign affairs and an increase in the strength of the Red Army, the special-assignments units were deactivated in 1924 and 1925 by a decision of the Central Committee of the RCP(B).

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SPECIAL RULING, in Soviet procedural law, a special decision rendered by a court as a body on the basis of a complete investigation of the circumstances of a case.

In criminal procedure, if there are grounds for issuing a special ruling, the ruling is rendered at the same time as the verdict. The special ruling may address the possibility of eliminating the causes and conditions that facilitated the commission of a crime, or it may direct the attention of the appropriate officials to violations permitted in the conduct of the inquiry or preliminary investigation or to the incorrect conduct of individual citizens at their place of work, at home, or in public places. The special ruling is sent to the head of the appropriate institution, enterprise, or organization or to some other person, such as the official responsible for the conduct of the inquiry or preliminary investigation. When necessary, a copy of the special ruling may be sent to a comrades' court.

In civil procedure, a special ruling is rendered by a court if, while hearing a civil case, it discovers a violation of legality or of the rules of socialist life by individual officials or citizens. A special ruling may also be given if the court finds considerable shortcomings in the work of a state institution, enterprise, collective farm, or other cooperative or public organization. If the court discovers indications of a crime in the actions of a party or other

person, it reports this fact to the procurator or initiates a criminal case.

The decision of whether or not to make public a special ruling is left to the discretion of the court. The procurator has the right to file a protest against a special ruling. A special ruling involving the initiation of a criminal case may be appealed by persons taking part in the case.

A special ruling may also be rendered by a court considering a case on appeal or supervisory review.

Officials who have received a copy of a special ruling are obligated to inform the court within one month of the appropriate measures that have been taken. [29–81–1]

SPECIMEN, a sample, usually metal, that may be studied macroscopically (in macrosections) or microscopically (in microsections). Preparation of a specimen entails grinding the flat surface of a sample and, if microsections are to be examined, polishing the surface. The surface is then etched with chemical reagents or heated in a gaseous atmosphere or in a vacuum. Selective etching and evaporation occur as a result of the differences in the physicochemical properties both of the grains of different phases as well as of the different grain-boundary regions. This leads to the formation of a macrorelief, which is visible to the unaided eye, or a microrelief, which must be examined with a microscope. [29–1294–2]

SPECTRAL LINES, WIDTH OF. Spectral lines in optical spectra of atoms, molecules, and other quantum systems are characterized by a range of frequencies ν or a range of wavelengths $\lambda = c/\nu$, where c is the speed of light. Such a frequency or wavelength range is called the width of spectral lines.

A certain range $\Delta\nu_{ki}$ of frequencies near the frequency ν_{ki} of a radiative transition between discrete energy levels $\mathcal{E}_k$ and $\mathcal{E}_i$ corresponds to every such transition; the transition frequency $\nu_{ki} = (\mathcal{E}_k - \mathcal{E}_i)/h = (\mathcal{E}_k - \mathcal{E}_i)/2\pi\hbar$, where $h = 2\pi\hbar$ is Planck's constant. The value of $\Delta\nu_{ki}$ gives the width of a spectral line, that is, the extent to which a given spectral line is nonmonochromatic. A spectral-line profile $\phi(\nu)$—that is, the frequency dependence of the intensity of emission or absorption—usually has a maximum at or near the transition frequency ν_{ki} (see Figure 1). The frequency range between points where the intensity falls to half the maximum intensity is taken as the width of a spectral line. Hence, the width of a spectral line is often referred to as the half-width of a spectral line. If the Doppler effect is not taken into account, the width $\Delta\nu_{ki}$ of a spectral line is given by the sum of the widths of the energy levels $\mathcal{E}_k$ and $\mathcal{E}_i$: $\Delta\nu_{ki} = (\Delta\mathcal{E}_k - \Delta\mathcal{E}_i)/h \approx (1/\tau_k + 1/\tau_i)/2\pi$. In other words, the shorter the lifetimes τ_k and τ_i at the energy levels, the greater the value of $\Delta\nu_{ki}$.

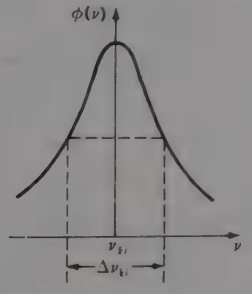

Figure 1. A symmetrical spectral-line profile. The maximum emission intensity $\phi(\nu)$ corresponds to the frequency ν_{ki}; the width of the spectral line ($\Delta\nu_{ki}$) is equal to the frequency range between the points where the intensity falls to half the maximum intensity.

The natural width of a spectral line is given by the expression $(\Delta\nu_{ki})_{nat} = (A_k + A_i)/2\pi$, where A_k and A_i are the total probabilities of spontaneous transitions from the levels $\mathcal{E}_k$ and $\mathcal{E}_i$ to all lower-lying levels. The natural width is very small.

For atoms and molecules, the width of spectral lines is governed mainly by the broadening of the energy levels of the atoms or molecules during interactions with surrounding particles and by the broadening of the spectral lines as a result of the Doppler effect. In a gas or a plasma, the energy levels of the particles are broadened during collisions. Depending on the type of broadening, a symmetrical or an asymmetrical spectral-line profile is produced. Figure 1 shows a symmetrical profile, which is characteristic of radiation broadening.

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M. A. EL'IASHEVICH [29–1224–3]

SPEE, MAXIMILIAN VON. Born June 22, 1861, in Copenhagen; died Dec. 8, 1914, near the Falkland Islands. German vice admiral. Count.

Spee entered the navy in 1878. In 1912 he became the commander of a cruiser squadron in the Pacific Ocean. After the outbreak of World War I, Spee took his squadron to the waters of South America. On Nov. 1, 1914, he defeated a British cruiser squadron in a battle at Coronel off the Chilean coast. On Dec. 8, 1914, Spee was defeated by a strong British squadron off the Falkland Islands. Spee went down with his flagship, the cruiser *Scharnhorst.* [29–1390–5]

SPEISS, an intermediate product or by-product in nonferrous metallurgy, an alloy of arsenides and antimonides of iron, cobalt, nickel, copper, or other metals formed in the melting of raw materials with a high arsenic content. Cobalt speiss is formed in the melting of arsenic-cobalt raw materials. To extract the cobalt, this speiss is roasted to remove arsenic and sulfur, and the oxides produced are subjected to further metallurgical treatment or are sulfatized by sintering with concentrated sulfuric acid and converted by hydrometallurgical treatment.

In the production of lead, speiss is formed in the shaft melting of charges with a high arsenic content and in the melting of copper drosses. As a consequence of its low solubility and relatively high density (8–8.5 g/cm$_3$), speiss is found in a separate layer between the molton lead and the matte.

Speiss is a good collector of lead, silver, and gold; because significant amounts of these metals are lost when using the alloy, the formation of speiss in lead production is undesirable. Speiss is usually treated together with matte in converters with the partial distillation of arsenic and antimony and production of low-quality black copper.

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M. P. SMIRNOV [29–1391–3]

SPEMANN, HANS. Born June 27, 1869, in Stuttgart; died Sept. 12, 1941, in Freiburg, Baden. German embryologist.

Spemann studied medicine, physics, and botany at the universities in Heidelberg, Munich, and Würzburg. He was a professor at the universities of Rostock (1908–14) and Freiburg (1919–37). From 1914 to 1919 he was director of the Kaiser Wilhelm Institute of Biology in Berlin.

Spemann's main studies were devoted to the experimental embryology of amphibians. Spemann developed microsurgical techniques for use on the embryos of amphibians and designed several microinstruments, including glass needles, hair loops, and micropipettes. He discovered the relationship between the development of one part of an embryo and that of another, specifically, the relationship between the development of the crystalline lens and the optic cup and between the central nervous system and the chorda and mesoderm. These studies laid the foundation for Spemann's theory of organizers of development, that is, those parts of the embryo that differentiate before other parts and then act on the development of the latter, thereby determining the direction of their differentiation (*see* INDUCTION and ORGANIZER). The research of Spemann and his school contributed greatly to our knowledge of the relations between the various parts of the developing embryo and the processes of determination.

Spemann received a Nobel Prize in 1935.

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[29–1391–4]

SPENGLER, OSWALD. Born May 29, 1880, in Blankenburg in the Hartz Mountains; died May 8, 1936, in Munich. German idealist philosopher, representative of the philosophy of life.

Spengler became famous after the sensational success of his principal work, *The Decline of the West* (*Der Untergang des Abendlandes*, vols. 1–2, 1918–22; Russian translation, vol. 1, 1923). During the 1920's he was a publicist of conservative-nationalist views and was close to fascism; in 1933, however, he rejected a proposal to collaborate with the Nazis. Hitler's regime boycotted Spengler, but this did not prevent the ideologists of Nazism from widely utilizing Spengler's ideas, converting them into weapons for their own demagogical purposes.

The philosophy of F. Nietzsche was a decisive influence on Spengler. Spengler proceeds from the concept of organic life, subjected to unlimited expansion. Culture is treated as an organism that, in the first place, possesses the most rigid, thoroughgoing unity, and, in the second place, is individuated from other, similar organisms. This means that there is not, nor can there be, any single culture for all mankind; the idea of unilinear progress is subjected to ridicule.

Spengler enumerates eight cultures: the Egyptian, Indian, Babylonian, Chinese, Apollonian (Greco-Roman), Magian (Byzantine-Arabic), Faustian (Western European), and Mayan; the birth of a Russo-Siberian culture is awaited. Each cultural organism, according to Spengler, has its limits predetermined (approximately 1,000 years), depending on its internal life cycle. In dying, a culture is reborn as a civilization. Civilization as opposed to culture is, on the one hand, the equivalent of the Spenglerian concepts of dead extension, a soulless "intellect," while, on the other hand, it stands within the context deriving from Nietzsche's concept of mass society. The transition from culture to civilization is a transition from creativity to barrenness, from emergence to ossification, from heroic deeds to mechanical work; Greco-Roman culture passed into civilization in the period of Hellenism, and Western culture became the civilization of the 19th century. With the onset of civilization, artistic and literary creative work becomes, as it were, unnecessary; hence Spengler proposes that we abandon cultural pretenses and give ourselves over to naked technicism.

While acknowledging the senselessness of imperialistic politicking, Spengler calls for it to be accepted as the "lot" of present and future generations. Spengler's expository style makes use of well-developed metaphors, but the metaphoric assimilation of words frequently subverts the logic of the concepts.

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S. S. AVERINTSEV [29–1392–1]

SPEYER, a city in the Federal Republic of Germany, on the Rhine, in the *Land* (state) of Rhineland-Palatinate. Population, 44,700 (1975). In addition to a food-processing industry, which produces beer and wine, Speyer has aircraft-construction, electrical-engineering, wood-products, textile, and chemical industries.

Speyer was founded in the fourth century B.C. as a Celtic settlement and later became a Roman town. It became an episcopal see in the eighth century and a free imperial city in the 13th century. In the 16th century the city was the site of several diets, including the Diet of Speyer of 1529. Speyer belonged to France from 1797 to 1814, when it passed to Bavaria; in 1949 it became part of the Federal Republic of Germany.

The visual character of the city, which has partly retained its medieval layout, is largely defined by baroque structures. Architectural landmarks include the Romanesque Speyer Cathedral (begun 1030; additions and restoration work in the 11th, 12th, 18th, and 19th centuries), the baroque Trinity Church (1701–17), the city hall (1712–26), the warehouse (1748), and burghers' houses of the 18th century. The Palatine Historical Museum is located in Speyer.

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SPEYER, DIET OF (1529), an imperial assembly of the Holy Roman Empire held from March 15 to April 22 in the city of Speyer. The diet adopted measures to halt the spread of the Reformation in Germany. In repealing the decrees of the Diet of Speyer of 1526, the diet proclaimed that the princes and the imperial cities had the right to determine the dominant religion in their holdings, prohibited the further secularization of church property, and affirmed the Edict of Worms of 1521. Some members of the diet were supporters of the Reformation (five princes, including the elector of Saxony and the landgrave of Hesse, and 14 imperial cities); they constituted the so-called Protestation—a protest against the decisions of the majority (hence the Protestants). [29–1391–2]

SPHAERIIDAE, a family of small hemispherical beetles measuring 0.6–1.0 mm in length. The hind wings have a fringe of long hairs, and the elytra are not reduced. The beetles live along shores in sand and flotsam. One species occurs in the USSR. The family has not been widely studied. [29–866–1]

SPHAERITIDAE, a family of beetles closely related to the family Histeridae. There is one genus, with three species. *Sphaerites glabratus* is distributed in Northern Europe and Siberia. The greenish black oval body is 4.5–5.5 mm long. The beetles usually live in rotting wood; they can be found in the fermenting sap of trees. The family has not been studied extensively. [29–866–1]

SPHAERIUM (also Sphaeriidae), a genus of bivalve mollusks. (Some classifications treat the mollusks as a group of genera, a subfamily, or a family.) The oval or spherical shell is 1–3 cm long; there is a beak in the center of the mantle. The mollusks are viviparous, with the newly born young acting the same as adults.

The Sphaerium are distributed mainly in northern temperate regions. There are some species in the tropics (East Africa), and some in southern temperate regions (South America and Australia). The mollusks inhabit freshwaters, burrowing to a shallow depth in the silty or sandy bottom. [29–866–3]

SPHERE, the geometric solid generated by revolving a circle about its diameter. A sphere is the locus of points in space at a distance not greater than a specified distance R from a fixed point. The fixed point is called the center of the sphere, and R is known as the sphere's radius. The volume of a sphere is $V = 4\pi R^3/3$. The surface of a sphere is also called a sphere; its area is $S = 4\pi R^2$. [29–853–1]

SPHERE GAP, a device for closing or opening an electric circuit. A sphere gap consists of two spherical electrodes separated by a gas-filled insulating interval. Sphere gaps are used as control gaps as well as devices for measuring high impulse voltages; in the latter case, the magnitude of the voltage is computed according to the distance between the spheres when a discharge occurs. [29–867–2]

SPHERICAL SECTOR (or sector of a sphere), the geometric solid generated by the rotation of a sector of a circle about one of the radii bounding the sector (Figure 1,a) or about a diameter that does not intersect the arc bounding the sector (Figure 1,b).

Figure 1

The volume of both types of spherical sector is $V = 2\pi R^2 h/3$. The area of the surface of the first type of spherical sector is $S_1 = \pi R(2h + a)$; the corresponding area for the second type of spherical sector is $S_2 = \pi R(2h + a + b)$. Here, R is the radius; h is the length of the projection, onto the axis of rotation, of the chord joining the endpoints of the arc; and a and b are the distances of the endpoints from the axis. [29–867–5]

SPHERICAL SEGMENT OF ONE BASE, a part of a sphere cut off by a plane (see Figure 1). The volume of such a solid is V

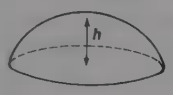

Figure 1

$= \pi h^2(3R - h)/3$, and the area of the solid's curved surface, which is called a zone of one base, is $S = 2\pi Rh$; here, R is the radius of the sphere, and h is the altitude of the segment. [29–867–4]

SPHERICAL SEGMENT OF TWO BASES, a part of a sphere bounded by two parallel planes intersecting the sphere (see Figure 1). The volume of such a solid is $V = \pi h(3a^2 + 3b^2 + h^2)/6$,

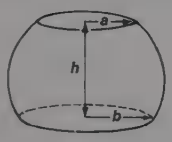

Figure 1

and the area of the solid's curved surface, which is called a zone, is $S = 2\pi Rh$; here, R is the radius of the sphere, h is the distance between the planes of the bases, and a and b are the radii of the bases. [29–867–6]

SPIEGEL, DER, an illustrated weekly magazine published in the Federal Republic of Germany. It was founded in 1947 in Hanover and has been published in Hamburg since 1952. One of the most influential weeklies in the Federal Republic of Germany, the magazine is oriented toward the liberal circles of the bourgeoisie and the intelligentsia. Circulation, 1.1 million (1977). [29–1394–1]

SPIELHAGEN, FRIEDRICH VON. Born Feb. 24, 1829, in Magdeburg; died Feb. 25, 1911, in Berlin. German writer.

Spielhagen studied first at the law faculty of the University of Berlin and then at the philosophy faculties of the universities of Bonn and Greifswald. His most famous novel, *In Formation* (1866; Russian translation under the title *One Not a Soldier in the Field*, 1867–68), shows that an exceptional personality cannot successfully transform society without the support of the masses. Spielhagen's works are noted for their veracity of portrayal, their wealth of ideas, and their declamatory spirit. After 1870 his novels became predominantly sentimental, moralizing, and melodramatic; some of them, however, such as *Storm Flood* (1876), have marked denunciatory elements.

Spielhagen's topical political novels were popular in Russia during the second half of the 19th century, especially among the Narodniki (Populists).

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SPIELMANN, a wandering actor and musician in medieval Germany and Austria. The *Spielmann*, who was similar to the French jongleur and the Russian *skoromokh* (itinerant performer), was at once a poet, actor, singer, acrobat, and dancer. In addition to heroic folk narratives, he performed tales and *Schwänke* (satiric folktales) of his own invention, appearing at fairs, folk festivals, and court celebrations. The art of the *Spielmann* was often anticlerical and antifeudal. [29–1395–2]

SPIN, in aviation, a special, critical flight regime of an airplane or glider. In a spin, the aircraft descends in a steep spiral of small radius, simultaneously turning relative to all three of its axes, and enters autorotation.

Spins are classified as tailspins and inverted (outside) spins, depending on the pattern; as steep (50°–90°), banked (30°–50°), and flat (< 30°) spins, depending on the inclination of the longitudinal axis of the aircraft to the horizon; and as stable and oscillating spins, depending on the nature of the occurrence. The descent and entry of an aircraft into a spin occurs when the aircraft achieves a supercritical angle of attack (above the stalling angle). Antispin parachutes and rockets are used in flight testing to provide for escape from a stable spin that has already developed.

The first deliberate entry of an airplane into a spin was achieved by the Russian military aviator K. K. Artseulov in 1916. The problem of spins was studied in 1918 and 1919 by the British scientist H. Glauert. The theoretical basis of spins was elaborated by the Soviet scientist V. S. Pyshnov, and subsequent experimental studies were carried out by A. N. Zhuravchenko.

S. IA. MAKAROV [29–1484–4]

SPINACIA (spinach), a genus of herbaceous annual or biennial plants of the family Chenopodiaceae. There are three species in Europe, Asia, and North America. The garden spinach (*S. oleraceae*) is cultivated in regions having a temperate climate. In the USSR it is raised in southern parts of the European portion, in the Caucasus, and in Middle Asia.

The spinach plant is 25–50 cm tall. At the beginning of vegetation, it yields a rosette of leaves, which are used as food at this stage. The plant later produces a flowering stalk. The leaves are triangularly hastate or elongate-oval and range from smooth to crimped. Male plants have less foliage and form the stalk earlier than female plants. The male flowers are gathered into panicled inflorescences, and the female ones are located in the leaf axils. Spinach is a relatively cold-resistant early-ripening plant. The seeds sprout at 4°C. They are sown in open ground at the rate of 30–50 kg per hectare (ha). Sowing may be repeated several times a summer. The yield is 150–300 quintals per ha. To make maximum use of the planting area in greenhouses and hotbeds, spinach is planted in the interrows of crops that grow slowly during the beginning of the vegetative period. Spinach leaves are rich in proteins and carbohydrates; they also contain vitamin C, B-complex vitamins, carotene, and salts of iron and phosphorus. Spinach is used widely in cooking, canning, and the production of juice.

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SPINDLE, the operating shaft of a metal-cutting machine tool. Either the tool (milling cutter, drill, grinding wheel, or the like) or the workpiece being machined may be attached to the spindle. Great demands are placed on a spindle with respect to rotational precision, which significantly affects the accuracy of machining. Thus, spindles are mounted on precision rolling-contact bearings or plain bearings; the spindles of internal grinding machines that exhibit particularly high rotation speeds (up to 100,000 rpm) are mounted on gas-lubricated plain bearings. The spindle may use a gear or belt drive, or it may be driven directly by a built-in electric motor or compressed-air turbine. [29–1396–1]

SPINED LOACH (*Cobitis taenia*), a fish of the family Cobitidae. The body is elongate and laterally compressed; there are large dark spots along the sides. Under the eye is a bipartite spine; there are six antennae around the mouth. The body length reaches 11.5 cm. The spined loach is distributed in rivers and lakes of Europe (up to 60° N lat.) and Asia. It prefers sluggish and stagnant waters with a silty-sandy bottom for burrowing. The fish feeds on small benthic crustaceans and the larvae of Chironomidae. Sexual maturity is attained in the second or third year. Spawning occurs from May through July; the roe, which number no more than 300, are deposited in batches and are benthic. The spined loach has no commercial importance; it is good bait for catching predatory fishes.

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SPINELS, a group of minerals of the class of multiple oxides with the general formula AB_2O_4 or $A(A, B)O_4$, where A is Mg, Zn, Mn, Fe^{2+}, Co, or Ni and B is Al, Fe^{3+}, Cr, Mn, Ti^{4+}, or V^{3+}.

Spinels are systems of solid solutions, with extensively developed isomorphism of the A and B cations. They are classified according to the predominant B cation as aluminum spinels, ferrospinels, chrome spinellids, titanium spinels, and vanadium spinels. Aluminum spinels include spinel, $MgAl_2O_4$; hercynite, $FeAl_2O_4$; galaxite, $(Mn, Fe)Al_2O_4$; and gahnite, $ZnFe_2O_4$. Ferrospinels include magnesioferrite, $MgAl_2O_4$; magnetite (*see* MAGNETITE); jacobsite, $MnFe_2O_4$; franklinite, $ZnFe_2O_4$; and trevorite (*see* TREVORITE). Titanium spinels include ulvospinel (*see* ULVOSPINEL) and the magnesium analog of ulvospinel, $MgTiO_4$. Vanadium spinels include coulsonite, FeV_2O_4. (*See also* CHROME SPINELLIDS.) There is nearly complete substitution among the minerals within each isomorphic series, and there is limited substitution among the members of different series.

Spinels crystallize in the isometric system, forming primarily octahedral crystals. In the unit cell of a spinel structure, 32 anions of oxygen form a closest cubic packing, with 64 tetrahedral vacancies (eight occupied by cations) and 32 octahedral vacancies (16 occupied by cations). Spinels are grouped according to the distribution of cations in the occupied tetrahedral and octahedral positions of the structure into normal spinels (eight tetrahedrons occupied by A^{2+} cations and 16 octahedrons by B^{3+} cations), inverse (eight tetrahedrons occupied by B^{3+} and 16 octahedrons occupied by eight B^{3+} and eight A^{2+} cations, with both statistical and ordered distribution of $B^{3+}A^{2+}$ cations in the octahedral vacancies being possible), and intermediate spinels. Spinel, gahnite, hercynite, and galaxite are among the spinels with normal structure, while magnetite, jacobsite, and ulvospinel are among those with inverse structure. A large number of minerals with the intermediate type of structure are known. The structures of certain sulfides with the composition RX_2S_4, where R^{2+} is Co, Ni, Fe, or Cu and X^{3+} is Co, Ni, or Cr, are classified with the structural type of spinels. Maghemite, $\gamma - Fe_2O_3$, has an abnormal spinel structure.

All the spinel minerals are characterized by considerable hardness (5–8 on Mohs' scale) and by chemical and thermal stability. Spinels are the primary carriers of the magnetic properties of rocks. Their density, reflective capacity, hardness, size of the unit cell, and magnetic and electrical properties depend significantly on the composition and nature of distribution of the cations and vary noticeably within each group. Spinels are typically formed at high temperatures. They are resistant to weathering and last well in placers. Many spinels are important ores of chromium, iron, manganese, titanium, and zinc. They are used in the production of ceramics, refractory materials, and heat-resistant paints.

Many synthetic spinels are known that contain, in addition to the cations typical of natural spinels, ions of lithium, indium, calcium, cadmium, copper, tungsten, gallium, silver, antimony, niobium, and germanium. Being variations of ferrites (ferrospinels), synthetic spinels are the basis of many magnetic materials and are used extensively in instrument-making, radio engineering, and the ceramics industry.

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G. P. KUDRIAVTSEVA [29–1396–3]

SPIRE, a vertical, sharply pointed structure surmounting a building, having the shape of a cone tapering upward. Spires are often capped with a flag or a sculpted or carved figure, such as the ship on the Admiralty spire in Leningrad. [29–1394–5]

SPITSBERGEN (ancient Russian name, Grumant; ancient Scandinavian and present Norwegian name, Svalbard), an archipelago in the Arctic Ocean, including also Bear Island and a number of small islands. Norwegian possession. Area, about 62,000 sq km. Population, 3,400 (1976).

The largest islands are Vestspitsbergen (West Spitsbergen), North East Island, Edge Island, and Barents Island. The shores are cut by fjords, primarily in the west and north. Mountain ranges alternate with plateaus and broad valleys. The highest point is Mount Newton (1,712 m), on Vestspitsbergen. Most of Spitsbergen is included in the Caledonian folding of Europe. Spitsbergen is composed of a thick (more than 10 km) sedimentary stratum of the Hecla Hoek series (Riphean quartzites, slates, dolomites, and limestones and Cambrian and Ordovician dolomites and limestones) with intrusions of Caledonian granite overlain by Devonian lagoon red sediments (up to 8 km thick). The eastern part of the archipelago (North East Island) is partially included within the hypothetical ancient platform called Barentsia, whose mantle is composed of Carboniferous and Cretaceous sand and shale strata up to 3 km thick as well as traps. There is a depression on Vestspitsbergen filled with Tertiary terrigenous strata containing seams of high-quality coal (reserves of about 8 billion tons). Coal is mined at Barentsburg and the Pyramid mine by Soviet enterprises and near Longyearbyen by a Norwegian joint-stock company.

Ice sheets and outlet and mountain glaciers, with a total area of 35,100 sq km, occupy more than one-half of Spitsbergen. The arctic marine climate is mitigated by the influence of the warm West Spitsbergen Current, a northeastern continuation of the North Atlantic Drift, which is most strongly manifested in the western part of Spitsbergen. On the coast the mean temperature in March, the coldest month in most of Spitsbergen, ranges from −13°C in the west to −21°C in the east; corresponding figures for July are 4°–5°C and 1°–2°C. Up to 400 mm of precipitation, almost exclusively in the form of snow, falls annually in the southeast, about 150 mm in the northeast, and 800–1,200 mm on the glaciers. Permanently frozen rocks are widespread. Mosses and lichens predominate, although there are about 150 species of higher plants. Dwarf willows and birches occur. Mammals include the polar bear, the reindeer, and the musk ox (brought in from Greenland), as well as sea mammals, such as the walrus, the ringed seal, the harp seal, and the beluga. The coastal waters are covered with ice most of the year. V. A. MARKIN and K. A. KLITIN

Spitsbergen was visited by the Pomory in the 11th and 12th centuries, a fact known in Western Europe as early as the 15th century. Spitsbergen was rediscovered in 1596–97 by the expedition of the Dutch navigator W. Barents. It long remained unclaimed. Between the 18th and early 20th centuries numerous Russian scientists visited the archipelago. The first Norwegian winter settlement was established on Spitsbergen in 1822.

The international legal status of Spitsbergen is defined by the multilateral Treaty of Paris of Feb. 9, 1920, signed by the United States, Great Britain and its dominions, France, Italy, Denmark, Norway, Sweden, Japan, the Netherlands, and other countries. The USSR became a de facto participant in the treaty in 1924 and formally joined it in 1935. By 1977, 40 states had signed the treaty. The treaty established Norwegian sovereignty over the Spitsbergen archipelago, including Bear Island, stipulating that it be demilitarized and neutral. It obliges Norway not to establish or permit the establishment of naval bases on Spitsbergen and not to build any fortifications. It stipulates that Spitsbergen should never be used for military purposes. The ships and citizens of the signatory states are accorded equal rights to fishing and hunting and to engage in navigation, industry, mining (the mining statute is a constituent part of the treaty), and commercial affairs on Spitsbergen and in surrounding territorial waters. The USSR has a consulate in the archipelago. A. N. TALALAEV

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SPITTELER, CARL (pen name, Felix Tandem). Born Apr. 24, 1845, in Liestal; died Dec. 29, 1924, in Luzern. Swiss writer. Wrote in German.

Spitteler studied law and theology at the universities of Basel, Zürich, and Heidelberg. From 1871 to 1879 he lived in Russia. In *Prometheus and Epimetheus* (1880–81; verse version *Prometheus the Sufferer*, 1924), an epic written in rhythmic prose, Spitteler used metaphors that paralleled the conflicts and contradictions of his epoch. His chief work, the epic poem *Olympic Spring* (1900–05; revised ed., 1910), is also characterized by an allegorical modernization of classical myth. His novel *Imago* (1906) has as its central concern the intensification in bourgeois society of the conflict between the artist and the burgher. Spitteler received a Nobel Prize in 1919.

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SPITZ, a group of breeds of house pet dogs. Spitzes are descended from the ancient Peat dog. It is believed that the modern spitz originated in southern Germany. All spitzes have a short, pointed muzzle, small, erect triangular ears, and a tail curled tightly over the back. The coat is fluffy, straight, and long, especially on the neck, where it forms a ruff, and on the top of the chest, on the tail, and on the back of the legs. Owing to a thick undercoat, the fur does not cling to the body. The dogs tolerate cold well.

The largest spitz breed is the German wolf spitz, which stands at least 45 cm high at the shoulder. Its coloration is various shades of gray. Somewhat smaller is the German great spitz, which stands at least 40 cm high at the shoulder. The most common color is pure white; other colors include black with a light bluish undercoat and dark brown without spots. The miniature spitz, distinguished by its delicacy, stands no more than 28 cm high at the shoulder. The coloration is white, black, brown, orange, or various shades of gray. White spitzes have dark eyes, eyelids, lips, and nose tips.

Spitzes have a lively temperament, are affectionate, and are capable of being taught varied and complex circus tricks. Wolf spitzes and great spitzes are also used as watchdogs in apartments and orchards. Spitzes are found almost everywhere in the world.

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SPITZER, LEO. Born Feb. 7, 1887, in Vienna; died Sept. 16, 1960, in Forte dei Marmi, Italy. Austrian philologist.

Spitzer studied at the universities of Vienna, Paris, Rome, and Leipzig. He became a professor at the universities of Bonn in 1922, Marburg in 1925, and Cologne in 1930. In 1933 he emigrated from fascist Germany and took up a post at the University of Istanbul, and from 1936 to 1956 was a professor at the Johns Hopkins University in Baltimore. Spitzer was influenced by the aesthetic idealism of K. Fossler. His principal works dealt with the literary stylistics of Romance languages, particularly French and Spanish; he also did research in various areas of Romance linguistics. Spitzer was the editor of *Hugo Schuchardt: Breviary* (1922).

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Wellek, R. "Leo Spitzer (1887–1960)." *Comparative Literature*, vol. 12, 1960. (Contains bibliography.) [29–1399–3]

SPITZWEG, CARL. Born Feb. 4, 1808, in Munich; died there Sept. 23, 1885. German painter and graphic artist; one of the greatest representatives of the Biedermeier style.

A self-taught artist, Spitzweg painted scenes from the lives of city dwellers and idyllic landscapes. He is most famous for his small genre paintings, such as *The Widower* (New Pinakothek, Munich), *Serenade* (Schackgallerie, Munich), and *The Hypochondriac* (Schackgallerie, Munich). These subtly poetic works by Spitzweg are distinguished by warm humor; drawing on characteristic human types and details from everyday life, they are noted for their expressive use of color.

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SPLINE-GRINDING MACHINE, a metal-cutting machine tool designed to grind splined articles. External splines (on shafts) are ground to the minor diameter and bearing sides; internal splines (on sleeves) are ground to the major diameter and bearing sides. The machining may be done by a single profiled or flat abrasive disk or by a set of several disks. The most efficient method is to grind the entire spline space with a single specially shaped disk. [29–1301–5]

SPLINE-HOBBING MACHINE, a metal-cutting machine tool for spline manufacture. Straight-sided and involute splines are generated on shafts with a hob. The hob rotates and simultaneously performs a feed motion, moving along the axis of the workpiece; the workpiece also rotates at a speed that depends on the number of splines being generated. In a similar manner, automatic milling machines with circular grooving cutters are used to machine slots on screwheads. [29–1301–4]

SPLINT, a device for immobilizing injured parts of the body. A splint is applied to a fracture, sprain, or areas with extensive injury to soft tissues; it is also applied in cases of inflammatory diseases of the limbs, in cases of burns, and after surgery on bones, blood vessels, and nerves in the extremities. A distinction is made between transport and therapeutic splints.

Transport splints are applied as a first-aid remedy before the victim is transported to a medical facility. The purpose is to immobilize the injured part and prevent the development of traumatic shock or increased bleeding when bone fragments are moved. Standard transport splints are made of wood, of wire (several types measuring 75 to 100 cm in length and 6 to 10 cm in width are available), which easily conforms to the contour of the limb regardless of the site of the injury, or of plastic. There are also pneumatic and vacuum types. If standard splints are not available, immobilization during transport can be achieved by improvising splints from available materials, such as a board, a ski, ■ piece of plywood, or a stick. In applying a transport splint it is important that the two segments adjoining the injured one also be immobilized. For example, in the case of a shin fracture, the splint is secured to the foot, crus, and thigh by bandages; in the case of a shoulder fracture, it is applied to the forearm, shoulder, and chest. The splint should be padded with soft material to prevent ulceration.

Therapeutic splints are used for extended immobilization, for the length of time required for a fracture to heal. For example, metal splints are used in skeletal traction. In stomatology, splints made of wire or quick-hardening plastic, special appliances, or arches are used to immobilize the parts in fractures of the upper or lower jaw and after osteoplastic surgery of the jaw.

V. F. Pozhariskii [29–1209–1]

SPOHR, LUDWIG (also Louis Spohr). Born Apr. 5, 1784, in Braunschweig; died Oct. 22, 1859, in Kassel. German composer, violinist, conductor, and teacher.

The son of a doctor, Spohr studied violin under F. Eck, with whom he made a trip to Russia. He held the post of *kapellmeister* in Braunschweig and Gotha and was a concertmaster in Vienna from 1812 to 1816; he also appeared on occasion in London and Paris. In 1822, Spohr was appointed *kapellmeister* to the court at Kassel. His European concert tours as a violinist and conductor were enormously successful.

As a violinist, Spohr was noted for his full, singing tone and impeccable technique. The founder of the 19th-century German school of violin playing, he educated several generations of violinists, including F. David, A. Kömpel, and L. Saint-Luban; he was the author of *Violin School* (1831). Spohr, who played a major role in the development of conducting into an independent performing art, was among the first to use the baton. As a composer, he was a representative of the romantic trend in German music.

Spohr composed ten operas, with plots taken, for the most part, from historical or fantastic subjects; the most popular were *Faust* (stage 1816 in Prague under the direction of C. M. von Weber), *Jessonda* (1823), *The Alchemist* (1830), and the *Crusaders* (1845). Among his other works are nine symphonies, 15 violin concerti, and 34 string quartets. Spohr's *Autobiography* (vols. 1–2, 1860–61) provides a broad survey of the musical life of the first half of the 19th century.

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SPOTTED REDSHANK (*Tringa erythropus*), a bird of the family Charadriidae of the order Charadriiformes. The body is about 30 cm long. The breeding plumage is slate black with white speckles, and the legs are reddish brown. The spotted redshank is found in the northern part of the forest zone, in the forest-tundra, and sometimes in the shrub tundra of Europe and Asia. In the USSR it is distributed from the Kola Peninsula east to the lower courses of the Kolyma and Anadyr' rivers. It is a migratory bird, wintering in Africa and southern Asia. Nests are built along the grassy shores of shallow lakes. The clutch contains four eggs, which are usually incubated by the male. The bird feeds primarily on aquatic insects and other invertebrates; sometimes small fish and tadpoles are eaten. [29–1577–2]

SPRANGER, EDUARD. Born June 27, 1882, in Grosslichterfelde, near Berlin; died Sept. 17, 1963, in Tübingen. German idealist philosopher, psychologist, and educator.

Spranger was a professor at the universities of Leipzig (from 1911), Berlin (1920–46), and Tübingen (from 1946). In 1944 he was arrested and confined in the military prison at Moabit. Spranger's philosophical ideas reveal the influence of W. Dilthey and the philosophy of life, as well as H. Rickert's teachings on values. Spranger's chief philosophical work is *Types of Men* (1914), in which he develops a typological analysis of personality; it is this "structural" psychology that Spranger, in the spirit of neo-Kantian differentiation of the sciences of the spirit and the sciences of nature, opposes to the "psychology of elements" of natural science. According to Spranger, the psychology of the sciences of the spirit, or "understanding" psychology, should examine the spiritual process as a whole, with all its semantic links—that is, as included in a specific cultural "content." Spranger considered comprehension of individual spiritual structure to be the only way to know any spiritual forms. Calling for liberation from sociological illusions—the reduction of science, art, morality, and religion to social forces—Spranger acknowledged the unbreakable link between the social form and the cultural content; however, he gave the deciding role not to the forms of social relations, but to the individual human and objective cultural content that develops in these forms and that determines their value.

Spranger also wrote about the theory and history of pedagogy (including works on W. von Humboldt, J. H. Pestalozzi, and F. Froebel), as well as a work entitled *The Psychology of Youth* (1924; Russian translation in the anthology *The Pedagogy of Youth*, 1931).

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Paffrath, F. H. *E. Spranger und die Volksschule*. Bad Heilbrunn, 1971. IU. N. POPOV [29–1408–2]

SPRATTUS, a genus of small marine fish of the family Clupeidae. Sprats measure up to 13–18 cm in length and weigh up to 10–12 g. Sexual maturity is reached at one to two years of age; the life-span is five to six years. Sprats feed on tiny zooplankton. The USSR has one species, *Sprattus sprattus*, which is found in the North and Baltic seas. The subspecies *S. sprattus phalericus*, which is smaller, inhabits the Mediterranean and Black Seas; these serve as food for predatory birds and dolphins. Sprats are also found near Australia, around New Zealand, and on the Patagonian Shelf.

The term "sprats" is sometimes used for many kinds of canned fish. Canned sprats were initially prepared only from the Baltic sprat, a subspecies of *S. sprattus*. Later, the tiulka, Baltic herring, herring fry, and other small fish came to be canned as sprats.

REFERENCE
Zhizn' zhivotnykh, vol. 4, part 1. Moscow, 1971. [29–1410–1]

SPREE, a river in the German Democratic Republic and West Berlin, a left tributary of the Havel River of the Elbe River basin. The Spree is 398 km long and drains an area of 10,100 sq km. It rises in the western Sudetes, in the northern foothills of the Lusatian Mountains, and flows through the Central European Plain. High water is in the spring, and there is a low-water period in the summer. The river's flow is strictly regulated by dams and lakes. The mean flow rate is approximately 40 cu m per sec; the river does not freeze over every year. The Spree, parts of which are canalized, forms part of a waterway that links the Oder with the Elbe. The city of Berlin is situated on the river. [29–1408–3]

SPREMBERG, a city in the German Democratic Republic, in the *Bezirk* (district) of Cottbus, on the Spree River. Population, 22,500 (1975). Spremberg produces textiles, plastics, and iron alloys. A 450-megawatt thermal power plant is located in the city. [29–1409–1]

SPRENGER, ALOYS. Born Sept. 3, 1813, in Nassereith; died Dec. 19, 1893, in Heidelberg. Austrian Orientalist and physician.

Sprenger studied medicine and Oriental languages in Vienna. After working on Arabic manuscripts, he defended a dissertation on the history of Arab medicine in Leiden in 1840. From 1843 to 1854, Sprenger worked for the British East India Company in India.

Sprenger taught Oriental languages at the University of Bern from 1858 to 1881; in 1881 he began teaching in Heidelberg. His chief work is a biography of Muhammad. Sprenger was especially interested in the influence of Islamic culture on the culture of the European Middle Ages.

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SPRINGER (full name, Axel Springer Verlag A.G.), a newspaper concern in the Federal Republic of Germany (FRG). The firm was established in Hamburg by A. Springer in 1947 and be-

came a joint-stock company in 1970. Springer publishes several dailies, notably *Die Welt*, *Hamburger Abendblatt*, and *Bildzeitung*, with a circulation of more than 40 percent of the total for all dailies in the FRG. It also publishes Sunday newspapers and magazines.

Springer publications regularly print propaganda against the USSR and other socialist countries and against the communist movement and democratic forces within the FRG. [29–1409–4]

SPUR. (1) In birds, a horny spine situated on a protuberance of the bones of the posterior or anterior legs. The spur serves as a defensive or offensive weapon. In Phasianidae the spur is located on the dorsal side of the metatarsal bone; it occurs most often in males. The tooth-billed pigeon, the spurred lapwing, and jacanas have a single spur, whereas screamers have two spurs on the bend of the wings. Spur-winged geese have sharp spurs on the metatarsal bones and on the wing folds.

(2) In cloacal mammals, spurs are found on the hind limbs, near the tarsus. They are well developed in males; females have only a rudiment of a spur. Inside the spur there is a duct of a poisonous gland, which is weakly expressed in females. The sharp back claws on the inside digits of the hind legs of the clawed frog are also referred to as spurs. [29–1407–2]

SPUR, a small, curved piece of metal that has a spike or a small wheel and that is secured to a horseman's shoe at the heel. Spurs are used to control the horse. Spurs were first used by the Celts, with the earliest archaeological finds dating from the fifth century B.C. Spurs were mentioned by Greek authors as early as the fourth century B.C. Although such gear was not worn in the ancient East, medieval Eastern peoples did use in its place a point on the rear of the stirrup.

Spurs were first worn in what is now the USSR in the first and second centuries A.D., among tribes of the Lipitsa and Przeworsk cultures, in what is now the Western Ukraine. Spurs came to be widely used in ancient Rus'. In the Middle Ages, spurs were an attribute of knighthood. The present-day spur is a small, curved implement with a small wheel, or rowel, attached to the fork at the end of the spur's neck. [29–1407–1]

SPUR, CALCANEAL, a thornlike bony excrescence on the lower surface of the calcaneal bones where the foot ligaments or Achilles tendon are attached; a type of osteophyte. Calcaneal spurs occur most frequently as a result of metabolic disorders or overtaxation of the foot ligaments in flatfootedness. Although a spur can cause severe pain, it is not visible externally. Detection is by means of a foot X ray. Treatment includes physical therapy, the use of special orthopedic inner soles and shoes, and—in cases of persistent severe pain—roentgenotherapy and surgery. [29–1407–4]

SPUR-WINGED GOOSE (*Plectropterus gambensis*), a bird of the order Anseriformes. The male measures about 1 meter in length and weighs up to 8 kg; the female is somewhat smaller. On the fold of the wing is a blunt, horny spur (hence the name). The plumage is white with black; there is a violet-green iridescence on the back and wings. The naked outgrowth on the forehead and bill is red. The spur-winged goose is distributed in Africa, south of the Sahara. It keeps to riverbanks and large swamps. It nests in reed thickets, on termite nests, among stones, or in the burrows of aardvarks. The clutch contains seven to 12 white eggs. The spur-winged goose is a game bird. [29–1408–1]

SQUALL, a sudden, brief increase in wind force that is accompanied by changes in wind direction. Wind velocity in a squall often exceeds 20–30 m/sec. A squall lasts several minutes, sometimes with a succession of gusts. Squalls may occur with the approach of storm clouds or clouds preceding atmospheric cold fronts and are often attended by showers, hail, or thunderstorms. Violent squalls can cause great destruction. [29–1253–4]

SQUAMATA, a subclass or order of Reptilia. The Squamata include three orders or suborders: Sauria (lizards), Amphisbaenidae, and Serpentes (snakes). The characteristic feature is the movable joint between the quadrate bone of the upper jaw and the skull. The upper body is covered with horny scales, plates, and squamae. [29–530–2]

SRI KSETRA, a state of the Pyu people of Burma that existed until the 830's. Sri Ksetra, which is first mentioned in Chinese sources of the fourth century A.D., occupied most of the Irrawaddy River valley and in the south bordered the Mon cities; its first capital was the city of Tarekitara, or Sri Ksetra. The state reached its peak under the Vikrama dynasty, which ruled in the seventh and eighth centuries. Sri Ksetra maintained extensive commercial and cultural relations with India and China. The dominant religion was Buddhism.

In the eighth century, Sri Ksetra became a dependency of the state of Nan Chao, and its capital was moved north to the city of Khalin. In 832, according to the Chinese chronicles of the T'ang Dynasty, the troops of Nan Chao overran and leveled the Pyu capital; the surviving Pyu became slaves. The Pyu, a people of the Tibeto-Burmese group, subsequently were assimilated by the Burmese; they are last mentioned between the 11th and 13th centuries as one of the peoples inhabiting the Pagan state.

Sri Ksetra considerably influenced the development of later Burmese states (particularly the Pagan state), primarily in the area of Buddhist ideology and culture.

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I. VSEVOLODOV [29–1417–2]

SRI LANKA (Ceylon until 1972), Republic of Sri Lanka, a state on the island of the same name in the Indian Ocean, lying off the southeastern coast of the Hindustan Peninsula. Member of the British Commonwealth of Nations. Area, 65,600 sq km. Population, 13.7 million (1976). The capital is the city of Colombo. For administrative purposes the country is divided into nine provinces, which in turn are subdivided into 22 districts.

Constitution and government

Sri Lanka is a republic. The present constitution was adopted on May 22, 1972 (amendments were adopted in 1977). The head of state is the president, elected for a term of six years. He is also the chief executive and the commander in chief of the armed forces. He has the right to dissolve the parliament. He appoints the prime minister and other ministers and determines their functions. The highest legislative body, a unicameral parliament, is the National State Assembly, whose members are elected for a term of six years. All citizens over 18 years of age have the right to vote. The government—the Council of Ministers—is headed by the prime minister.

Each district is administered by a government official, appointed by the president from among the members of parliament. Town, urban, and municipal councils and village committees constitute the local bodies of authority.

The judiciary comprises the Supreme Court, which also exercises appellate jurisdiction, district and magistrates' courts (for criminal cases), and rural courts, which exercise jurisdiction with respect to petty crimes and civil disputes. The judges are appointed by the Council of Ministers, while the members of the Supreme Court are appointed by the president.

Natural features

The island's coasts are primarily low-lying, with numerous lagoons. Rimmed by coral reefs, they are weakly indented, with isolated ingression-type gulfs.

Terrain. More than 80 percent of Sri Lanka is occupied by lowland plains, dotted with isolated rocky inselbergs. Located in the central and southern parts is a steed highland, with flattened surfaces and steep fault scarps; the upper stratum is formed by table surfaces and steep summits, including Mount Pidurutalagala, which rises to an elevation of 2,524 m, and Adam's Peak.

Geological structure and mineral resources. Sri Lanka occupies part of the Hindustan Shield of the Indian Plate, the foundation of which is composed of gneisses, granite gneisses, charnockites,

amphibolites, schists, quartzites, and marbles with intrusions of Upper Proterozoic granites (from approximately 1 billion years ago) and dikes of dolorites and pegmatites. Carbonatites also occur. Rocks of the foundation outcrop to the surface on nine-tenths of the territory of Sri Lanka; in the north the foundation is overlain by a mantle of Jurassic and Miocene sedimentary rocks, including sandstones, siltstones, argillites, limestones, sands, and clays. Coastal marine Quaternary deposits (pebbles, gravel, sand, and clay) are widespread on the Indian Ocean coast. Laterites are developed in the crystalline rocks.

The principal minerals are graphite (with total reserves of 20 million tons), precious and semiprecious stones (sapphire, ruby, aquamarine, topaz, moonstone, chrysoberyl, coastal-marine black sands containing ilmenite and rutile (2 million tons in the form of TiO_2), zircon, and monazite. Other important minerals are kaolinite and other clays, as well as limestones, feldspars, and quartz sands.

Climate. The climate is the monsoon type; in the north and east it is subequatorial, and in the south and west, equatorial. The temperature is 26°–30°C on the plains, dropping to 15°–20°C in the mountains; it changes little in the course of the year. The greatest amount of precipitation (as much as 5,000 mm annually) falls on the southwestern slopes of the highland, primarily during the summer monsoon); in the foothills the annual precipitation reaches 2,000 mm. On the northeastern slopes of the highland and on the adjacent plains most of the precipitation, which amounts to 1,000–2,000 mm annually, falls during the winter monsoon; there is a dry season lasting eight to nine months. The least amount of precipitation, amounting to less than 1,000 mm a year, occurs on the northwestern and southwestern coasts. During the spring and autumn, many areas experience abundant convective afternoon showers.

Rivers and lakes. The river network is dense. Short, copious rivers, the largest of which is the Mahaweli Ganga, rise in the central highland and radiate out in all directions, forming waterfalls in the mountains. They are used for irrigation, primarily in the north and east; numerous reservoirs have been constructed.

Soil and flora. The soils are red earths and lateritic; there are bands of alluvial soils in the river valleys and on the coasts. Natural vegetation covers about three-fourths of the island. On the southwestern slopes of the mountains and in some parts of the foothills, humid equatorial forests have been preserved; with individual trees reaching 80 m in height, they are characterized by an enormous diversity of species. Trees include palms and dipterocarps; forests have dense undergrowth and abundant mosses. The plains in the island's northern and eastern parts and the adjacent highland slopes are covered with secondary deciduous forests, with trees of 9–12 m. The plateaus are occupied by savanna-type wasteland, consisting of high, coarse grasses and individual trees; elfin woodland occurs at elevations above 2,000 m. Thickets of prickly shrubs grow along the northwestern and southeastern shores; mangrove forests and coconut palms grow in certain areas near the coasts.

Fauna. The fauna is of the Indo-Malaysian type, with some Madagascar species, for example, lemurs. Mammals include elephants, leopards, lynx, five species of monkeys, deer, wild boars, and civets. There are numerous birds (parrots, peacocks, flamingos, storks), lizards, snakes, and crocodiles. There are also many types of insects, including butterflies, ants, termites, and malarial mosquitoes.

Preserves. The flora and fauna are preserved in botanical gardens (the largest is Peradeniya, near the city of Kandy), national parks (Gal Oya, Yala, Vilpatthu), and preserves (Rittigalla, Wasgomuva, Hakgala).

Iu. K. Efremov (physical geographical characteristics) and R. E. Tkacheva (geological structure and minerals)

Population

Seventy percent of the population are Sinhalese, and 20 percent, Tamils. The Sinhalese, who number 9.8 million (1975; here and below the population figures are estimated), inhabit the western, central, and southern parts of the country; they speak Sinhalese. The Tamils, who number 2.6 million, comprise two separate groups: the Sri Lankan Tamils, who live in the northern and eastern parts of the country, and the Indian Tamils, who live in the central part; they speak Tamil. Minority ethnic groups of mixed origin include the Ceylon Moors (854,000), the Burghers of Ceylon (44,000), and Malays (42,000). The Veddas are the descendants of the oldest population.

Sinhalese is the official language. About 67 percent of the population (Sinhalese) are Buddhists, more than 17.5 percent (Tamils) are Hindus, 7 percent (Moors and Malays) are Muslims, and another 7 percent (the Burghers, some Tamils, and others) are Christians, primarily Catholics.

The natural population increase (2.2 percent annually in the period 1970–74) is due to a high birthrate and a significant decline in the death rate. At the end of the 19th and beginning of the 20th centuries, a major role in the population increase was played by emigration from India, for the most part, of Tamil agricultural workers. In 1965 a state policy of controlling the birthrate was announced. In 1971, 51.3 percent of the population were males. A large proportion of the population is young; 43 percent are under the age of 15.

In 1971, 40.6 percent of the economically active population were engaged in agriculture; these were, for the most part, peasants and plantation workers. The average population density is more than 200 persons per sq km. In 1971 the urban population constituted 22.4 percent of the total.

The most important cities are Colombo (607,000; 1976), Jaffna, Kandy, Galle, and Moratuwa.

Historical survey

Rise of early state formations (to the eighth century A.D.). The area now occupied by Sri Lanka was settled during the Paleolithic period. The most ancient inhabitants were hunting tribes, probably the ancestors of the modern Veddas. The island underwent several waves of migration, primarily from India. According to written sources, the first Indian settlers, under the leadership of Prince Vijaya, came to the island in the fifth century B.C., bringing with them the culture of growing rice. The indigenous population intermixed with the new arrivals, thus giving rise to the Sinhalese ethnic group, centered in the north and southeast. Sinhalese settlements were self-sufficient village communities.

The first major state formation arose under Devanampiya Tissa in the third century B.C., a period of history called the Anuradhapura period, after the name of the state's capital. Agriculture attained considerable development (there was intensive construction of irrigation networks), as did handicraft production and trade. Close state and cultural contacts with India facilitated the penetration of Buddhism. The Buddhist clergy played an important role in economic and cultural life. In the fifth century, internecine strife led to the disintegration of the state, which enabled the Tamil conquerors, orginally from southern India, to seize considerable parts of the island. In the sixth century Anuradhapura once again became the capital of the state. In the sixth and seventh centuries, the struggle for the throne continued between the Sinhalese and Tamil rulers.

Development of feudal relations (eighth to late 18th centuries). In the eighth century, a Sinhalese dynasty became firmly entrenched in Anuradhapura. Large landholdings were concentrated in the hands of the chief of state. Feudal relations began developing. From the eighth through 13th centuries Polonnaruwa was the capital of a large Sinhalese state, whose rulers waged a struggle against the separatism of the big feudal lords and repelled incursions from the southern Indian states, such as Pandya. The wars inflicted enormous damage and led to the disintegration of the unified state. In the 13th century the inhabitants began settling the central and southwestern regions of the island. In the 15th century three large states were formed: the Sinhalese kingdoms of Kotte (in the west and southwest) and Kandy (in the central regions) and the Tamil kingdom of Jaffna (in the north).

The country's political fragmentation and economic weakness facilitated European expansion. In 1517 the first trade agreement was concluded between the Portuguese, who threatened to use military force, and the rulers of Kotte. The Portuguese obtained the right to export spices and other goods from the island to Europe. They created a network of forts along the western coast, and the fort of Colombo became their stronghold. To consolidate

their domination, the Portuguese sent Catholic missionaries to the island for the purpose of converting the indigenous population to Catholicism. The protracted wars waged by the Portuguese against the Kandy state ended in defeat.

In the mid-17th century, the rivalry between the Dutch and the Portuguese over the island intensified. In 1658 the Dutch expelled the Portuguese and seized up to one-fourth of the island. The Dutch monopolized trade in cinnamon and a number of other items. The specialization of many regions in the production of commodity crops led to the development of commodity-monetary relations. The Dutch colonialists harshly exploited the country's population, which led to an uprising in 1723. In the mid-18th century the conflict between the English and the Dutch for possession of the island intensified. In 1795–96, the Dutch were expelled.

British colonial domination; development of capitalist relations and growth of the national liberation movement (to 1917). The areas seized by the British colonialists were made part of the Madras Presidency, administered by the British East India Company. The British introduced heavy taxes. At the end of 1796, a major anti-British uprising broke out; it was suppressed by the British authorities, who nevertheless were compelled to abolish some of the taxes and promulgate administrative reforms. In 1802, Ceylon became a separate British colony. In order to consolidate their domination, the British colonial authorities decided to eliminate the independent Kandyan state. Great Britain's war against Kandy in 1803–05 ended in a British defeat, but in 1815 the British succeeded in annexing the Kandyan state, the last stronghold of Sinhalese independence. The seizure of the Kandyan state exacerbated relations between the Kandyan feudal lords and the British colonialists. In 1818 almost all of the area formerly occupied by the Kandyan state was engulfed by an anti-British uprising, headed by the Kandyan aristocracy and the Buddhist clergy. The uprising was harshly suppressed, and the Kandyan feudal aristocracy was deprived of many privileges. The former Kandyan state was divided into 11 districts and placed under the control of British officials. A standardized administrative and taxation system was introduced throughout the entire island. In 1833 an advisory body—the Legislative Council—was instituted under the governor's jurisdiction, and the trade monopoly of the British East India Company was transferred to the colonial authorities. The colonialists increased the tax burden, which engendered anti-British uprisings among the peasants in the areas of Kandy, Matale, and Kurunegala (1848) under the leadership of the Kandyan aristocracy and the Buddhist clergy. The uncoordinated peasant detachments were unable to offer substantial resistance to the British forces.

In the 1830's a plantation economy gradually developed on the lands taken from the peasants. By the 1850's, vast tracts of land were occupied by coffee plantations. The expropriation of the rights of the peasants intensified. In the 1890's tea became the chief export crop. The plantation crop production was dominated by British colonialists; Ceylonese landowners were also involved in plantation agriculture, but local capital was in a subordinate position.

The nascent Ceylonese bourgeoisie demanded political and economic rights. An indigenous intelligentsia began developing. The first national sociopolitical organization—the Ceylon League—was founded in 1864. Its members advocated increased Ceylonese participation in the country's rule; in particular, they sought a Ceylonese majority in the Legislative Council. In the second half of the 19th century various educational and religious reforms were instituted. By the turn of the 20th century, the country's transformation into an agrarian raw material adjunct of the home country was complete. Nevertheless, capitalist relations developed rapidly. A working class emerged, consisting primarily of plantation workers, mostly immigrants from India. Tenant farming became the predominant form of peasant land utilization. Criticism of the British colonial system by the indigenous bourgeoisie and other groupes of the population grew. The national liberation movement of the peoples of India exerted a considerable influence on the development of the anticolonialist struggle. At the beginning of the 20th century a number of bourgeois political organizations were formed that demanded the implementation of constitutional reforms. Leaders of the national liberation struggle included J. Peiris, P. Arunachalam, P. Ramanathan, D. B. Jayatilaka, and E. W. Perera. The labor movement developed at the beginning of the 20th century, and one of the first major actions of the working class was a railroad strike (1912).

During World War I (1914–18), the colonial exploitation of Ceylon intensified. Traders and moneylenders took advantage of the colony's dependence on the importation of foodstuffs and raised the prices on rice and other commodities. In 1915 spontaneous outbreaks occurred among the poorest groups of the urban and rural population against the Muslim traders. The British colonialists unleashed repressive actions against the participants in these outbreaks, as well as against the leaders of the national liberation movement. The terror imposed by the British colonial authorities impelled new groups of the Ceylonese people to join the liberation struggle.

Development of the struggle for national independence (1918–48). Led by the nationalist bourgeoisie, the anti-imperialist movement took on the form of a struggle for democratic reforms. In May, 1917, P. Arunachalam founded the Ceylon Reform League. In the period 1917–19, conferences of bourgeois representatives were convoked to revise the constitution. The Great October Socialist Revolution exerted an important influence on the development of the national liberation and labor movement on the island.

The first major political party—the Ceylon National Congress (CNC)—was founded in December 1919 by P. Arunachalam, P. Ramanathan, D. B. Jayatilaka, D. S. Senanayake, and F. R. Senanayake, among others. The CNC program included a demand for the creation of an elected Ceylonese majority in the Legislative Council, for implementation of the principle of territorial representation, and the formation of a responsible government. In 1922 the Ceylon Labor Union was formed.

Political and economic demonstrations by the working masses intensified during the worldwide economic crisis. Between 1929 and 1933 there were major strikes by dockworkers, streetcar operators, and printers. In 1931 a constitution was adopted, which provided for the creation of an elected parliament—the State Council. The introduction of universal suffrage was an important political victory for the democratic forces. In the 1931 and 1936 elections a majority of seats in the State Council were won by members of the CNC, representatives of the Sinhalese big bourgeoisie. At the beginning of the 1930's, the first Marxist circles emerged, which established ties with the working class. The Suriya Mal aniticolonialist movement developed in the country (*suriya mal* is the name of the flower that was sold by the adherents of the movement to build up a fund to assist the workers); the movement attracted the broad masses to the anti-imperialist struggle. In 1935 the Socialist Equality Party (Lanka Sama Samaja Party; LSSP) was founded.

World War II (1939–45) brought enormous hardships to the people of Ceylon. There were severe food shortages, since Ceylon lost its traditional supplier of rice as a result of the Japanese occupation of Burma. The increase in prices on essential goods considerably surpassed the increase in wages. The export of the plantation products continued to bring in large profits to British firms and the big Ceylonese planters. In 1942 the CNC demanded the abolition of the colonial regime after the end of the war. A decisive struggle to consolidate the democratic forces and attain independence was led by the Communist Party of Ceylon (CPC), founded in July 1943. The growth of the anti-imperialist movement compelled the British government to appoint a commission to draft a new constitution for Ceylon. In 1945–46 the commission's report and draft of a new constitution were made public. The refusal of the British imperialists to grant immediate independence provoked widespread protest. There were many large-scale demonstrations by the workers, including a general strike in May and June 1947. Under pressure from the national liberation movement of the peoples of Ceylon and the neighboring Asian countries, the British government on Feb. 4, 1948, granted dominion status to Ceylon.

After the achievement of political independence. After the achievement of independence, political power in the country was attained by the bourgeois United National Party (UNP; founded 1946), headed by D. S. Senanayake. According to the conditions

of the Anglo-Ceylonese defense agreement (1947) the British were to retain troops and military bases on the island. The Senanayake government adopted a course that was not directed at the decisive abolition of the colonial heritage. The British monopolies continued to occupy the key positions in the export of plantation crops and to control the country's economy. Persons of Indian origin were deprived of their citizenship and the right to vote. The policies of the UNP government were subjected to criticism by the working class and a number of national bourgeois groups. The policies of the UNP were opposed by a group of Tamil bourgeoisie, which in 1949 established the Federal Party (FP). In 1951 a national bourgeois group, led by Solomon Bandaranaike, split from the UNP and formed the Sri Lanka Freedom Party (SLFP), whose program included demands for the abolition of the colonial heritage and the implementation of progressive socioeconomic reforms. The forces in opposition to the government rallied around the SLFP and created the People's United Front (Mahajana Eksath Peramuna; MEP), which defeated the UNP in the 1956 parliamentary elections. The Bandaranaike government embarked on a program reinforcing the country's independence and promulgating progressive socioeconomic reforms. British military bases were closed down in 1957. Diplomatic relations were established with the USSR (1957) and other socialist countries (1957–58). In 1958 an agreement was signed with the USSR on economic and technical cooperation. Plans for economic development were worked out. The government's progressive course provoked dissatisfaction among the reactionary elements, who organized a conspiracy; Solomon Bandaranaike was assassinated in September 1959.

In the parliamentary elections held in March 1960, the UNP gained a victory, but the new government soon received a vote of no confidence. The SLFP emerged victorious in the 1960 parliamentary elections. The government was headed by the party's new leader, Sirimavo Bandaranaike, the widow of Solomon Bandaranaike. It adopted a nonaligned course in foreign policy. The economic program sought to accelerate industrial development, restructure agriculture, and expand the state sector. The government nationalized three foreign oil companies (1963). With Soviet aid, it carried out the construction of enterprises. An agrarian reform was instituted in 1958 (the law on lands under rice), which sought to protect the rights of peasant tenant farmers and poor peasants. Important social and cultural reforms were also promulgated.

In the course of the struggle against the reactionaries, the left-wing forces gradually united; an expression of the growth of their solidarity was the creation in 1963 of the United Left Front (ULF), which included the CPC, the LSSP, and the MEP (the name adopted in 1960 by the Revolutionary Socialist Party of Ceylon, founded in 1951). In 1964 an SLFP-LSSP coalition government was formed. Because of the government's attempts to further democratize the country, the right-wing members of the SLFP left the party. The opposition elements created a government crisis, and the coalition government was compelled to resign.

In the 1965 parliamentary elections, a relative majority of seats was won by the UNP. Dudley S. Senanayake, the UNP leader, assured himself of the support of the FP and a number of Sinhalese bourgeois parties and formed a government. The new government adopted a policy of encouraging the private sector and attracting foreign capital. The mass firing of workers and trade union leaders who had participated in the strike of Jan. 8, 1966, was carried out. Nevertheless, the workers continued their struggle to improve their economic position and political rights. A major strike under the leadership of the Joint Committee of Trade Union Actions took place at the end of 1967 and the beginning of 1968; there were many strikes in 1968 and 1969.

Cooperation between the UNP and the FP was conditional upon a number of concessions to the Tamil leaders. A great deal of pressure on the UNP government was also exerted by the Sinhalese nationalists. Increasing disagreements between the Sinhalese and Tamils led to the withdrawal of the FP from the government in 1968. In June 1968 a platform was worked out for joint actions by the SLFP, the CPC, and LSSP; the United Front (UF), whose platform was supported by the country's progressive forces, was created. In the May 1970 parliamentary elections, the UF emerged victorious, having won 115 seats out of a total of 151. The UF government, which included members of the SLFP, LSSP, and CPC, was headed by Sirimavo Bandaranaike. It proclaimed a program of broad democratic reforms directed at eliminating the remnants of colonialism. In foreign policy the government sought to expand cooperation with peace-loving nations. State control over important economic spheres, primarily foreign trade, increased, and the activities of the state sector were strengthened. The UF government came under the attack of right-wing forces, who took advantage of objective economic and political difficulties to sabotage the government's efforts. The reactionary elements succeeded in provoking an antigovernment revolt by left-wing extremist youth (April and May 1971).

On May 22, 1972, Ceylon was proclaimed the Republic of Sri Lanka. The new constitution abolished all forms of the country's dependence on Great Britain. Of great importance for strengthening the Republic of Sri Lanka's independence was the promulgation of a peace-loving foreign policy. Contacts with the USSR and other socialist countries continued to expand. Sri Lanka has taken part in all the conferences of the nonaligned countries. It made a great contribution to the organization of the Fifth Conference of the Heads of State or Government of Nonaligned Countries, held in Colombo in August 1976.

Agrarian reforms were developed further. A maximum was established for the amount of land that could be owned, and excessive amounts held by large foreign and indigenous landowners were confiscated. However, the government was unable to improve substantially the position of the working masses; it could not prevent price increases on essential goods, nor could it bring a stop to the growth of unemployment. Pressure from the right wing of the SLFP complicated relations within the ruling coalition. The exacerbation of disagreements between the LSSP and the other parties of the coalition supporting the UF platform led to the withdrawal from the government of the LSSP in September 1975 and the CPC in February 1977. In May 1977 the CPC, LSSP, and People's Democratic Party (founded 1977) formed the United Left Front. That same year, the Tamil nationalist parties created the Tamil United Liberation Front. In the parliamentary elections of the July 1977, the UNP emerged victorious. Its leader, J. R. Jayewardene, became head of the government. In February 1978 he became president. E. D. TALMUD

Political parties and trade unions

The United National Party (UNP), founded in 1946, expresses the interests of the middle and upper bourgeoisie. The Sri Lanka Freedom Party (SLFP), founded in 1951, expresses the interests of various strata of the national bourgeoisie. The Lanka Sama Samaja Party (LSSP; Socialist Equality Party) was founded in 1935. The Communist Party of Sri Lanka (CPSR) was founded in 1943. The People's Democratic Party was founded in 1977. The Federal Party (FP), founded in 1949, expresses the interests of Tamil bourgeois nationalist circles. The United Tamil Liberation Front (UTLF) is a bloc of the Tamil bourgeois parties that emerged from the United Tamil Front (UTF), founded in 1972.

The Ceylon Workers' Congress, founded in 1936, unites plantation workers. The Sri Lanka Federation of Trade Unions (until 1965, the Ceylon Federation of Trade Unions) was founded in 1940. It is affiliated with the World Federation of Trade Unions. The Ceylon Federation of Labor was founded in 1939. The Democratic Workers' Congress was founded in 1956.

Economic geography

General state of the economy. Sri Lanka's economy is dominated by agriculture, which accounts for more than one-third of the gross national product (industry accounts for only about one-eighth). The plantation economy, which emerged during the colonial period, forms the basis of the country's present economy, which continues to be heavily dependent on the foreign market. After the achievement of independence, a number of state development programs (the latest in the period 1972–76) and reforms have been carried out; they are directed at transforming agriculture to increase food production, expanding power production and industrial construction, and strengthening the state's control over foreign capital.

The growth of the state sector has been a key factor in the strengthening of the country's economic independence and the creation of a national industry; for example, in 1976 the state sector accounted for approximately one-third of the entire industrial output. Under state ownership are the railroads, the port facilities, the major industrial enterprises, the electric power plants, and the irrigation installations. A system of state-sponsored corporations has been established (in 1973 there were about 84 such corporations, of which 26 were in industry); the corporations are responsible for the management of many industrial enterprises (and the construction of new facilities), plantations, and trade institutions. One example is the state petroleum corporation, which has established a monopoly on the importation and domestic trade of petroleum products and which controls the supply of foreign vessels; another state corporation is the tea export corporation.

As a result of the nationalization of plantations (by a 1975 law) owned by foreign and domestic capital (under conditions whereby specified compensation was paid), more than 400 tea, rubber, and coconut plantations, with a total area of 160,000 hectares (ha), were transferred to state control. All plantations with an area of more than 20 ha were nationalized. By the mid-1970's, the proportion of foreign, primarily British, capital decreased sharply, to a level of 26 percent in tea production and 12 percent in rubber production. The activities of foreign banks have been curtailed; all financial operations pertaining to the tea trade are handled by the Central Bank of Ceylon.

Along with the growth of the state sector, the role of the private capitalist sector has been maintained and strengthened. The number of mixed state-private companies has increased. The restructuring of Sri Lanka's economy has been financed by both domestic and foreign (albeit with certain limitations) capital investments and loans. The USSR and other socialist countries have granted substantial financial and technical aid to Sri Lanka, and a majority of the most important industrial enterprises of the state sector have been built with the aid of socialist countries.

Agriculture. The 1972 agrarian reform, which placed limits on large-scale landownership (a maximum of 20 ha), succeeded in somewhat curtailing landownership by the big landlords (by the beginning of 1975 more than 200,000 ha had been taken away from landlords). However, the nature of landownership and land tenure essentially remains unchanged. A considerable portion of the land is still concentrated in the hands of the relatively large-scale landowners, temples, and monasteries. Much of the peasantry lacks land or has too little. Rent payments for the use of the lands have been somewhat curtailed. The following two types of farms predominate: capitalistic, primarily plantation, farms, which make extensive use of hired labor; and small, truck-garden or seminatural peasant farms (with average plots of about 0.3 ha), managed by tenant farmers or the owners themselves. The renting of land is widespread. In accordance with the present state plan for developing new lands, every peasant may buy 1.5–2 ha of irrigated land on credit and several ha of unirrigated land. The formation of farm cooperatives is an important feature of the agrarian changes.

About 37 percent of the country's land area is used for agriculture (2.4 million ha in 1974), primarily in the Wet Zone; 895,000 ha are occupied by arable lands, 1.084 million ha by perennial plantation crops, and 439,000 ha by pastures and meadows. As of 1974, 430,000 ha were being irrigated. More than 40 percent (2.9 million ha) of the country is forested. During the years of independence there has been a 45-percent increase in the amount of land cultivated as a result of assimilation of state-owned lands in the Dry Zone (the northern and eastern parts of the island) and the expansion of irrigation construction. In 1970 complex hydraulic-engineering contruction was begun on the Mahaweli Ganga, a project developed by a group of UN experts under the direction of a Soviet engineer.

Plantation farming, concentrated in the central and southwestern parts of the island, specializes in the production of export crops—namely, tea, rubber, and coconut products. In 1976, Sri Lanka's tea harvest accounted for nearly one-eighth of the world production; Sri Lanka ranks behind only India and China in tea production. The coconut harvest is considerable, one of the highest in the world; in the production of copra and export of coconut oil, Sri Lanka also ranks high on the world market. Sri Lanka is a major producer of natural rubber, ranking fourth in the world, after Malaysia, Indonesia, and Thailand.

Food crops for domestic needs are grown primarily by the peasant farms. The principal food crop is rice, which is harvested twice a year. During the years of independence, the harvest of unmilled rice (paddy) has increased considerably, primarily owing to the state policy of subsidizing and granting credits to rice-growing farms and the achievement of somewhat higher harvest yields. However, the country's rice production meets only 65–75 percent of the country's needs. Other food crops include millet, corn, legumes, sweet potatoes, manioc, green vegetables, and spices—cinnamon, black pepper, and cardamon. Industrial crops include fiber and oil crops; among fruits grown are bananas and pineapples. (See Table 1 for the production of farm crops.)

Stock raising is poorly developed; cattle are primarily used as draft animals. In order to improve this branch of agriculture, state stock-raising farms are being established, and ways are being sought to expand the fodder base. As of 1975, there were 2.5 million head of cattle (including 700,000 buffalo) and 550,000 goats. Elephants are also used as work animals.

The fish catch amounted to 129,000 tons in 1975. There is also a pearl-fishing industry.

Industry. Sri Lanka's industry is still characterized by the predominance of many small-scale enterprises, including cottage-type handicraft enterprises; individual large-scale enterprises have been constructed, for the most part, in the state sector.

The island is poor in mineral fuel, and consequently fuel is imported. Sri Lanka supplies the foreign market with high-grade graphite (the Bogala and Ragedara mines; 7,800 tons mined in 1975); small amounts of ilmenite, rutile, zircon, salt, and precious stones (rubies, sapphires, and aquamarines) are also mined. The principal source for expanding the energy base is waterpower. Construction is under way on state hydroelectric power plants on the Kehelgomu, Maskeliya, and other rivers.

Traditional branches of the processing industry are the processing of tea and rubber and the production of copra and coconut oil. The enterprises of these branches are located primarily in regions with large plantations. There are rice-cleaning enterprises, sugar refineries (output of raw sugar amounted to 28,000 tons in 1975), and other enterprises of the food industry, as well as textile enterprises (one of the largest textile enterprises in southern Asia was built in cooperation with the German Democratic Republic) and enterprises of the footwear and certain other branches of light industry.

Heavy industry is still in its infancy. In Oruvella, near Colom-

Table 1. Principal agricultural crops

	Area (ha)			Harvest (tons)		
	1961–65[1]	1974	1975	1961–65[1]	1974	1975
Rice	505,000	638,000	597,000	967,000	1,875,000	1,154,000
Tea	239,000	240,000	242,000	217,000	201,000	—
Rubber	—	—	—	107,000	145,000	150,000[2]
Coconuts	—	—	—	2,040,000	1,350,000	1,650,000
Copra[3]	—	—	—	284,000	109,000	170,000

[1]Yearly average [2]1976 [3]Output

bo, the first metallurgical plant, with a capacity of 50,000 tons of rolled steel per year, was built in 1967 (with the cooperation of the USSR). Machine-building and metalworking enterprises include mainly assembly plants, which supply equipment for light industry, transportation equipment, and agricultural equipment. Certain branches of industry are being expanded, such as the production of fertilizers, the oil-refining and rubber industries (a tire plant was built in Kelani, a suburb of Colombo, in 1967 with the cooperation of the USSR), the wood-products industry (a large plant has been built with the cooperation of Poland), and the production of construction materials (a plant has been built near Colombo with aid from the USSR). The principal industrial center is the city of Colombo and it environs.

The old-fashioned, traditional crafts are widespread, for example, blacksmithing, pottery-making, cloth weaving, basketry, the plaiting of bags, hats, and ropes, rug weaving, carving in wood, antler, ivory, and tortoiseshell, metal stamping, and the production of gold and silver ornaments with precious stones.

Transportation. The leading form of transportation is automotive transport, and the length of roads exceeds 21,500 km. There are about 1,500 km (1976) of railroads. Most of the overseas merchant marine is owned by British companies; Sri Lanka is also establishing its own fleet, which by mid-1976 totaled 36 vessels. About 5 million tons of cargo are handled by the ports, including Colombo, which handles up to 90 percent of Sri Lanka's imports and more than one-half of its exports, Galle, and Trincomalee. Colombo has an international airport—Katunayaka Airport—located north of the capital.

Foreign trade. More than 90 percent of the total value of exports is provided by tea (40–60 percent of the monetary revenues), natural rubber, and coconut products. The principal imports are foodstuffs, which account for one-third to one-half of the total value of imports (707,000 tons of rice in 1975–76); other important imports are industrial goods, raw materials, and fuel. The chief foreign trading partners are China, Great Britain, Saudi Arabia, Australia, the USA, Pakistan, Japan, and India. The USSR and the socialist countries of Europe account for 5.2 percent (1975) of the value of foreign trade turnover.

The monetary unit is the Sri Lanka rupee. In May 1978, at the exchange rate of Gosbank of the USSR, 100 rupees equaled 4 rubles and 50 kopeks.

L. I. BONIFAT'EVA

Armed forces

The armed forces comprise an army, air force, and navy. The supreme commander in chief is the president; direct leadership is exercised by the minister of defense. The armed forces, which consist of paid volunteers, number (1976) about 14,000 persons.

The army, with about 9,000 men, comprises one brigade, intelligence and artillery regiments, and military supply and service units. The weapons are of foreign make. The air force, which numbers about 2,300 men, has five combat and six transport airplanes, a communications squadron, about 20 trainers, and 15 helicopters. The navy, which numbers 2,400 men, has one frigate, five gunboats, and 23 patrol boats.

Health and social welfare

Medicine and public health. According to data of the World Health Organization (1972), the birthrate is 29.5 births per 1,000 population, and the death rate, 7.7; the infant mortality rate is 45.1 per 1,000 live births. Infectious and parasitic diseases predominate. Malaria and tuberculosis are widespread, as are gastrointestinal infections, which constitute the principal cause of death.

In 1973, Sri Lanka had 456 hospitals, with 39,700 beds (approximately three beds per 1,000 inhabitants). Outpatient care is provided by 334 polyclinics attached to hospitals, 546 dispensaries, and 1,300 maternity and child-welfare centers. In 1972 there were 3,200 physicians in Sri Lanka (one physician per 4,000 inhabitants), 280 stomatologists, and more than 11,000 other medical personnel, as well as more than 10,000 practitioners of traditional folk medicine—the Ayurvedas. Physicians are trained at two medical faculties at the universities.

In 1970–71 expenditures on health care made up 3.5 percent of the state budget.

Veterinary services. Foot-and-mouth disease, pasteurellosis, fowl pox, coccidiosis, and mastitis are widespread in Sri Lanka. Also registered have been leptospirosis of cattle (in regions where buffalo are bred), anthrax among cattle (rare), Newcastle's disease, hoof rot, blackleg, salmonellosis, brucellosis, avian leukosis, rabies among dogs, cattle, and wild animals, anaplasmosis, babesiasis, theileriasis, fascioliasis, and mange.

As of 1976 there were 284 veterinarians in Sri Lanka; they are trained in the faculty of agriculture and veterinary science of the University of Sri Lanka and in India and other countries. There is a research center for veterinary science.

M. G. TARSHIS

Education and cultural affairs

Sri Lanka has a high literacy rate; more than 80 percent (1974) of the adult population is literate. In 1972, on the initiative of the United Front government, an educational reform was instituted in the country, in accordance with which an 11-year school replaced the previous 12-year general-educational school: a primary school (five years), a junior (incomplete) secondary school (four years), and a senior (complete) secondary school (two years). Nine years of instruction—five in primary and four in the junior secondary school—are compulsory for children ranging in age from six to 14. During the 1974–75 school year, there were 1.370 million pupils in grades 1–5 and 1.064 million students in grades 6–11. Instruction is free and conducted in Sinhalese or Tamil; English is taught in the secondary schools. Teachers for the general-education schools are trained at two-year teacher-training colleges, based on the complete secondary school. In the 1973–74 academic year, there were 28 teacher-training colleges, with an enrollment of 9,300 students.

Teachers for the secondary schools are trained at the universities. Vocational and technical training is conducted after completing the nine-year school in two-year schools or the four-year technical institutes. The University of Sri Lanka (established 1972 through a merger of previously existing universities) has campuses in Peradeniya, Colombo, Vidyalankara, Vidyodaya, Katubedde, and Jaffna (opened in 1974). During the 1975–76 academic year, the university had an enrollment of more than 15,600 students.

The largest libraries are the Public Library in Colombo (with more than 132,000 volumes in 1975), the National Museum Library in Colombo (more than 500,000 volumes), and the university library in Peradeniya (400,000 volumes). Museums include the National Museums of Sri Lanka, which comprise the national museums in Colombo, Kandy, and Ratnapura and the folk museum in Anuradhapura.

V. Z. KLEPIKOV

Science and scientific institutions

Scientific research is coordinated by the National Science Council (founded 1968) under the Ministry of Industries and Scientific Affairs. The state finances projects related to the country's economic development. The International Bank for Reconstruction and Development provides funds for the Ceylon Institute of Scientific and Industrial Research (1955). Scientific personnel are primarily trained abroad. The leading scientific center is the University of Sri Lanka, where research in the natural sciences, history, sociology, and linguistics is conducted. Applied research is conducted at the Central Agricultural Research Institute (1965) and the institutes of the departments of the Ministry of Agriculture and Lands, such as the Tea Research Institute of Ceylon in Talawakele (founded 1925). The Ceylon Medical Research Institute (1900) works on the study and treatment of tropical diseases. Archaeological and ethnographic studies are concentrated at the Colombo National Museum.

The most important scientific societies are the Sri Lanka Association for the Advancement of Science (1944) and the Royal Asiatic Society (1845), a branch of the Royal Asiatic Society of Great Britain. With the aid of the USSR research is being conducted in hydraulic-engineering construction, industry, and agriculture. In collaboration with foreign scholars, including scholars from the USSR, the multivolume *Buddhist Encyclopedia* is being published.

E. D. TALMUD

Press and radio

In 1976 more than 30 periodicals were being published (in Sinhalese, Tamil, and English).

The most widespread newspapers, all published in Colombo, are the Sinhalese-language *Lankadipa* (since 1947; circulation, 67,000), *Dinamina* (1909; circulation, more than 129,000), and *Dinakara* (1977), the Tamil-language *Virakesari* (1930; circulation, 32,000), and the English-language *Ceylon Daily News* (1918; circulation, 65,000), and *Ceylon Observer* (1834; circulation, 5,000). The Communist Party of Sri Lanka publishes the following newspapers: the Sinhalese-language *Aththa* (1964; circulation, 17,500), the Tamil-language *Desabhimani* (1946; circulation, 10,000), and the English-language *Forward* (1950; circulation, 9,000). The Press Trust of Ceylon, a national cooperative news agency, was founded in 1951. The national information agency *Lanka Tuvat* was founded in 1978.

Radio broadcasting is directed by the state-sponsored Sri Lanka Broadcasting Corporation (founded 1967). It is conducted in four languages—Sinhalese, Tamil, English, and Hindi.

E. D. TALMUD

Literature

Literature has developed primarily in Sinhalese, although literature in Tamil and English is also of some importance. The first literary works—the *Dipavamsa* chronicle (fourth century) and *Mahavamsa* chronicle (fifth century)—were written in the Pali language. In addition to historical facts, the *Mahavamsa* includes myths and legends. During the fourth and fifth centuries, various commentaries on the basic tenets of Buddhism were recorded. Circa the fifth century, *jatakas*, borrowed from India, were written in Pali. Literature in Pali formed the basis of Sinhalese literature. Works in Sanskrit also became widespread.

The first works in Sinhalese appeared in the sixth century. Verse and prose excerpts have been preserved, along with cave and rock inscriptions; later works contain references to the poets of the period. Medieval Sinhalese literature borrowed the genres of the chronicle and the epic poem from ancient Indian literature.

Medieval authors considered religious preaching to be the principal goal of creative art. The epic poem *The Crest-Gem of Poetry* by the Sinhalese king Parakrama Bahu II (1236–70) includes sections that, to a certain extent, reflected Parakrama's own epoch. Beginning in the 13th century, prose acquired increasing importance, since its simpler language made it easier to expound the ideas of Buddhism (for example, *The Flood of Nectar*, 13th century, by Gurulugomi). Important prose works of the 13th century were Vidyachakravarti's *The Refuge of Buddha* and Mayurapadathera's *The History of Offerings*, a collection of sermons in which the hard lot of the peasants was first depicted in Sinhalese literature. *A Garland of Jewels of the Good Doctrine*, by the Buddhist monk Dharmasena, depicts the life of the peasants, along with their language and customs. In *The Ornament of the Good Law* (14th century), Dharmakirti wrote about the famine that had devastated the country and about peasant life and its many deprivations.

In the 14th century the translation of the *jatakas* into Sinhalese was completed. In the 15th century poetry once again acquired importance. Epistolary narrative poems provided a detailed description of Sri Lanka's cities, villages, and monasteries. Sri Rahula wrote *The Dove's Message*, *The Starling's Message*, and *The Diadem of Poetry*. In Guttilaya, Vœttœve Thera expressed opposition to the king's court. In the narrative poem *The Ornament of the Buddha's Virtues*, Vidagama expressed displeasure with the greed and injustice of the powers that be. The last major representative of medieval poetry—Alagiyavanna Mohottala (late 16th and early 17th centuries)—in his narrative poem *The Great War* depicted the struggle of the Sinhalese King Rajasinha II against the Portuguese colonialists.

Colonization impeded the development of Sinhalese literature, but as early as the second half of the 19th century and the beginning of the 20th, there was a noticeable increase in national self-awareness and a striving to retain originality and a national culture. The first Sinhalese novels were published in the first decade of the 20th century. S. de Silva spoke out in defense of national customs and Buddhism, and P. Sirisena (1875–1946) expressed similar ideas in the novel *Jayatissa and Rosalind, or The Happy Marriage* (1906). W. A. Silva (1892–1957), in such historical novels as *Sunetra, or The Dark Age* (1936), described the struggle of the people against the Portuguese; in the novel *The Puppet Chieftain* (1939), he satirized the wealthy landowners. Elements of realism are evident in his short stories.

The establishment of realism and the subsequent development of the Sinhalese literary language are linked with the writer and literary scholar M. Wickramasinghe (1891–1976), whose trilogy *Changing Village* (1944), *The Last Century* (1947), and *The End of an Age* (1949) depicted class stratification in the village, the rise of a new merchant class, and the emergence of a working class.

During the 1940's the short-story genre gained importance; the leading short-story writers include H. Munidas (1903–57) and G. B. Senanayake (born 1903). The achievement of political independence (1948) and the ensuing democratic changes, as well as the adoption of Sinhalese as the official state language, gave new life to literature. During the 1950's and 1960's reality became the principal object of depiction. Humanity and sympathy for the simple working man characterize the works of E. Sarathchandra (born 1914) and K. Jayatilaka (born 1926), as well as the works of Gunadasa Amarasekara (born 1929), author of the novels *Prisoners of Destiny* (1955) and *The Legless Ones* (1961) and of short stories and poems depicting the life of the people. The plots of some of his short stories echo the works of N. V. Gogol and A. P. Chekhov. The heroes of Jayatilaka's novels *Those Who Have Suffered Defeat* (1960) and *Three Characters* (1963) and his short stories are helpless in the face of life. The themes of disillusionment and confusion are at the center of Sarathchandra's novels *A Tired Man Sees Not the Path* (1962) and *A Day of Remembrance for the Dead* (1965). Sarathchandra's *The Sinhalese Novel* (1950) presents an analysis of the national literature from the mid-19th century to the 1950's. A comparison of the urban and rural ways of life is the theme of Madawala Ratnayake's novel *Five Acres* (1959). The novellas of L. Gunasekara depict village life.

At the end of the 1960's and the beginning of the 1970's, criticism of social relations increased. Kumara Karunaratna's novella *Colombo 7* (1972) and Gunadasa Liyanage's novels *Dona Kamalawathie* (1971) and *I Will Come Back, Mama* (1973) expose the hypocrisy and corruption of the bourgeois politicians. The hero of contemporary prose joins the struggle for a better life, for example, in *Heyiyammaruva* (1971) by A. V. Suravira. The themes of poetry (S. Mahinda, Munidas Kumaranatunga, Sagara Palansuriya, G. H. Perera, Alwis Perera, Vilmalaratna, Kumaragama, Chandraratna Manavasimha) include the beauties of nature, the hard lot of the working masses, and the awakening of civic and national feelings. Sarathchandra's plays *Maname* and *Sinhabahu* are based on ancient legends. The life of the people of Sri Lanka and social changes constitute the themes of works by Amaradasa Samaravira and Henri Jayasena.

In 1969 the progressive writers of Sri Lanka formed the organization called the "People's Writers Front", which since 1973 has published the literary newspaper *Jana ruchiya*. The journals *Sahityaya, Sanskruti*, and *Kala puvat* publish materials dealing with literary history and criticism.

A. A. BEL'KOVICH

In the course of many centuries the Tamil-language literature of Sri Lanka developed as part of India's Tamil literature and thus lacked an independent, national character. With the upsurge in the national liberation movement at the end of the 19th and beginning of the 20th centuries and with the growth of national self-awareness among the Tamils of Sri Lanka, Tamil literature assumed increasingly more original traits. The greatest development in the 20th century was attained by poetry and by prose, specifically, the novella and the one-act play. The Tamil writers have addressed social themes. Their heroes are the toilers of the city and the village—petty clerks, workers, peasants, and fishermen—voicing their protest against exploitation and social injustices. Popular prose writers and poets include S. P. Amarasingam, Varathar, J. Vijaytunga, C. V. Velupillai, S. Ganeshalingam, K. Daniel, D. D. Jiva, Ilangayarkone, V. A. Rajaratnam, Kanaga Senthinathan, Nirvai Ponnaiyan (born 1930), Sargunar Ponnuthuram, Premji, and Sokkalingam. The emergence of Tamil dramaturgy has been facilitated by the festivals in Colombo organized every year by the division of Tamil drama of the Cultural Council of Sri Lanka.

English-language literature originated in the 19th century and developed under the influence not only of the European but also of Sinhalese and Tamil literatures of Sri Lanka. R. L. Spittel published novellas, narrative poems, and stories, including *Vanished Trails, or The Last of the Veddas* (1950), *Where the White Sambhur Roams*, and *Wild White Boy* (1958). Popular writers include J. Vijayatunge, author of the short-story collections *Grass for My Feet* (1935) and *Girl From the Rodiya Caste and Other Stories* (1960); G. Virasuriya, author of the realistic novel *Harijan in Trousers*, drawn from the life of petty clerks; J. Gunawarhana (or Goonawardine), author of novellas in English and Sinhalese; R. Proctor, author of the novella *The Fisherman's Daughter* and short stories; and Anna Ranasinghe (poems, 1971, 1975).

Children's short stories and tales based on Sinhalese and Tamil folklore are also published. IU. N. MASLOV

Architecture and art

The ancient period of the art of Sri Lanka (third century B.C. to eighth century A.D.), which owes much to the art of India, is represented by Buddhist monuments, concentrated, for the most part, in Anuradhapura.

During the early medieval period (eighth to 13th centuries), construction was carried out primarily in the new capital—Polonnaruwa—where Hindu temples were also erected. The monumentality and grandeur of the early stupas gave way to harmonic restraint in proportions, while retaining the former moderation (in comparison with India) in the interior and exterior sculptural decoration. Particularly characteristic for the medieval plastic arts of Sri Lanka are statues of Buddha, including huge rock statues, characterized by a sense of balance and clarity of strongly stylized forms. Also preserved are numerous examples of secular stone sculptures, metal statuettes of deities, and the well-known rock paintings of Sigiriya.

Under the colonial regime (beginning in the 16th century), the art of Sri Lanka, which on the whole had entered a period of decline, was developed only by village masters of temple paintings, artistic metalworking (utensils and weapons), wood carving (carved architectural details, furniture, tools, small boxes), carving in ivory (statuettes, panels, boxes, chalices, door stops, and combs), lacquer work, and work in stone and clay. Jewelry was also made, as well as artistic fabrics, mats, embroidered items, and wooden masks.

Professional easel art in Sri Lanka originated at the end of the 19th century under the influence of the official art of the British Academy of Arts. The first art association was the Ceylon Society of Arts (founded 1887; A. Amarasekere, J. D. A. Perera, T. Rajapaksha, and others). During the first half of the 20th century, a school of painting emerged in connection with the development of the liberation movement that combined national traditions with elements of the new European trends; this school included members of the 43 group (beginning in 1943; J. Daraniyagala, G. Keyt, H. Peiris, and others) and the Society of Folk Arts, which included primarily nonprofessional masters working in the gouache technique (beginning in 1950; V. L. A. Mendis and others).

After the achievement of independence, the time was ripe for the formation of a national school of architecture; urban and rural complexes were erected that combined elements of national medieval and contemporary European architecture.

S. I. TIULIAEV

Theater

Sri Lanka's theatrical art is rooted in the folk games, rituals, and dances of the various tribes that had settled the island in antiquity. Religious holidays were accompanied by songs and dances, and various spectacles were arranged in honor of the gods and legendary heroes. The chronicle-poem *Mahavamsa* (fifth century) attests to the ancient origin of the theater; it contains passing mention of dance spectacles and descriptions of the *mandaran*, a stage area where dancers and musicians performed. With the spread of Buddhism, the mystery-like drama appeared in the monasteries, propagandizing religious and philosophical doctrines. There also existed various forms of folk theater, some of which have been preserved, including the *kolam*, a masked dance and mime presentation whose origin was linked with magical religious rituals (it was widespread in the vicinity of Ambalangoda and Bentara), and the *sokari* ("threshing-floor" theater), a humorous theatrical production. A newer theatrical form, based on folk music and dance, arose—the *nadagama*, a unique musical spectacle with singing, dancing, and pantomime that became popular in the early 19th century (it is not staged in the 20th century, and only the songs have been preserved).

The emergence of the modern theater is closely linked with the growth of national self-awareness and the national liberation struggle of the peoples of Sri Lanka. At the end of the 19th century, plays clearly divided into acts appeared, the curtain was introduced, and women began performing on the stage. A new type of play, the *nurtiya*, while retaining the music and dance form of the *nadagama*, included dialogue. Among such plays were *Romlin* (1866) and *Rolina* (1879) by C. Don Bastian, an adaptation of Shakespeare's *Romeo and Juliet* (1885), and J. de Silva's *Siri Sangabo* (1903), *Vihara Maha Devi* (1916), and other plays, constructed in accordance with the rules of Sanskrit drama. De Silva's plays were staged by the professional companies Arya Subodha Natya Sabha and Vijaya Ranga Sabha. During the 1920's and 1930's, plays dealing with social issues appeared, such as B. Jayamanna's *Iranama* and *Hadisi Viniscaya*, which are about urban workers.

The establishment of Sri Lanka's independence (1948) facilitated the revival and development of national traditions. New theatrical forms emerged, including the ballet, which synthesized traditional and folk-dance arts. In 1944 a ballet school and troupe were formed (known since 1955 as the Chitrasena Dance Company), under the direction of Chitrasena, Sri Lanka's first professional dancer and choreographer. The company's repertoire includes the ballets *The Triumph of Peace*, which depicts the struggle for peace, *Kardiya* (Salt Water), which deals with the life of fishermen, and *Nala and Damayanti*, which is based on the ancient Indian epic *Mahabharata*. (In 1960 and 1963 the troupe toured the USSR.) The state Folk Dance Ensemble of Sri Lanka was founded in 1973 under the direction of Pani Bharata (it toured the USSR in 1974).

There are many amateur theatrical groups in Sri Lanka. A group at the university in Colombo is well known; its repertoire includes the plays by the contemporary Sinhalese playwright E. Sarathchandra *Maname* and *Sinhabahu*, as well as plays by A. P. Chekhov, O. Wilde, and other writers. M. P. KOTOVSKAIA

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[29–1417–3]

SRIVIJAYA, an Indonesian state that arose circa the mid-seventh century in the region of what is now Palembang, on the island of Sumatra.

Srivijaya developed from a principality or principalities that had existed from at least the early third century; its emergence was facilitated by its favorable location on the trade route from India to Southeast Asia and by the fall of Funan. Between the second half of the seventh century and the ninth century, Srivijaya grew into a powerful maritime empire; it conquered the neighboring Sumatran states, western Java, western Kalimantan, and the Malay Peninsula. The empire reached its height in the second half of the ninth century and in the tenth century, during which period it was ruled by the Sailendra dynasty.

Srivijaya was probably an early feudal despotism with a highly developed system of vassal relationships. The principal source of revenue for its rulers was trade, based on the export of gold, tin, and products from the tropical rain forests; in addition, the maharajas received duties from the numerous foreign trading vessels and exploited the population through the levying of taxes and the exaction of tribute payments. Circa 922 a war began with Mataram for control of the peninsula. Circa 1016 the struggle ended in victory for Srivijaya, which was invaded, however, by the Indian state of Chola in 1025. Although its power was undermined by these conflicts, Srivijaya maintained control over the western regions of the archipelago for another two centuries. In the late 13th century, the Javans and Siamese redoubled their attacks on the empire. In the mid-14th century, Srivijaya became a tributary state of Majapahit, and it is last mentioned in 1376.

Srivijaya was a leading cultural center of Southeast Asia and an international center of Buddhism. The chief language was Old Malay; the official language was Sanskrit. In Indonesian history, Srivijaya is notable for being the first state to unite politically and culturally a significant area of the archipelago; it also established extensive ties with the states of Southeast Asia, India, China, and the Middle East.

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IU. V. MARETIN [29–1416–3]

SRUTI (also *shruti*), in the classical music of India, the smallest interval between two sounds. It is also a principle of scale gradation into 22 unequal degrees. [29–1443–2]

STACHYS (woundwort), a genus of annual and perennial herbs or subshrubs of the family Labiatae. The leaves are opposite and entire. The usually pink, purple, white, or yellow flowers are in false whorls that form spicate inflorescences. The corolla has a flat or helmet-shaped upper lip. The fruit consists of four nutlike lobes.

There are about 300 species of woundwort, distributed in the temperate and subtropical zones of both hemispheres and in the mountains of the tropics. The USSR has about 55 species. The marsh woundwort (*S. palustris*) and the annual woundwort (*S. annua*) are weeds of fields, gardens, and fallow lands. The former occurs along bodies of water and in wet meadows, swamps, and marshy forests. The annual woundwort grows on dry slopes, along embankments, and in precipices and wastelands. It is poisonous to horses, as is the species *S. recta*, which grows wild on steppe and rocky slopes. The hedge nettle (*S. sylvatica*) grows in shady broad-leaved and mixed forests, amid underbrush, in ravines, and in damp meadows.

The Chinese, or Japanese, artichoke (*S. sieboldii*) is widespread in China and Japan. It is cultivated as a vegetable in East Asia and in some countries of Europe and the Americas; the tuberous formations on the roots are eaten boiled, fried, or pickled. Many species of *Stachys* yield a substantial amount of nectar. The woolly betony (*S. byzantina*, formerly *S. lanata*) is cultivated as an ornamental. [29–639–1]

STACKER, a materials-handling machine with a frontally attached lifting device or pair or forks capable of being raised and lowered. A stacker travels along the surface of the floor on wheels made of metal, plastic, or solid rubber and is designed to stack merchandise or place it on racks to a height of up to 8 m. A stacker is controlled from its cab, which, in some cases, may be raised and lowered itself. The load-lifting capacity of a stacker can be as much as 3.2 tons. [29–1443–3]

STADEN, HEINRICH VON. Born circa 1542 in Ahlen; date of death unknown.

From 1564 to 1576, Staden lived in Russia and was an *oprichnik*. After returning to Western Europe, he engaged in anti-Russian activities and worked out plans for intervention in Russia by the German emperor Rudolf II (1578) and the Swedish king John III (1581). Staden was the author of *The Land and Government of the Muscovites*, an extremely valuable source on the history of Russia in the *oprichnina* era.

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STÄDER. Dates of birth and death unknown. A lieutenant colonel of the Russian Army and the author of a geographic and historico-ethnographic description of the mountain regions of the Northern and Central Caucasus (1781). Städer's journal contains abundant material on Russian policy in the Caucasus in the late 18th century.

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STADTHOLDER, in a number of European countries, an official who exercised state authority over a certain territory. Stadtholders existed in the Netherlands during the rule of the Burgundian and Hapsburg dynasties, in the crown lands of the Austrian Empire, and in Austria-Hungary until 1918. In the German Empire from 1871 to 1918, the term stadtholder was applied to the governor of Alsace-Lorraine. The office of *Reichsstatthalter* existed in fascist Germany from 1933 to 1945. [29–1458–1]

STAFF, the chief body responsible for troop command and control. There are combined-arms staffs, staffs for the combat arms and services, and staffs for the individual branches of the armed forces.

The most important missions of the staff are to maintain troops and command bodies in combat readiness; to collect, study, process, and assess situation data and to report operational and tactical estimates and proposals to the commander to enable him to make decisions during the planning of battles and operations and in the course of combat; to plan the battle or operation, delivering missions to the troops and organizing troop command and control, cooperation, and comprehensive support; to regulate the everyday life, training, and indoctrination of military personnel; and to maintain firm discipline, military order, and organization. The staff does its work on the basis of the commander's decisions and the orders of the higher-ranking staff. The staff is headed by the chief of staff, who is the first deputy commander and who has the right to give orders to subordinate troops in the commander's name.

The armies of the slaveholding and feudal states (until the 16th century) were comparatively small and waged battle in relatively small areas, so that the leader or commander saw the field of battle and did not need a special body, or staff, for command and control of his troops. With the formation of standing national armies in Europe between the late 16th century and the early 18th century, the growth in the size of the armies, and improvements in troop organization, the functions of command and control of troops became more complex; it became necessary, for example,

to establish special quartermaster positions in charge of troop movement, billeting, and the compilation of plans and maps. The needs to be met by the general staff, therefore, gradually emerged. Commanders had adjutants who were used to command and control troops. With the appearance of mass armies in the late 18th century and an increase in the scale and duration of military operations, it became necessary to establish special bodies among the armies for command and control of large and smaller units. These bodies, which facilitated the commander's work, were the staffs. In 1792 the General Quartermaster Department in France was renamed the Main Staff of the army. In the early 19th century a main staff, staffs of armies and corps, and later staffs of divisions were established in Russia. By this time the staffs were already being given considerable authority and acted as bodies to ensure that the commander's plans were carried out.

By the late 19th century and the early 20th century, staffs in the armies of most countries had permanent tables of organization and the functions of their personnel were clearly defined. Various types of technical equipment, such as the telegraph, telephone, and radio, were used for command and control of troops. At the start of World War I, staffs of fronts were formed in the Russian Army and staffs of army groups were established in the armed forces of Germany, France, and, during the war, Great Britain. The Russian staffs of fronts and armies consisted of the directorate of the quartermaster general, who had authority over the operational, intelligence, military topography, and other sections, and the directorate of the duty general, who had authority over the inspection, general, printing, and other sections. The staff of a division included a senior adjutant of the general staff and a senior adjutant (a regimental adjutant in a regiment) who managed operational affairs, intelligence, and matters pertaining to drill and inspections. The staffs of divisions and regiments also included chiefs of communications and administrative affairs, a weapons officer, commandants and quartermasters, a senior doctor, and others.

The modern staff structure took shape in the period between the two world wars, and staffs were supplied with more advanced means of communication and transportation and with reconnaissance forces and equipment. The Staff Manual was developed in the Red Army. The staff was elaborated further during World War II. In the Red Army the staffs of fronts, armies, corps, divisions, and regiments consisted of the operational, reconnaissance, and other directorates or sections; battalion staffs comprised several officers. There were also staffs of the combat arms and services. A system of control points (command, observation, rear, and other posts) was established during offensive operations using staff forces and means to command and control troops. Experience was gained in collecting and processing situation data; organizing and supporting reliable communication with troops; carrying on cooperative operations; coordinating work among combined-armed staffs, the staffs of combat arms and services, and other command and control bodies; and setting up command and control points and moving them behind the troops during the battle or operation. In 1942 the new Field Service Manual for Staffs of the Red Army was published.

After the war the following general structure took shape in the Soviet armed forces: the General Staff of the Armed Forces of the USSR; main staffs of the branches of the armed forces; the Staff of the Rear Services of the Armed Forces; the Civil Defense staff; and staffs of the chiefs of the combat arms and services and of special forces. There are also troop staffs in formations, large units, units, and subunits. Similar staffs exist in the armed forces of foreign countries. The unified armed forces of NATO have established a unified staff, and the unified armed forces of the Warsaw Pact of 1955 have a staff of the unified armed forces of these countries. There are also various other large staffs and staffs of formations, large units, and units that differ in composition. For example, in the armed forces of the United States the staff of an infantry division and the headquarters company included within it comprise 102 men; the staffs of mechanized and armored divisions each have 115 men. The command staff of all types of divisions in the US ground forces includes a headquarters section and sections for personnel, intelligence, operations and combat training, logistics, civilian affairs, adjutant general, army aviation, field artillery, antiaircraft artillery, signal troops, engineer troops, the chemical, financial, medical, transport, and meteorological services, the commandant's office, military police, and chaplains.

With the adoption of nuclear weapons by the armed forces of various countries in the 1950's and 1960's and with the introduction of electronic equipment and full motorization and mechanization of troops, the functions of staffs became more diverse and important and their working conditions grew more complex. In the most advanced armies of today, staffs are incorporating a new technical base, setting up automated command and control systems that include computers and high-speed and secret communications equipment. Scientific methods of work for all bodies involved in troop command and control are being introduced and incorporated.

I. S. LIAPUNOV [29–1443–7]

STAFF, the full complement of properly approved employees' positions in an enterprise, institution, or organization.

In the USSR, the positions that make up an administrative staff are determined in accordance with the Model Branch Structure approved for enterprises, institutions, and organizations. A staff schedule sets forth an administrative framework, job titles, the number of staff members for each position, and salaries and pay supplements. The classification of employees as administrative personnel is carried out in accordance with the official job titles adopted by the Central Statistical Board of the USSR. The managers of enterprises, construction administrations or sites, territorial geological administrations, and certain other organizations have the right to approve and make changes in the administrative personnel within limits established for labor (centrally determined plan targets for labor) and administrative expenditures. The Ministry of Finance of the USSR decides which enterprises, institutions, and organizations belong to a particular wage category and monitors compliance with staff finance discipline (*see* DISCIPLINE, STATE). The staff, official salaries, and estimated administrative expenditures approved by the manager of an enterprise need not be registered at financial agencies.

L. N. KACHALINA [29–1459–3]

STAFF CAPTAIN (Russian, *shtabs-kapitan*), an officer's rank in the Russian Army (except for the cavalry). The rank was introduced in 1801; the corresponding rank in the period 1705–98 was lieutenant captain (*kapitan-poruchik*). [29–1443–5]

STAFF ROTMISTR (Russian, *shtabs-rotmistr*), an officer's rank in the cavalry of the Russian Army from 1801 to 1917. [29–1443–6]

STAHL, GEORG ERNST. Born Oct. 21, 1659, in Ansbach, in what is now the Federal Republic of Germany; died May 14, 1734, in Berlin. German physician and chemist.

Stahl graduated from the medical faculty at the University of Jena in 1683 and subsequently became a professor there. In 1694 he was named a professor at the University of Halle, and in 1716 he became the personal physician of the king of Prussia. Further developing the concepts of J. J. Becher, Stahl formulated the phlogiston theory in 1697; in 1703 he advanced a more detailed version. The theory, which synthesized a large body of data on reduction, combustion, and calcination, gained considerable popularity in the 18th century; it was later proved erroneous, however, by research on gases (*see* PNEUMATIC CHEMISTRY) and the findings of A. Lavoisier.

In his works on physiology, Stahl supported the idea of vitalism, and he developed the reactionary theory of animism, a term he introduced.

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STÄHLIN, JAKOB (also Iakov Iakovlevich Shtelin). Born May 10, 1709, in Memmingen, Swabia; died June 25, 1785, in St. Petersburg. Art scholar and engraver. Member of the St. Petersburg Academy of Sciences.

Stählin moved to Russia in 1735. He was the tutor of Grand Prince Peter Fedorovich (later Emperor Peter III) from 1742 to 1745 and Peter's librarian from 1745 to 1747 and from 1754 to 1762. Stählin became a member of the Free Economic Society in 1766. A collector of reminiscences about Peter I the Great, Stählin wrote diaries and memoirs about events occurring in the 1740's to 1760's.

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STAIGER, EMIL. Born Feb. 8, 1908, in Kreuzlingen, Switzerland. Swiss literary scholar. Writes in German.

Staiger became a professor at the University of Zürich in 1943. With W. Kayser (1906–60; Federal Republic of Germany) he established the "school of interpretation," which is related to the New Criticism. The school of interpretation views the literary work as being outside and independent of the social, historical, and biographical factors entering into its creation; it perceives the work as a specific phenomenon of human consciousness that can be understood by "direct impression" and by the interpretation of its individual aspects and components as a united whole. Staiger expounded his critical views in such works as *Time As the Imagination of the Poet* (1939) and *The Art of Interpretation* (1955).

Staiger also wrote on the classics of German literature, including the works of Geothe, and translated works of ancient Greek authors into German.

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STAMMLER, RUDOLF. Born Feb. 19, 1856, in Alsfeld; died Apr. 25, 1938, in Wernigerode. German neo-Kantian legal philosopher, whose social views were close to those of the Katheder-socialists.

Stammler became a professor at the University of Marburg in 1882, at the University of Giessen in 1884, and at the University of Halle in 1885. From 1916 to 1923 he was a professor at the University of Berlin. In his book *Economy and Law From the Point of View of A Materialist Conception of History* (1896; Russian translation, 1899), he adopted a "juridical" world view and tried to refute Marxism by equating it with economic determinism. Stammler asserted that law is primary with respect to the economy and state—if not in a temporal and causal sense, then at least from the standpoint of logic. All types of societies require that people live together in an orderly manner, and law provides such regulation. Economic and political development must therefore be accomplished through partial changes in the law, and the criteria for making such changes must be the "correct law" created by human reason.

Stammler's views were criticized by V. I. Lenin, G. V. Plekhanov, and other Marxists.

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Plekhanov, G. V. *Izbrannye filosofskie proizvedeniia*, vol. 1. Moscow, 1956. Pages 490–91. Vol. 2, pp. 303–04. Vol. 3: Moscow, 1957; pp. 191–94. V. A. TUMANOV [29–1447–1]

STAMPS, DIES AND PRESS TOOLS (in Russian, *shtamp*), in engineering, a tool for imparting a given configuration to a workpiece by means of plastic deformation of metal stock or the division of the stock into sections. Each article requires its own tool, the design of which depends on the type of metal stock (section or sheet stock), the type of machine used (hammer forge or press), the nature of the operations to be performed, and the size of the production run.

When dies are used with forge hammers to shape section stock, the die cavities fill with stock metal during deformation, and the stock acquires the shape and size of the die cavity. The deformation of the metal is accomplished by the relative displacement of the individual working elements of the die. In this case there are two such elements: the upper half of the die, which is attached to the hammer, and the lower half, which is attached to the anvil. A distinction is made between open dies, in which the clearance between the working elements decreases during deformation, and closed dies, in which the clearance is constant. In open dies the metal is partially forced into the clearance during deformation, forming a flash, which is subsequently removed by special trimming dies. Open dies have several impressions, in which the stock is successively deformed to effect a gradual approximation of the shape of the manufactured article. The impressions are sometimes made in separate dies, and the billet is consecutively transferred from one die to the next. A distinction is made between preforming die impressions, which give the stock a preliminary shape that makes it easier to achieve the required final shape of the article, and final impressions.

In order to facilitate removal of the workpiece from the die, the side walls of the cavity are made to slope. The slopes can be made less steep if the dies are designed to incorporate knockouts (die shedders), which forcibly remove the forged articles from the die cavity. In closed impression die forging of articles with complex shapes, the dies are made in several parts with several parting lines to facilitate removal of the forging from the die. Closed dies with two cavities are used, for example, in horizontal forging machines. Dies for sheet stamping and hot stamping of section stock on crank presses consist of many parts mounted on upper and lower plates (the working elements of dies include the punch and matrix in sheet stamping, components to guide the upper plate relative to the lower, guide and locating components for positioning the stock in the die, and attachment components). Dies for cold forging and sheet-metal forming may be designed for a single operation or multiple operations. Dies of the second type are classified as progressive-action dies (the stock is subjected to various operations in different positions in the direction of the feed), and compound-action dies (various operations are performed in a single position). Small-series production calls for the use of simple dies with fewer auxiliary components and dies that are not attached to the machine elements.

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Okhrimenko, Ia. M. *Tekhnologiia kuznechno-shtampovochnogo proizvodstva*, 2nd ed. Moscow, 1976. E. A. POPOV [29–1447–3]

STANDARD. **(1)** The banner carried by Russian cavalry units from 1731 to 1917 and by various foreign armies from the 18th to the 20th century. It consisted of a square cloth smaller than the regular banner. The staff was fitted to the stirrup and grasped by the horseman by means of a looped strap.

(2) The personal flag of a head of state, such as a monarch or president, used in several countries in the 19th and 20th centuries, including Russia. It served to mark the position of the head of state, for example, in the palace or on board a ship.

[29–1453–5]

STAPLE FIBER, chemical fiber obtained by cutting or breaking a tow of longitudinally arranged filaments into staple lengths of 40–70 mm. Yarn from staple fiber is used to make dress and other fabrics. Use of the Russian term *shtapel'noe volokno* is not recommended by GOST (All-Union State Standards.) [29–1454–1]

STAPLING MACHINE, a machine used in the textile industry to obtain sliver of staple length from chemical fibers gathered into tow; the sliver is then used to produce yarn. Stapling is accomplished by cutting or breaking the fibers in the tow. Cutting has several advantages, inasmuch as the fibers produced are more uniform in length and are free of excessive internal stress.

In the modern production process of stapling, the stapling machine uses a taker-in to form a lap or sliver from several tows, stretches the lap between feed and intermediate rollers, and cuts the fibers (at an angle of approximately 8° to the direction of the lap motion) to the required staple length with a cutting device. It then draws the staple sliver with separating cylinders and drawing rollers, crimps it with a special device, and coils it into a can by means of guide rollers in a coiling head.

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V. E. SLYVAKOV [29–1453–7]

STARHEMBERG, ERNST RÜDIGER VON. Born May 10, 1899, in Eferding, near Linz; died Mar. 15, 1956, in Schruns. Austrian state and political figure; large landholder. One of the leaders of the Heimwehr.

Starhemberg was minister of internal affairs in 1930 and vice-chancellor from 1934 to 1936. One of the chief organizers of the reign of terror against the working-class movement, he was particularly active in the suppression of the armed uprising of February 1934. Starhemberg left Austria after the *Anschluss* of 1938 and lived abroad until 1955. [29–1454–2]

STARK, JOHANNES. Born Apr. 15, 1874, in Schickenhof; died June 21, 1957, in Traunstein. German physicist (Federal Republic of Germany).

Stark became a professor at the Technische Hochschule in Hanover in 1906, at the Technische Hochschule in Aachen in 1909, at the University of Greifswald in 1917, and at the University of Würzburg in 1920. From 1933 to 1939, he was the president of the Reich Physical-Technical Institute in Berlin. Between 1934 and 1936, he was the president of the German Scientific Society.

In 1919, Stark received a Nobel Prize for the discovery of the Doppler effect in canal rays and for the discovery of the splitting of spectral lines in electric fields (*see* STARK EFFECT). Stark also carried out research in gas discharges. He discovered the deflection of light as it passes through nonuniform electric fields.

During Hitler's regime, Stark was an active Nazi. [29–1454–3]

STARK EFFECT, the splitting of spectral lines in electric fields. The effect was discovered in 1913 by J. Stark while studying the spectrum of the hydrogen atom. Observed in the spectra of atoms and of other quantum systems, it results from a shift of a quantum system's energy levels and the splitting of the energy levels into sublevels under the influence of an electric field. The splitting and the sublevels are referred to as Stark splitting and Stark sublevels. The term "Stark effect" is applied not only to the splitting of spectral lines in electric fields but also to the shift and splitting of energy levels in such fields.

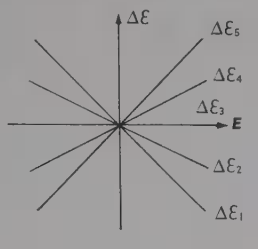

Figure 1. Dependence of the magnitude of level splitting ΔE on the strength of the electric field E in the linear Stark effect for the splitting into five sublevels of a hydrogen atom's energy level specified by a principal quantum number $n = 3$

The Stark effect has been explained on the basis of quantum mechanics. An atom (or some other quantum system) in a state with a given energy $\mathcal{E}$ acquires additional energy $\Delta\mathcal{E}$ in an applied electric field E as a result of the polarizability of the atom's electron shell and the appearance of an induced dipole moment. A nondegenerate energy level, or an energy level to which one possible state of an atom corresponds, will have an energy of $\mathcal{E} + \Delta\mathcal{E}$ in a field E; that is, the level will shift. The various states of a degenerate energy level may acquire different additional energies $\Delta\mathcal{E}_\alpha$; here, $\alpha = 1, 2, \ldots, g$, where g is the degree of degeneracy of the level (*see* ATOM). As a result, a degenerate level is split into Stark sublevels, the number of which is equal to the number of different values of $\Delta\mathcal{E}_\alpha$.

Thus, in an electric field, an energy level of an atom with a given angular momentum $M = (h/2\pi)\sqrt{J(J+1)}$—where h is Planck's constant and $J = 1, 2, \ldots$ is the quantum number of total angular momentum—is split into sublevels characterized by different values of the magnetic quantum number m_J, which represents the projection of M in the direction of the electric field. The same additional energy $\Delta\mathcal{E}$ corresponds to the values $-m_J$ and $+m_J$. Therefore, all the Stark sublevels except the sublevel with $m = 0$ turn out to have a twofold degeneracy, in contrast to the case of splitting in a magnetic field, where all the sublevels are not degenerate (*see* ZEEMAN EFFECT).

A distinction is made between the linear Stark effect, where $\Delta\mathcal{E}$ is proportional to E (Figure 1), and the quadratic Stark effect, where $\Delta\mathcal{E}$ is proportional to E^2 (Figure 2). In the linear effect, the pattern of the energy-level splitting and of the spectral lines produced upon transitions between the levels is symmetric. In the quadratic effect, the pattern is asymmetric.

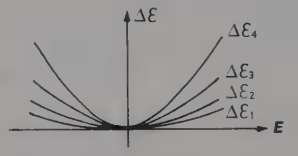

Figure 2. Dependence of the magnitude of level splitting ΔE on the strength of the electric field E in the quadratic Stark effect; the sublevels turn out to be unequally spaced

The linear Stark effect is characteristic of hydrogen in electric fields that are not too strong. For example, in fields of $\sim 10^4$ volts per cm (V/cm), the effect amounts to a few thousandths of an electron volt. An energy level of a hydrogen atom with a given principal quantum number n is split symmetrically into $2n - 1$ equidistant sublevels (Figure 1 corresponds to $n = 3$, $2n - 1 = 5$). The components of a spectral line that is split in a field E are polarized. If the direction of E is perpendicular to an observer, some of the components—called the π components—are polarized parallel to the field, while the remaining components—known as the σ components—are polarized perpendicular to the field. When observed in the direction longitudinal to the field, the π components do not appear and the σ components are replaced by unpolarized components. The intensities of the various components differ. The splitting of the H_α spectral line of hydrogen (the first line of the Balmer series) as a result of the Stark effect in shown in Figure 3.

The linear Stark effect is also observed in hydrogen-like atoms (He^+, Li^{2+}, Be^{3+}, . . .) and for highly excited states of other atoms; in a number of cases, the effect results in the appearance of forbidden lines. The quadratic Stark effect, which exhibits an asymmetric splitting pattern, is typical of many-electron atoms. The magnitude of the quadratic effect is small. For example, in fields of $\sim 10^5$ V/cm, the splitting amounts to a few ten-thousandths of an electron volt. The linear Stark effect is characteristic of molecules that are sufficiently symmetric and have a constant dipole moment. In other cases, the quadratic Stark effect is usually observed.

An important case of the Stark effect is the splitting of the electronic energy levels of an ion in a crystal lattice under the influence of the crystalline field E_{cr}, which is generated by surrounding ions. Such splitting may be as high as a few hundredths of an electron volt, is taken into account in crystal spectroscopy, and is essential for the operation of quantum mechanical amplifiers.

The Stark effect is also observed in variable electric fields. The change in the position of the Stark sublevels in a variable field E

may be used to vary the frequency of a quantum transition in quantum-mechanical devices. An example is Stark modulation (*see* MICROWAVE SPECTROSCOPY).

In particular, the influence of a rapidly varying electric field on the energy levels of atoms or ions determines the Stark broaden-

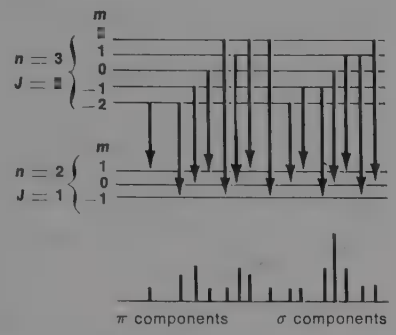

Figure 3. The splitting of the H_α line of hydrogen in an electric field. Differently polarized line components — the π components and the σ components — appear for specific combinations of sublevels.

ing of spectral lines in a plasma. The motion of plasma particles and the associated change in the distances between the particles lead to rapid changes in the electric field around each radiating particle. As a result, the energy levels of atoms or ions shift by differing amounts when they are split, leading to the broadening of spectral lines in the emission spectra of a plasma. Stark broadening makes it possible to estimate the concentration of charged particles in a plasma, for example, in a stellar atmosphere.

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M. A. EL'IASHEVICH [29–1454–4]

STARNBERG LAKE (also Starnberger See, Würmsee), a lake in the southern part of the Federal Republic of Germany, in Bavaria. Starnberg Lake is situated at an elevation of 584 m; it has an area of 57 sq km and a maximum depth of 123 m. The Würm River of the Danube basin issues from it. In summer the temperature of the lake varies from 15°C to 24°C. The lake is a popular recreation area. The city of Starnberg is located on the northern shore. [29–1457–1]

STASSFURT, a city in the German Democratic Republic, in Magdeburg District; situated on the Bode River. Population, 26,000 (1975). The city produces televisions, equipment for the soda industry, chemicals (including soda), metal goods, woodworking products, garments, and food products. [29–1457–2]

STASSFURT SALT-BEARING BASIN (also Stassfurt Basin), a section of the Upper Permian (Zechstein) Western European Basin, located within the German Democratic Republic and the Federal Republic of Germany. In the broad sense, the term is sometimes used as a synonym for the Western European Salt-bearing Basin, which stretches from Great Britain to the northwestern USSR. The salt-bearing deposits also continue beneath the North Sea.

The Stassfurt Basin covers an area of 1–1.2 million sq km. It stretches for more than 1,600 km from west to east in a band measuring 300 to 600 km in width. The thickness of the salt-bearing deposits reaches 1,200–1500 m. The basin includes geological reserves of rock salt, which, according to overall estimates amount to 1.5×10^5 cu km, or 3×10^{14} tons, and potassium salts, with estimated reserves of 135 billion tons of K_2O). Potassium salts account for its major industrial importance.

The rock salt of the Stassfurt Basin has been known since the beginning of the Middle Ages; the potassium salts were discovered in 1857. The Zechstein salt-bearing deposits are subdivided stratigraphically into five series (in ascending order): Werra, Stassfurt, Leine, Aller, and Ohre. Blanket deposits of potassium salts are found in the three lowest series. There are eight such deposits in the Werra and Northeastern German depressions, five of which are exploited by the German Democratic Republic and the Federal Republic of Germany. The deposition conditions of the strata range from nearly horizontal to complex salt dome formations. The thickness of the strata ranges from 2 to 35–40 m, and the depth at which the deposits occur, from 300 to 1,500–2,000 m. Mining work is carried out at depths of 400 to 1,000 m (rarely to 1,200 m). The Stassfurt stratum is the largest, occupying an area of at least 80,000 sq km.

The potassium deposits are of the sulfate type and contain more than 20 sulfate and chloride potassium and potassium-magnesium minerals. Kieserite-containing sylvinite (hartsalz), mixed potassium-magnesium salts, and carnallite rocks are the major products. The K_2O content in the salts mined is 10–18 percent. The mining of rock salt is carried out by underground methods (in mines) or by leaching through drilled wells. Potassium salts are worked in mines in the German Democratic Republic and the Federal Republic of Germany. In 1974, 2.8 and 2.6 million tons of potassium salts (with respect to K_2O content) were produced in the German Democratic Republic and the Federal Republic of Germany, respectively.

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A. A. IVANOV [29–1457–3]

STATE, in a number of federated countries (USA, Mexico, Venezuela, Brazil, India, Australia, Nigeria), the name of the governmental-territorial units that form the federation. With the exception of India, states are not usually created along national lines.

The rights of a state are determined by the federal constitution and the constitution of the individual state (USA, Venezuela, Australia); however, a state does not always have the right to adopt its own constitution (in India only two of the 22 states have a constitution). The states create their own governmental bodies. As a rule, the central power either formally or in fact controls the legislative and executive activities of the states. A state is usually headed by a governor elected by the population (USA and Mexico) or chosen by the head of the federal government (India and Australia). Each state is represented in the upper chamber of the federal legislative body, either by an even number of representatives (USA, two; Mexico, two; Venezuela, two; Brazil, three; Australia, ten) or according to a norm of representation that depends on the size of the state's population (India). The mutual relations of the states to the federation and of the states among themselves are determined by the constitutions, judicial decisions, agreements among the states, and custom.

A. A. MISHIN [29–1457–4]

STATE EXPENSES COLLEGIUM (Shtats-kontor Kollegiia), a state institution in Russia in the 18th century. The staff, president, and vice-president were approved in December 1717, and the functions of the body, in December 1718. The collegium managed state expenditures and, upon order of the Senate, distributed specific amounts to governmental institutions and officials.

In November 1723 the State Expenses Collegium was converted to a Senate office, called the State Office of the Senate; between 1726 and 1730 it was subordinate to the Chamber Collegium. In July 1730, however, its status as an independent collegium was restored. In October 1780 the State Expenses Collegium was abolished. Most of its functions were transferred to the treasury offices established in St. Petersburg and Moscow, but some were transferred to the provincial financial boards and district treasury offices. [29–1459–2]

STAUB, RUDOLF. Born Jan. 29, 1890, in Glarus; died June 25, 1961, in Fex, Graubünden Canton, Switzerland. Swiss geologist.

Staub became a student at the Eidgenössische Technische Hochschule in Zürich in 1908 and later studied at the University of Zürich. From 1928 to 1957 he was a professor at both schools. His principal works dealt with the geological structure, tectonics, and geomorphology of the Alps and with general questions of geotectonics. Staub developed the idea that the continental blocks of the earth's crust sometimes shift toward the poles, as a result of subcrustal magmatic currents, and sometimes toward the equator, as a result of centrifugal forces; this leads to alternating compressions and extensions of the geosynclinal regions in the equatorial zone of the globe.

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STAUDINGER, HERMANN. Born Mar. 23, 1881, in Worms; died Sept. 8, 1965, in Freiburg. German chemist (Federal Republic of Germany).

Staudinger studied at the Technische Hochschule in Darmstadt and at the universities of Halle and Munich. He was a professor at the Technische Hochschule in Karlsruhe from 1908 to 1912, at the Swiss Federal Institute of Technology in Zürich from 1912 to 1926, and at the University of Freiburg from 1926 to 1951. From 1940 to 1956 he was the director of the State Institute for Macromolecular Compounds.

Staudinger's principal works deal with the chemistry of macromolecular compounds. In 1905 he discovered ketenes, a class of organic compounds. In 1919 he proposed a method of substituting an imino group for the oxygen atom of a carbonyl group by using triphenylphosphine imines; the process is known as the Staudinger reaction. In 1922 he proved that polymers are compounds consisting of large molecules, the atoms of which are joined by covalent bonds. To describe such molecules he introduced the concept of the macromolecule. Staudinger also advanced the theory of the chain structure of macromolecules, to which he subsequently added the concepts of the branched macromolecule and the three-dimensional polymer network. He demonstrated the relationship between the molecular weight of a polymer and the viscosity of its solutions, thus laying the foundations for the development of the viscometric method for determining molecular weight. He also proposed polymer-analogue transformation reactions. In 1947, Staudinger founded the journal *Die makromolekulare Chemie*.

Staudinger received a Nobel Prize in 1953.

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Arbeitserinnerungen. Heidelberg, 1961. [29–1460–1]

STAUDT, KARL GEORG CHRISTIAN VON. Born Jan. 24, 1798, in Rothenburg; died June 1, 1867, in Erlangen. German mathematician.

Staudt became a professor at the University of Erlangen in 1835. His principal works dealt with projective geometry. They sought to provide a logically complete construction of projective geometry that would not rest on concepts borrowed from metric geometry. Staudt contributed a purely projective introduction of general projective (homogeneous) coordinates and an interpretation of the introduction of imaginary quantities into projective geometry.

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STAUDTE, WOLFGANG. Born Oct. 9, 1906, in Saarbrücken. German stage and motion-picture director of the Federal Republic of Germany (FRG).

Staudte became an actor in the Volksbühne Theater in 1926 and worked in the companies of M. Reinhardt and E. Piscator. He began his film career in 1931, first as an actor and later as a director. In 1943 he directed *Hooray for the Acrobat*, a comedy film about the fate of an honest performer, a clown named Charlie, in Nazi Germany. In 1946, Staudte and the directors S. Dudow, K. Maetzig, and F. Wolf formed the motion-picture studio DEFA (Deutsche Film Aktiengesellschaft) in Babelsberg, near Berlin, German Democratic Republic. This studio produced such antifascist films as *The Murderers Among Us* (1946; released in the USSR as *They Won't Be Able to Hide*), *Rotation* (1949, Soviet release, *The Brown Spiderweb*), and *The Loyal Subject* (1951, after a work by H. Mann). In the mid-1950's, Staudte began working in the film studios of the FRG. His best works, several of which warn of the danger of a rebirth of Nazism and revanchism, include *Roses for the Public Prosecutor* (1959), *The Fair* (1960), *A Get-together With the Boys* (1964), and *The Commissar* (1971).

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Knietzsch, H. *Wolfgang Staudte*. Berlin, 1966.

O. V. IAKUBOVICH [29–1460–3]

STEDINGERS, free peasants, probably of Frisian and Saxon origin, who in the 11th and 12th centuries settled in the marshy area along the lower course of the Weser River, below the city of Bremen, on land owned by the archbishop of Bremen. For a long while the Stedingers successfully resisted enserfment. They were proclaimed heretics in 1230, and a crusade was conducted against them from 1232 to 1234. They were defeated in 1234 by the united forces of the princes at Altenesch. Some of the Stedingers were later killed; others became feudally dependent peasants. [29–1461–4]

STEENBECK, MAX. Born Mar. 21, 1904, in Kiel. German physicist (German Democratic Republic). Member of the German Academy of Sciences (1956); vice-president of the academy from 1962 to 1967.

Steenbeck studied at the Christian Albrechts University in Kiel from 1922 to 1927. From 1927 to 1945, he was employed by the firm of Siemens and Schuckert. From 1945 to 1956, he worked in the USSR. Steenbeck became a professor at the University of Jena in 1956 and was made the director of the Institute of Magnetohydrodynamics in 1958. From 1957 to 1962, he directed research in nuclear physics and nuclear power engineering in the German Democratic Republic. In 1965 he became the chairman of the Scientific Council of the German Democratic Republic.

Steenbeck's main works deal with gas-discharge physics, semiconductor physics, isotope separation, and magnetohydrodynamics. Steenbeck took part in the development of the first nuclear power plant in the German Democratic Republic.

Steenbeck was awarded the Lomonosov Gold Medal of the Academy of Sciences of the USSR. He became a foreign member of the Academy of Sciences of the USSR in 1966. [29–1461–5]

STEERING WHEELS AND CONTROL COLUMNS, control devices connected by linkage with the rudder of a ship, the elevator and ailerons of an airplane, or the road wheels of a machine such as a motor vehicle or a tractor.

The steering wheel of a ship is located in the pilothouse, and the control column of an airplane, in the cockpit. The steering wheel of a transport vehicle such as a motor vehicle is in the cab. Small ships have steering wheels that are operated manually, as are the control columns in light aircraft. Larger craft are equipped with auxiliary steering mechanisms, or boosters, which reduce to acceptable levels the force needed to turn the wheel or to operate the controls. The operation of the steering wheel on modern ships is fully automated and is facilitated by what is called a servomechanism. [29–1501–2]

ŠTEFÁNIK, MILAN RASTISLAV. Born July 21, 1880, in Košariska, Slovakia; died May 4, 1919. Czechoslovak political and military figure.

The son of an evangelical minister, Štefánik graduated from Charles University. In 1904 he moved to France, where he became a French citizen (1910) and carried out special diplomatic and intelligence assignments for the authorities. During World War I Štefánik was an officer in the French Army; he became a general in the summer of 1918.

In 1916, Štefánik became a member of the Czechoslovak National Council in Paris. He helped form Czechoslovak military units composed of prisoners of war and emigrés in the countries of the Entente and the USA. He became minister of war in the Czechoslovak emigré Provisional Government in October 1918 and helped the Entente carry out its intervention in Soviet Russia. Štefánik died in a plane crash en route from Italy to Czechoslovakia.

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Klevanskii, A. Kh. *Chekhoslovatskie internatsionalisty i prodannyi korpus*. Moscow, 1965. [29–1477–3]

STEIGER, OTTO. Born Aug. 4, 1909, in Uetendorf, Bern Canton. Swiss writer. Writes in German.

Steiger studied in Bern and Paris; in the 1930's he lived in France. His main genre is the novel of social criticism, characterized by a tendency toward allegory and the use of elements of the grotesque in the plot. In such novels as *Portrait of a Respected Man* (1952; Russian translation, 1957), *The Trevenbold Brothers* (1954), and *Journey to the Sea* (1960), he satirizes and expresses hostility toward the antihumanist tendencies of bourgeois society. Steiger is also the author of the novel *The Eleven-month Year* (1962; Russian translation, 1966), the collection of short stories *A Hole in the Sound Barrier* (1965), and the political comedy *The Siege* (1960).

WORKS

Die Schlinge. Zürich, 1962. [29–1462–1]

STEIN, BARON VOM (full name, Heinrich Friedrich Karl, Baron vom und zum Stein). Born Oct. 26, 1757, in Nassau; died June 29, 1831, at the estate of Kappenberg, Westphalia. German state figure. *Reichsfreiherr* (imperial baron).

Beginning in the 1780's, Stein held a series of important posts in the mining industry of Westphalia. From 1804 to 1807 he was a minister of the Prussian government, in which capacity he proposed sweeping reforms of the government that met with resistance from the king and his circle. Developments following the defeat of the Prussian Army at the battle of Jena-Auerstädt (1806) eventually led to Stein's appointment as head of the Prussian government in October 1807; despite the objections of the *Junkers*, who favored reactionary policies, he implemented a number of bourgeois reforms (*see* STEIN-HARDENBERG REFORMS).

In November 1808, under pressure from Napoleon I, who feared a strong Prussia, Stein was dismissed. Forced to leave Prussia, he took up residence in Prague; in May 1812 he arrived in Russia at the invitation of Tsar Alexander I. Stein developed a plan for a general uprising against Napoleonic rule in Germany. He headed the Committee on German Affairs, an organization independent of the German princes that played an important role in the struggle to liberate Germany from the Napoleonic yoke. In 1813 and 1814, Stein headed the council of administration of the liberated German territories.

Stein insisted on the need to create a German state. With the onset of reaction in Germany, he withdrew from politics. In 1827 he became a member of the Prussian Staatsrat (State Council). Stein helped found the series *Monumenta Germaniae historica*.

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Pertz, G. H. *Das Leben des Ministers Freiherrn vom Stein*, vols. 1–6. Berlin, 1850–55. [29–1463–1]

STEINACH, EUGEN. Born Jan. 27, 1861, in Hohenems; died May 13, 1944, in Territet, near Montreux, Switzerland. Austrian physiologist and biologist.

Steinach graduated from the University of Vienna in 1886. From 1886 to 1889 he was an assistant at the Physiological Institute in Innsbruck, Austria. In 1907 he became a professor at Charles University in Prague. Beginning in 1912, he became director of the physiology division of the Biological Institute of the Austrian Academy of Sciences. Steinach's main research dealt with sex change in mammals induced by removing and transplanting the sexual glands. Well known is his work on vasoligation related to rejuvenation.

WORKS

Sex and Life. New York, 1940.

Verjüngung durch experimentelle Neubelebung der alternden Pübertätsdrüse. Berlin, 1920. [29–1464–2]

STEINDL, IMRE. Born Oct. 29, 1839, in Pest; died Aug. 31, 1902, in Budapest. Hungarian architect.

Steindl graduated from the Academy of Fine Arts in Vienna in 1867. He worked extensively on the restoration of Hungarian medieval architectural monuments. A connoisseur and enthusiast of Gothic architecture, Steindl made wide use of Gothic motifs in his designs for the New City Hall (1870–72, Budapest) and the Parliament (Budapest). [29–1466–3]

STEINER, JAKOB. Born Mar. 18, 1796, in Utzenstorf; died Apr. 1, 1863, in Bern. Swiss geometer; one of the founders of projective geometry. Member of the Berlin Academy of Sciences (1834).

Steiner became a professor at the University of Berlin in 1835. He refined and systematized the use of projective methods to build complex geometric structures from simpler ones. Steiner was the author of *Systematic Development of the Dependence of Geometric Forms on One Another* (part 1, 1832) and *The Geometric Constructions Executed by Means of the Straight Line and a Fixed Circle* (1833; Russian translation, 1939).

REFERENCE

Klein, F. *Lektsii o razvitii matematiki v XIX stoletii*, part 1. Moscow-Leningrad, 1937. (Translated from German.) [29–1467–1]

STEINER, RUDOLF. Born Feb. 27, 1861, in Kraljević, Croatia; died Mar. 30, 1925, in Dornach, near Basel. German mystical philosopher and founder of anthroposophy.

Steiner was influenced by the natural philosophy of Goethe, and in the period 1883–97 he edited the poet's scientific writings. Steiner was also influenced by the evolutionary teachings of C. Darwin and E. Haeckel and subsequently by the philosophy of F. Nietzsche. In 1902, Steiner embraced theosophy, heading the German branch of the Theosophical Society; after a conflict with the society in 1913 over the proclamation of J. Krishnamurti as the new Messiah, Steiner founded the Anthroposophical Society with its center at Dornach, Switzerland.

Steiner attempted to transform theosophy into an experimental science, setting as its goal the revelation of the "secret" forces of man through the use of a system of special exercises that involved eurythmics, music, the contemplation of mysteries, and meditation. Steiner's "spiritual science" claimed to combine German classical idealist philosophy and the natural scientific ideas of modern times with the various religious doctrines of antiquity and the Middle Ages (the ancient mysteries, Christianity, and Eastern religions), as interpreted in the spirit of occultism. Steiner's writings ranged over such subjects as pedagogy, education, the arts, medicine, cosmology, and the history of religion.

In 1919, Steiner began developing utopian ideas for overcoming the soulless, mechanistic economy on the basis of a spiritual approach to nature—for example, by transforming agriculture through the comprehension of the biorhythms of plants. Plato's influence was evident in Steiner's political utopia in his division of the social organism into three independent spheres—juridical, spiritual, and economic. Under conditions of the post-World War I crisis, Steiner's doctrine gained widespread acceptance primarily in Germany; it had a definite effect on the artistic intelligentsia.

Steiner was also a playwright, sculptor, and architect; the Goetheanum, an architectural complex that was built in Dornach in accordance with his design, exerted a considerable influence on architectural expressionism. The Anthroposophical Society was persecuted by the Nazis, who banned Steiner's works after 1933. Since the 1960's there has been a revival of Steinerism in Western Europe and the USA (for example, the therapeutic clinical center in Arlesheim, Switzerland).

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Abendroth, W. *R. Steiner und die heutige Welt*. Munich, 1969.
D. N. LIALIKOV [29–1466–4]

STEIN-HARDENBERG REFORMS, bourgeois reforms implemented in Prussia from 1807 to 1814 by governments headed by Baron vom Stein and K. A. von Hardenberg.

The Edict of 1807 freed the peasants from hereditary servitude and permitted landowners to dispose of their property as they saw fit, thereby making it possible for burghers and peasants to acquire land; the edict did not affect, however, the peasants' obligations deriving from the tenure of land. The Edict of 1811, designed to regulate the freeing of the peasants, made it extremely difficult for the peasants to redeem their obligations; in order to become a freeholder, the peasant had to cede one-third to one-half the land he occupied or pay 25 times the amount of the yearly lease. The agrarian reforms fostered the development of capitalism in agriculture along "the Prussian path," by which many vestiges of feudalism were retained.

In November 1808 a municipal reform was promulgated giving the cities limited self-government. At the same time institutions at the highest level of government were reorganized, with the creation of ministries of war, domestic affairs, foreign affairs, justice, and finance. Administrative reforms were carried out to strengthen the bureaucratic centralization of Prussia; these included placing an *Oberpräsident*, appointed by the government, in charge of each province.

In 1810 and 1811 legislation was enacted to remove restrictions on productive activity, thereby abolishing the guild system, which had slowed the development of industry. Under the military reform of 1807–14 members of the nobility were no longer guaranteed officers' posts, and the use of corporal punishment was sharply curtailed. The implementation of army reforms on the bourgeois model was completed during the German people's war of liberation against Napoleon, when what was in fact universal military service was introduced (subsequently enacted into law in 1814), and a national militia—the *Landwehr*—was established.

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[29–1464–1]

STEINITZ, WOLFGANG. Born Feb. 28, 1905, in Breslau (now Wrocław, Poland); died Apr. 21, 1967, in Berlin. German linguist, ethnographer, and folklorist (German Democratic Republic; GDR). Academician of the German Academy of Sciences in Berlin (1951); the academy's vice-president from 1954 to 1963. Member of the Communist Party of Germany from 1927. Member of the Central Committee of the Socialist Unity Party of Germany (1954–58).

Steinitz graduated from the University of Berlin in 1927. In 1934 he emigrated to the USSR, where he was a professor at the Leningrad Institute of the Peoples of the North from 1934 to 1937. He taught at the universities of Tartu and Stockholm from 1938 to 1945. In 1945 he returned to Germany (GDR), where in 1946 he became a professor at the Humboldt University of Berlin. He served as director of the Institute of Finno-Ugric Studies and in 1953 became director of the Institute of Ethnography of the German Academy of Sciences.

In his principal works Steinitz dealt with Finno-Ugric linguistics and the history, daily life, and folklore of the Finno-Ugrian peoples; he traced the history of the sound system of the Finno-Ugric languages. He also conducted research on Russian and modern German. Steinitz wrote a textbook on the Russian language (1945) and a work on German democratic songs.

WORKS
Der Parallelismus in der finnisch-karelischen Volksdichtung: Untersucht an den Liedern des karelischen Sängers Arhippa Pertunen. Helsinki, 1934.
Ostjakische Volksdichtung und Erzählungen aus zwei Dialekten, vols. 1–2. Tartu-Stockholm, 1939–41.
"Geschichte des finnisch-ugrischen Konsonantismus." *Acta Instituti Hungarica Universitatis Holmiensis*, series B: *Linguistica*, 1, 1952.
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Etnografisch-archäologische Zeitschrift, vol. 9, 1968, pp. 197–218.
R. A. AGEEVA [29–1467–2]

STEINMETZ, CHARLES PROTEUS (Karl August Rudolf Steinmetz). Born Apr. 9, 1865, in Breslau (now Wrocław), Poland; died Oct. 26, 1923, in Schenectady, N.Y. American electrical engineer; consulting engineer with the General Electric Company.

Steinmetz studied at the University of Breslau and graduated from the Polytechnic Institute in Zürich. He had fled to Zürich to escape the persecution of the authorities for his participation in the labor movement. In 1889 he emigrated to the USA and settled in Yonkers, N.Y., where he went to work at a small electrical shop. In 1893 he joined the General Electric Company, where he held responsible positions under the title of consulting engineer.

Steinmetz' main work dealt with the processes in electric machines and devices. He proposed an empirical formula for determining hysteresis loss (1890–92) and, in 1897, developed a symbolic method for calculating alternating current phenomena. He studied aspects of the design and analysis of illumination devices and large electric machines produced at General Electric plants.

Steinmetz was a socialist by conviction. In 1922 he addressed a letter to V. I. Lenin, in which he welcomed the social transformations in Russia.

WORKS
Theory and Calculation of Alternating Current Phenomena, 5th ed. New York, 1916.
In Russian translation:
Teoreticheskie osnovaniia elektrotekhniki sil'nykh tokov. St. Petersburg, 1905.
REFERENCE
Bel'kind, L. D. *Charlz Proteus Shteinmets*. Moscow, 1965.
G. K. TSVERAVA [29–1468–1]

STEINTHAL, HEYMANN. Born May 16, 1823, in Gröbzig; died March 14, 1899, in Berlin. German linguist.

Steinthal, who became a professor at the University of Berlin in 1863, was a follower of W. von Humboldt, one of the founders of the psychological school of linguistics. He developed a subjective idealist conception of language, which he applied to the solution of problems in ethnopsychology (*Völkerspsychologie*). Stein-

thal pointed out the special role of language in ethnopsychology. His views influenced the early work of A. A. Potebnia and the neogrammarians (*see* NEOGRAMMARIAN). Steinthal advanced an onomatopoeic theory of the origin of language and laid the foundations of cultural anthropology. Steinthal is known as a popularizer of Humboldt's typological classification of languages, although the changes that he introduced into this classification in 1860 did not gain recognition.

WORKS

Grammatik, Logik und Psychologie, ihre Principien und ihr Verhaltniss zu einander. Berlin, 1855.

Charakteristik der hauptsächlichsten Typen des Sprachbaues. Berlin, 1860.

Philologie, Geschichte und Psychologie in ihren gegenseitigen Beziehungen. Berlin, 1864.

Abriss der Sprachwissenschaft, part 1. Berlin, 1881.

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Bumann, W. *Die Sprachtheorie H. Steinthals*. Meisenhelm am Glan [1966]. [29–1468–2]

STEP-BY-STEP AUTOMATIC TELEPHONE CENTRAL OFFICE, a telephone central office in which the switching of subscriber and connecting lines is accomplished with a low-capacity step-by-step electromechanical switch with single-motion wipers. A step-by-step automatic central office establishes both direct and indirect routes.

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Markhai, E. V., and I. A. Babitskii. *Avtomaticheskie telefonnye stantsii*, part 1. Moscow, 1944. [29–804–1]

STEPHĂNESCU, GEORGE. Born Dec. 13, 1843, in Bucharest; died there Apr. 25, 1925. Rumanian composer, teacher, and conductor.

Stephănescu studied at the conservatories in Bucharest from 1864 to 1867 and in Paris from 1867 to 1871. From 1877 to 1890 he was a conductor and composer at the National Theater in Bucharest. A seminal figure in the Rumanian school of composition, he made a particularly important contribution to orchestral and chamber music. Stephănescu composed the first Rumanian symphony in 1869. He founded and was the conductor of several professional opera companies in Rumania that paved the way for the creation of a national opera theater. Stephănescu, a professor of voice and opera at the Bucharest Conservatory from 1872 to 1904, helped develop a national school of vocal music.

REFERENCES

Tomescu, V. "Un înaintaş al muzicii noastre, George Stephănescu, compozitor de seamă şi i întemeietor al teatrului liric românesc." *Muzica*, 1954, supplement 1.

Stephănescu, G. *George Stephănescu: Viaţa în imagini*. Bucharest, 1962.

Vancea, Z. *Creaţia muzicală românească*, vol. 1, sections 19–20. Bucharest, 1968. Pages 106–15. [29–1477–4]

STEPPER MOTOR (also magnetic stepping motor), a synchronous motor in which current pulses supplied to stator windings are converted into discrete angular motions, or steps, of a rotor. A stepper motor may be either a salient-pole motor or a nonsalient-pole motor. The field windings are on the stator, and the rotor has no winding. In a variable-reluctance stepper motor, the rotor is made of a soft magnetic material. In a permanent-magnet stepper motor, the rotor is made of a hard magnetic material.

The current pulses are supplied from a power source to the field windings in sequence through a commutator. As a result, the direction of the magnetic flux in the space between the stator poles changes in discrete steps (Figure 1), causing the rotor to rotate through a certain angle θ. Each such rotation of the rotor is called a step.

The magnitude of a step depends on the number of field windings and either on the number of rotor projections (for a variable-reluctance stepper motor) or on the number of salient poles (for a permanent-magnet stepper motor). The step is usually 1.5°–3° for variable-reluctance motors or 15° for permanent-magnet stepper motors. A permanent-magnet stepper motor makes it possible to obtain a relatively high torque and ensures that the rotor does not move when the windings are not energized.

Stepper motors are used in electric stepping drives.

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Chechet, Iu. S. *Elektricheskie mikromashiny avtomaticheskikh ustroistv*, 2nd ed. Moscow, 1964.

Bruskin, D. E., A. E. Zorokhovich, and V. S. Khvostov. *Elektricheskie mashiny i mikromashiny*. Moscow, 1971.

M. D. NAKHODKIN [29–804–3]

STEP VOLTAGE, a voltage that is caused by a current flowing in the ground or in a conducting floor and is equal to the potential difference between two points on the surface of the earth or of the floor that are separated by a distance of one pace. The magnitude of a step voltage depends on the current and on the resistivity of the ground or the floor.

Hazardous step voltages may be produced near the grounding conductors of electrical installations when a ground fault occurs. Therefore, permissible values of the resistance of grounding conductors and the resistivity of the ground are set by standards.

[29–804–2]

STERN, LEO. Born Mar. 27, 1901, in Woloka, Austria. German historian and social figure (German Democratic Republic). Member of the German Academy of Sciences (1955); professor at the University of Halle (1950).

In 1921, Stern joined the Communist Party of Austria. He studied at the University of Vienna and took part in armed proletarian uprisings in Vienna in 1927 and 1934. He emigrated in 1934 and lived first in Czechoslovakia and then in the USSR. Stern fought in the international brigades in Spain. From 1941 to 1945 he was an officer in the Red Army and fought against fascist Germany; he joined the National Committee, Free Germany.

Upon his return to Austria, Stern became a teacher. He moved to the German Democratic Republic (GDR) in 1950 and joined the Socialist Unity Party of Germany. He was vice-president of the German Academy of Sciences from 1963 to 1968; from 1957 to 1975 he was chairman of the German section of the Commis-

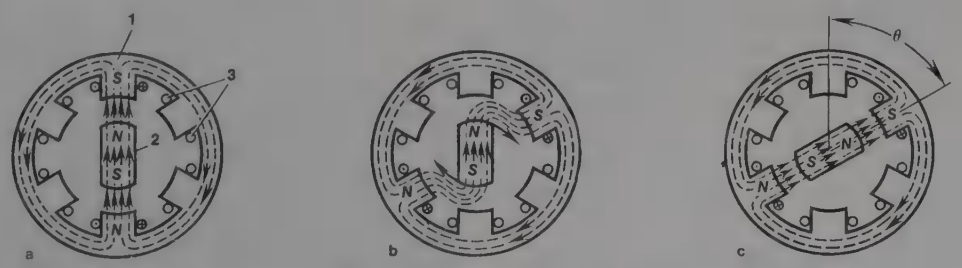

Figure 1. Cross section of a stepper motor: (a) at the initial moment, (b) at the moment the next set of stator windings is energized, (c) upon rotation through an angle θ; (1) stator, (2) rotor, (3) field windings

sion of Historians of the USSR and German Democratic Republic. Stern's works deal with a broad range of problems in German history from the Middle Ages to modern times, focusing particularly on the working-class movement and historiography.

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Zur Vorgeschichte der Gründung der Kommunistischen Partei Deutschlands. [Halle, 1954.]
Die zwei Traditionen der deutschen Polenpolitik und die Revolution von 1905–1907 in Königreich Polen. Berlin, 1961.
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In Russian translation:
Vliianie Velikoi Oktiabr'skoi sotsialisticheskoi revoliutsii na Germaniiu i germanskoe rabochee dvizhenie. Moscow, 1960. [29–1472–2]

STERN, OTTO. Born Feb. 17, 1888, in Sorau (Żary), Silesia; died Aug. 17, 1969, in Berkeley, Calif. Physicist.

Stern graduated from the University of Breslau (Wrocław) in 1912. He joined the staff of the University of Frankfurt in 1920 as a docent and subsequently became a professor there. He was named a professor at the University of Rostock in 1922. From 1923 to 1933, Stern was a professor at the University of Hamburg and director of its physicochemical laboratory. He then emigrated to the United States; from 1933 to 1945 he was a professor at the Carnegie Institute of Technology in Pittsburgh.

Stern's principal works were devoted to nuclear physics, quantum physics, and thermodynamics. In 1920, in what is now called the Stern-Zartman experiment, he became the first to measure directly the velocities of molecules. In 1921 he suggested the possibility of experimentally verifying the space quantization of the magnetic moment of an atom; together with the German physicist W. Gerlach, he performed the verification, a report of which was published in 1922. In 1933, Stern and the German physicist O. R. Frisch became the first to measure the magnetic moment of a proton in the H_2 molecule. The method of molecular or atomic beams was developed by Stern and his colleagues. Stern received a Nobel Prize in 1943. [29–1473–2]

STERN, WILLIAM. Born Apr. 29, 1871, in Berlin; died Mar. 27, 1938 in Durham, N.C. German psychologist and idealist philosopher.

Stern was on the faculty of the University of Breslau from 1897 to 1915, becoming a professor in 1907. From 1916 to 1933 he was a professor in Hamburg, where he founded an institute of psychology to study mainly problems of child and pedagogical psychology. Stern emigrated to the United States in 1933 and became a professor at Duke University the following year.

Stern was the author of classical works on child psychology (*Psychology of Early Childhood*, 1914; Russian translation, 1915). He was particularly interested in gifted children. Stern's studies embraced a wide range of aspects of general, genetic, and applied psychology, including differential psychology. Stern was one of the first to engage in a systematic study of individual differences and to use intelligence tests. He introduced the concept of the intelligence quotient. He also pioneered in forensic psychology (see his article in the collection *Problems of Psychology*, fasc. 1, 1901). In philosophy, Stern developed the concept of "personalistics" (*Person and Matter*, vols. 1–3, 1906–24), regarding the world as a hierarchical system of "personalities" of varying ranks (adult human being, child, animal, plant, crystal). Stern contrasted matter as something determined from without with personality as some internally active and purposeful integral whole.

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D. N. Lialikov [29–1471–3]

STERN-GERLACH EXPERIMENT, an experiment that confirmed that atoms have a magnetic moment, the projection of which on the direction of an applied magnetic field takes on only specific values, that is, is quantized with respect to direction in space. The experiment was performed in 1922 by the German physicists O. Stern and W. Gerlach. They investigated the passage of a beam of Ag atoms (and, later, beams of atoms of other elements) in a highly inhomogeneous magnetic field (see Figure 1) in order to verify the theoretically obtained equation for the space quantization of the projection μ_z of the magnetic moment μ_0 of an atom on the Z direction. The equation is $\mu_z = \mu_0 m$, where $m = 0, \pm 1, \ldots$.

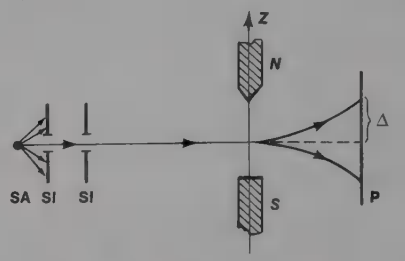

Figure 1. Schematic of the Stern-Gerlach experiment: (SA) source of atoms, (SI) slits that formed a narrow beam, (*N*, *S*) poles of a magnet created by the steady inhomogeneous field, (P) plate on which the atoms were deposited, (Δ) magnitude of the beam deflection from the original direction; the experiment was carried out in a vacuum

A force $\mathbf{F} = \boldsymbol{\mu}_z \partial \mathbf{H}/\partial Z$ acts on an atom having a magnetic moment and moving in a magnetic field **H** that is inhomogeneous in the direction longitudinal to Z. The force deflects the atom from its original direction of motion. If the projection of the magnetic moment of an atom could vary continuously, a broad diffuse band would be observed on the photographic plate P. However, in the Stern-Gerlach experiment, the atomic beam was found to be split into two components that were symmetrically shifted by a quantity Δ with respect to the original direction of propagation; that is, two narrow bands appeared on the plate. The results of the experiment indicated that the projection μ_z of an atom's magnetic moment on the direction of the field **H** takes on only two values, $\pm \mu_0$, that differ in sign. In other words, μ_0 is oriented in the direction parallel to **H** and in the opposite direction. The value of the magnetic moment μ_0 that was measured in the experiment from the shift Δ turned out to be equal to the Bohr magneton.

The Stern-Gerlach experiment played a major role in the further development of concepts of the electron. According to the Bohr-Sommerfeld theory, the orbital angular momentum and, consequently, the magnetic moment of the atoms used in the experiment, which have a single electron in the outer shell, should be equal to zero. Therefore, such atoms should not, in general, be deflected by a magnetic field. The Stern-Gerlach experiment showed that, contrary to the theory, the atoms used have a magnetic moment. In 1925, the Stern-Gerlach experiment, together with previous experiments, led G. E. Uhlenbeck and S. Goudsmit to the hypothesis that the electron has intrinsic angular momentum, which is called spin.

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A. V. Kolpakov [29–1474–1]

STERNHEIM, CARL. Born Apr. 1, 1878, in Leipzig; died Nov. 3, 1942, in Brussels. German writer and critic.

The son of a banker, Sternheim studied philosophy, literature, and psychology in Munich and Leipzig. He emigrated to Belgium before 1933; in the latter years of his life he withdrew from literature. In his early works, Sternheim polemized with the aesthetics of naturalism from a neoromantic point of view. He revealed the inner decay and degeneration of the bourgeoisie and the kaiser's arrogant aristocracy in a cycle of satirical plays drawn "from the

heroic life of a bourgeois." These plays, which make use of elements of the grotesque, include *The Trousers* (1911), *The Box* (1912), *Burgher Schippel* (1913), *The Snob* (1914), *1913* (1915), and *Tabula Rasa* (1916). Sternheim's perceptive characterization and sometimes shockingly expressive language gave his plays a formal similarity to the drama of expressionism. Sternheim also wrote novellas; publicist works, such as the collection of essays *Berlin, or Juste Milieu* (1920); works about art; and literary criticism.

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[29–1476–2]

STERN-ZARTMAN EXPERIMENT (in Russian, called the Stern experiment), an experimental determination of the speeds of gas molecules in thermal motion. It was first carried out by O. Stern in 1920. The Stern-Zartman experiment confirmed the validity of the foundations of the kinetic theory of gases.

The gas studied in the experiment was a rarefied silver vapor, which was obtained by vaporizing a silver coating from a platinum wire heated by an electric current. The wire was placed in a vessel from which air had been evacuated, so that the silver atoms freely escaped from the wire in all directions. To obtain a narrow beam of escaping atoms, a barrier with a slit, through which the atoms impinged on a brass plate maintained at room temperature, was set up in the path of the escaping atoms. The silver atoms were deposited on the plate as a narrow band, forming a silver image of the slit. A special device was used to set the entire apparatus in rapid rotation about an axis parallel to the plane of the plate. As a result of the rotation of the apparatus, the atoms impinged on another site on the plate because the plate shifted as the atoms traversed the distance l from the slit to the plate (see Figure 1).

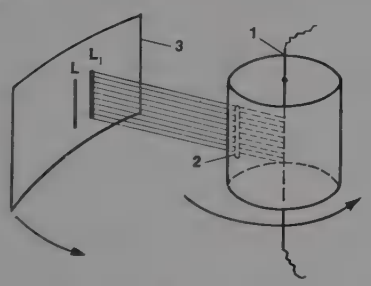

Figure 1. Schematic of the Stern-Zartman experiment: (1) silver-coated platinum wire, (2) slit forming a beam of silver atoms, (3) plate on which the silver atoms were deposited, (L) location of the band of deposited silver when the apparatus was stationary, (L_1) location of the band when the apparatus rotated

The shift of the plate increases as the angular velocity ω of the apparatus increases and decreases as the speed v of the silver atoms increases. If ω and l are known, v may be determined. Since the atoms move with different speeds, the band spreads and becomes broader as the apparatus rotates. The density of the silver deposit at a given point of the band is proportional to the number of atoms moving with a given speed. The maximum density of the deposit corresponds to the most probable velocity of the atoms.

The values obtained in the Stern-Zartman experiment for the most probable velocity were in good agreement with the theoretical values obtained on the basis of the Maxwellian distribution of molecules over velocities. [29–1473–3]

STETTIN, PEACE OF (1570), a treaty concluded between Sweden and Denmark, in the city of Stettin in Pomerania (now Szczecin, Polish People's Republic). The Peace of Stettin ended the Seven Years' War of the North (1563–70) and reestablished the former boundaries between Sweden and the Danish-Norwegian kingdom. In return for an indemnity, Denmark gave back to Sweden the port of Älvsborg, which had been captured during the war. [29–1477–2]

STETTIN LAGOON, a lagoon off the Baltic Sea, on the coasts of the German Democratic Republic (GDR) and Poland. The Stettin Lagoon measures 33 km in length and 46 km in width. The depth of the shipping channel reaches 8.5 meters. The Oder (Odra) River flows into the lagoon. Its principal port is Szczecin, which is situated on the Oder. [29–1603–2]

STIEBER, WILHELM. Born 1818; died 1882. Prussian police official.

Stieber was head of the Prussian political police from 1850 to 1860. Using forgery and provocation, he organized the trial of a group of participants in the Silesian weavers' uprising of 1844, accusing them of forming a "communist conspiracy"; he also organized a trial of members of the Communist League (*see* COLOGNE COMMUNIST TRIAL OF 1852). Stieber was one of the authors of the slanderous book *Communist Plots of the 19th Century* (1853–54).

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[29–1477–5]

STIEDRY, FRITZ. Born Oct. 11, 1883, in Vienna; died Aug. 9, 1968, in Zürich. Austrian conductor.

Stiedry studied music at the Vienna Conservatory and received further training in the opera theaters of Vienna and Dresden as an assistant conductor to G. Mahler and E. von Schuch. Until 1923 he conducted the Berlin Opera. He led the Vienna Volksoper in 1924 and 1925 and the Berlin Municipal Opera from 1929 to 1933; he also undertook several European tours.

After the fascists came to power, Stiedry left Germany and served as principal conductor of the Leningrad Philharmonic from 1933 to 1937. In 1938 he took up residence in the USA, where he founded and conducted the New Friends of Music Orchestra. In 1946 he was engaged as a conductor at the Metropolitan Opera. He spent the last years of his life in Switzerland.

Stiedry combined an impetuous performance style with a logical approach to the music and a sense of form. These qualities made him an outstanding interpreter of the Viennese classical school and the romantics, notably W. A. Mozart, J. Haydn, L. van Beethoven, J. Brahms, and G. Mahler. He was also known for his performances of the operas of G. Verdi and R. Wagner. Stiedry conducted the premiere of D. D. Shostakovich's First Piano Concerto. M. M. IAKOVLEV [29–1478–2]

STIERNHIELM, GEORG. Born Aug. 7, 1598, in Svartskär, Dalarna; died Apr. 22, 1672, in Stockholm. Swedish poet; scholar of encyclopedic scope.

Stiernhielm studied in Germany and Holland. In the allegorical-didactic narrative poem *Hercules* (1648, published 1658) he affirmed the ideas of Renaissance humanism and moral stoicism. Stiernhielm was the first in Swedish literature to use classical and Renaissance plots; he introduced accentual versification, the hexameter line, the alexandrine, the sonnet, and other verse forms and meters into Swedish poetry. Stiernhielm was the compiler of an unfinished dictionary entitled *Treasury of the Language of the Svear and Götar* (1643).

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[29–1143–1]

STIFTER, ADALBERT. Born Oct. 23, 1805, in Oberplan; died Jan. 28, 1868, in Linz. Austrian writer and painter of the late romantic period.

Stifter studied at the University of Vienna from 1826 to 1830. From 1849 to 1866 he was an inspector in the public schools of Upper Austria.

Stifter's belief in the humanistic ideals of the German Enlightenment is reflected in his *Indian Summer* (1857), a psychological *Bildungsroman*; his political conservatism is seen in the historical novel *Witiko* (1865–67). In his collections of short stories and novellas, such as *Studies* (vols. 1–6, 1844–50) and *Colored Stones* (1853), he gives an idyllic depiction of the mores of an Austrian village. His idealist views on public education and the humanistic upbringing of the individual are presented in such pedagogic works as *On the School and the Family* (published 1952); he based these views on a faith in the power of reason to destroy social evils.

As a painter, Stifter produced for the most part romantic landscapes, such as *View of the Meadows of the Western Hungarian Alps in Inclement Weather* (A. Stifter Museum, Vienna). Stifter's expressive, plein-air style of painting made him one of the forerunners of German and Austrian impressionism.

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ŠTIGLIC, FRANCE. Born Nov. 12, 1919, in Kranj, Slovenia. Yugoslav motion-picture director.

Štiglic studied in an art school in Ljubljana. During the fascist occupation he served in the war of liberation. After 1945 he worked as an actor and journalist, and in 1946 he directed his first film, the documentary *Youth Builds*. Štiglic later directed several feature films, mainly about the heroic struggle of the Yugoslav people against the German and Italian occupiers during World War II. These include *On Our Own Land* (1948), *Trieste* (1950), *Wolf Night* (1955), *Valley of Peace* (1957), and *The Ninth Circle* (1960). Štiglic has made several films on modern life, including *Visa of Evil* (1959), *One Fine Day* (1962), the children's comedy *Don't Cry, Peter* (1964), and *A Tale of Good Folk* (1975).

O. V. IAKUBOVICH [29–1477–6]

STILLE, HANS. Born Oct. 8, 1876, in Hanover; died there Dec. 26, 1966. German geologist (Federal Republic of Germany).

Stille graduated from the University of Göttingen (1899). He began working in the geological survey in Berlin in 1900. He was a professor at the Technische Hochschule in Hanover (from 1908) and at the universities in Leipzig (1912), Göttingen (from 1913), and Berlin (from 1932). From 1945 to 1950 he was vice-president of the German Academy of Sciences, and from 1946 to 1950 he served as director of the Geotectonic Institute, which he had founded in West Berlin.

Stille's works on the tectonics of Europe and comparative historical analysis of the folded regions of Europe, North and South America, Southeast Asia, and the Pacific Ocean became world famous. Stille developed the idea of the alternation in earth history of long periods of growing consolidation of the crust and shorter global phases of folding, stressing the universality of these phenomena throughout the world. He noted the consistent relationship between manifestations of magmatism and the stages of development of geosynclinal regions, singling out initial, subsequent, and terminal magmatism. He subdivided geosynclinal regions into the highly magmatic eugeosynclines and the weakly magmatic miogeosynclines. He identified (1955) the Assyntic orogenic phase, establishing the importance of a late Precambrian tectonic stage in the development of the earth.

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STIRNER, MAX (pen name of Johann Kaspar Schmidt). Born Oct. 25, 1806, in Bayreuth; died June 26, 1856, in Berlin. German Young Hegelian philosopher, ideologist of anarchism.

In his *The Ego and His Own* (1845), Stirner attempted to promulgate a solipsistic point of view in anthropology, ethics, and law. The theoretical point of departure for Stirner's world view is his thesis of self-awareness as the creative force of history. Man's ideals and social traits, according to Stirner, represent something universal, since all personality is the same. Hence everything relating to man in general does not relate to the given ego. The concepts of man, law, morality, and the like were treated by Stirner as "specters," alienated forms of the individual consciousness. Denying all norms of conduct, Stirner asserted that the original sources of law and morality are the power and the might of the individual personality. The will of the individual establishes the truth of phenomena ("I am the criterion of truth"). Man should seek not social, but his own personal freedom, inasmuch as, according to Stirner, behind every social formation are concealed the egotistical interests of individual persons. Nihilism and anarchism proved to be the general result of Stirner's views.

During the 1840's and 1850's, Stirner enjoyed a certain success among the petit bourgeois intelligentsia, and he exerted some influence on M. A. Bakunin and F. Nietzsche. K. Marx and F. Engels, in their *The German Ideology* (see *Soch.*, 2nd ed., vol. 3, pp. 103–452), offered a devastating critique of Stirner's subjective idealism and his petit bourgeois individualism and anarchism; they demonstrated the utter groundlessness of his criticism of communism.

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ŠTÍTNÝ, TOMÁŠ. Born circa 1333; died circa 1405. Czech writer.

Štítný studied at the University of Prague. He wrote the first prose works in Czech and was a forerunner of the writers of the Hussite era. His tracts include *On the Three States—Virgin, Married Woman, and Widow; On Man, Wife, and Servants*; and *Words From Conversations*. Reflecting the views of the petty nobility, who were opposed to the Catholic Church, the tracts criticized the contemporary social order, defended the common man, and preached Christian morality and moral self-improvement. Štítný's style was simple and clear.

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L. S. KISHKIN [29–1481–1]

STOCK (geology), a cylindrical, tear-shaped, or cube-shaped body of rock or useful mineral. Its intersecting contacts with the country rock are irregular in outline and complicated by swells

and shoots. Stocks vary in width from a few meters to several kilometers and have a vertical extent of up to several kilometers.

Three types of stocks are distinguished according to conditions of formation: tectonic, magmatic, and metasomatic. Tectonic stocks occur as a result of squeezing out the plastic substance of rocks during tectonic deformations, for example, stocks of rock salt in regions of tectonic salt structures.

Magmatic stocks form when a magmatic melt enters the country rock. In the early geosynclinal stage, stocks of ultrabasic and basic rocks are formed, as well as stocks of chromites and titanomagnetites associated with them. In the middle stage, stocks of granitoids are formed. In the late stage of the geosynclinal cycle and under platform conditions, stocks of syenites, porphyries, porphyrites, diabases, and andesites are formed.

Metasomatic stocks form when the rock is replaced by a mineral substance precipitated from hot hydrothermal solutions circulating in the crust. Examples of such stocks are those of copper, lead, zinc, tin, antimony, and other metal ores. [29–1482–3]

STOCKHAUSEN, KARLHEINZ. Born Aug. 22, 1928, in Mödrath, near Cologne. German composer (Federal Republic of Germany). Leading exponent of avant-garde music.

In 1951, Stockhausen graduated from the Hochschule für Musik in Cologne, where he had studied piano; he later studied composition under F. Martin, O. Messiaen, and D. Milhaud. In 1953 he began composing in the electronic music studios of West German Radio in Cologne. Most of his compositions, notably *Counterpoints* (1953), *Groups* (1957), *Cycle* (1959), and *Moments* (1962), are the result of explorations in aleatoric and electronic music and are devoid of any significant ideological or artistic content. Stockhausen's music, a typical example of elitist bourgeois art, has not gained recognition from the public.

[24–1484–1]

STOCKWORK, an ore body formed by a mass of rock permeated by a dense network of variously oriented veins and veinlets containing the ore minerals; such minerals in the form of phenocrysts are usually found in rocks interpenetrated by veinlets.

A distinction is made between areal and linear stockworks. Areal stockworks are cube-shaped with sinuous boundaries. Linear stockworks extend in one direction. The dimensions of stockworks range from a few dozen meters to several kilometers. Stockworks are classified with the group of hydrothermal formations that arise upon the deposition of the metal-bearing substance from hot mineralized solutions circulating in fissured rock. Some deposits of copper, molybdenum, tungsten, gold, tin, beryllium, uranium, mercury, and other metal ores belong to this group. [29–1483–1]

ŠTOLL, LADISLAV. Born June 26, 1902, in Jablonec nad Nisou. Czech critic, literary scholar, and publicist. Academician of the Czechoslovak Academy of Sciences (1960). Honorary doctor of Moscow State University (1972). Member of the Communist Party of Czechoslovakia since 1926; member of the Central Committee of the CPC since 1946.

Štoll became the director of the Czech and World Literatures Institute of the Czechoslovak Academy of Sciences in 1972. A leading Czech Marxist critic since the 1930's, he is the editor of a number of Communist publications. His work deals chiefly with the contemporary ideological struggle, the development of socialist culture, the role of the intelligentsia in public life, and *Partiinost'* (party spirit) in literature. In his work *Thirty Years of Struggle for Socialist Poetry* (1950), Štoll revealed the importance of the tradition of S. K. Neumann and J. Wolker for the development of Czech literature. In the monograph *On Form and Structure in the Art of the Word* (1966; K. Gottwald State Prize, 1972), Štoll gave a critical analysis of the Russian formalist school and Czech structuralism.

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STOPH, WILLI. Born July 9, 1914, in Berlin. Party and state figure of the German Democratic Republic (GDR). Hero of Labor of the GDR.

The son of a worker, Stoph was a mason by trade. He joined the Communist Youth League in 1928 and the Communist Party of Germany in 1931. Under the fascist dictatorship (1933–45) he actively opposed the Nazi regime. After the defeat of fascism he engaged in high-level party and administrative work.

From 1945 to 1948, Stoph headed several departments of the German Central Administration for Industry. In 1950 he became a member of the Central Committee of the Socialist Unity Party of Germany (SED). He was a secretary of the party's Central Committee from 1950 to 1953, when he became a member of the Politburo of the Central Committee. In 1950 he became a deputy to the People's Chamber of the GDR, and from 1950 to 1952 he served as chairman of of its commission on economic affairs.

Stoph was minister of the interior from 1952 to 1955 and minister of national defense from 1956 to 1960. In 1959 he was given the rank of general of the army. He served as deputy chairman of the Council of Ministers of the GDR from 1954 to 1962, first deputy chairman from 1962 to 1964, and chairman from 1964 to 1973; he became chairman again in 1976. Stoph was a member of the Council of State of the GDR in 1963 and 1964, deputy chairman from 1964 to 1973, and chairman from 1973 to 1976, when he again assumed the post of deputy chairman.

Stoph has been awarded the Order of Karl Marx, other orders and medals of the GDR, and the Order of Lenin. [29–1487–2]

STORM, THEODOR. Born Sept. 14, 1817, in Husum; died July 4, 1888, in Hademarschen. German writer.

The son of a lawyer, Storm studied law in Kiel in 1837 and 1838 and in Berlin in 1838 and 1839. He began his career as a lawyer in 1843 and practiced law in Husum, Potsdam, and other cities.

In many ways, Storm's lyric poetry continued the romantic tradition. His verse was characterized by immediacy and sincerity of feeling and by musicality; it had roots in folklore. Storm's main themes were love, art, and the natural beauty of Schleswig-Holstein; many of his poems are about the history of his native region. Storm's novellas are also deeply lyrical. He evolved from his early novellas of mood, such as *Immensee* (1849, published 1852) and *Angelica* (1855), to his novellas of action written in the 1870's and 1880's.

The social content of Storm's later and artistically most perfect novellas, such as *Hans and Heinz Kirch* (1882), attest to the increasingly realistic and antibourgeois tendencies of his work. The theme of art, as seen in *Paul Puppetmaster* (1874), and that of the historical past, as seen in *Renate* (1878), are linked to Storm's basic theme of the disappearance of the patriarchal order. Storm's greatest literary achievement is the novella. *The Rider of the White Horse* (1888).

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Böttger, F. *Th. Storm in seiner Zeit*. Berlin [1958].
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ZH. P. SARKISIAN [29–1485–2]

STORM, an assault upon an enemy force defending a population point such as a fortress or a large city or upon enemy forces defending positions they have fortified strongly. Pillboxes, individual strongpoints, and fortified buildings are usually attacked by specially trained storm detachments or groups, which are formed from subunits of various branches of the armed forces or from special troops. [29–1502–3]

STOSS, VEIT (also Wit Stosz, Wit Stwosz). Born circa 1455 in Horb, Württemberg; died 1533 in Nuremberg. German sculptor, painter, and engraver; marked the transition from the Middle Ages to the Renaissance in German and Polish sculpture.

From 1477 to 1496, Stoss worked primarily in Kraków. His works executed in Poland include the tombstone of Peter of Bnin (stone, c. 1494) in the cathedral in Włocławek and his most important Polish work, the high altar of the Church of St. Mary in Kraków (wood, 1477–89). The altar has a round wooden sculpture in the central portion and relief work, with painted landscape backgrounds, on the side panels. The festive polychromy of the Kraków altar, its wealth of human types, and its dramatic emotional force, which is emphasized by the tense rhythm of the folds of the clothing, place this work by Stoss among the finest examples of European sculpture.

In 1496, Stoss returned to Nuremberg, where he was to remain for virtually the rest of his life. His works from the 1490's to the 1520's include the *Madonna From Stoss' House* (wood, c. 1499, German National Museum, Nuremberg), the *Annunciation* (wood, 1517–18, Church of St. Lorenz, Nuremberg), and the altar of the cathedral in Bamberg (wood, 1520–23). These works attest to a deepening of Stoss' Renaissance tendencies. The faces are softer and smoother; the play of the folds of the clothing and the gestures and poses of the figures reveal more harmoniously the plasticity of the forms. Stoss, moreover, made less use of polychromy in these later works.

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STRAIN, a pure culture of a species of microorganism in which its morphological and physiological characteristics are studied.

Strains can be isolated from a variety of sources, for example, soil, water, or food, or they can be isolated from a single source at different times. Hence, the same species of bacterium, yeast, or microscopic fungus may have a great many strains, differing from one another in several characteristics, such as sensitivity to antibiotics and capacity to produce toxins and enzymes. Commercial strains of microorganisms developed as a result of selection and used in industry for the microbiological synthesis of proteins (including enzymes), antibiotics, vitamins, and organic acids are much more productive than wild strains. [29–1446–5]

STRALSUND, a city in the German Democratic Republic, in the *Bezirk* (district) of Rostock. Population, 72,100 (1975). Stralsund, a port on the Baltic Sea and a railroad junction, is linked by a road and rail embankment with Rügen Island. Industry is represented by shipbuilding, which produces chiefly fishing vessels, and the production of tin cans for the canning industry. Stralsund has a wood-products industry and a food-processing industry, whose products include beet sugar. [29–1487–5]

STRALSUND, PEACE OF (1370), a treaty between Denmark and the Hanseatic League concluded on May 24, 1370, in the city of Stralsund to end a war (1367–70) between the two parties. The victorious Hanseatic cities secured confirmation and broadening of their trade privileges, freedom of trade in Denmark, and possession for 15 years of four cities on the eastern shore of the Øresund and two-thirds of the customs' revenues of the cities; Denmark also promised not to choose a new king without the agreement of the Hanseatic cities. The peace consolidated the trade monopoly of the Hanseatic cities in northern Europe and their military and political power. [29–1488–1]

STRAUSS, DAVID FRIEDRICH. Born Jan. 27, 1808, in Ludwigsburg; died there Feb. 8, 1874. German philosopher, a Young Hegelian.

Strauss studied in Tübingen from 1825 to 1831 and was influenced by F. C. Baur (*see also* TÜBINGEN SCHOOL). In his *The Life of Jesus Critically Examined* (vols. 1–2, 1835–36; Russian translation, books 1–2, 1907), which began the "process of the decomposition of the Hegelian system" (K. Marx and F. Engels, *Soch.*, 2nd ed., vol. 3, p. 15), Strauss rejected the historical reliability of the evangelical legends and examined them as myths created by the spiritual substance of the era. Strauss regarded Jesus Christ as a historical person and separated him from the "eternal" idea of god-man as a foundation of Christian faith. In the second edition of *The Life of Jesus* (1864) and in *The Old Faith and the New* (1872; Russian translation, 1906), Strauss followed L. Feuerbach in preaching a pantheistic religion based on the feeling of human dependence on universal law.

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STRAUSS, JOHANN (the Elder). Born Mar. 14, 1804, in Vienna; died there Sept. 25, 1849. Austrian composer, violinist, and conductor.

Strauss studied violin with A. Polischansky and composition with I. von Seyfried. He joined J. Lanner's quartet in 1819 and became assistant conductor of Lanner's orchestra in 1824. In 1825, Strauss organized his own orchestra, which, in 1833, embarked on a series of European concert tours.

Strauss, one of the most popular masters of dance music of his day, further developed the musical idiom of Lanner, particularly in his waltzes. His distinctive dance cycles consist of several waltzes framed by an introduction and conclusion. Among Strauss' more than 250 works are 152 waltzes, the most popular of which are the *Donau-Lieder, Lorelei-Rheinklänge, Gabrielen-Walzer, Taglioni-Walzer*, and *Bajaderen-Walzer*. [29–1489–1]

STRAUSS, JOHANN (the Younger). Born Oct. 25, 1825, in Vienna; died there June 3, 1899. Austrian composer, conductor, and violinist. Son of the composer J. Strauss.

In 1844, J. Strauss, the Younger, organized his own orchestra; after his father's death he merged the family orchestras into an ensemble with which he made several European tours and appeared in America. From 1856 to 1865 and in 1869 and 1872 he directed concert seasons in Pavlovsk, near St. Petersburg, and in 1886 he performed in St. Petersburg and Moscow. Several of his compositions have a Russian theme: *Farewell to St. Petersburg* (1858), the polka *In Pavlovsk Forest* (1869), and the fantasy-waltz *In a Russian Village* (1873).

Strauss was both an outstanding conductor and a remarkable violin virtuoso, and he combined both these roles in his concert performances. He enriched the dance music repertoire with a variety of compositions, including some 500 waltzes, galops, polkas, and quadrilles. His waltzes, notable for their beautiful melodies and stirring rhythms, have many ties with traditional Austrian folk music and with Viennese music evocative of everyday life.

Strauss created the classic Viennese waltz, for which he was crowned "King of the Waltz" by his contemporaries. The melodies of his finest waltzes (*An der schönen blauen Donau* [the *Blue Danube*], *An Artist's Life, Tales From the Vienna Woods, Vienna Blood, Voices of Spring*, and *Wine, Women, and Song*), galops

(Perpetuum Mobile), and polkas (*Tritsch-Tratsch* and *Pizzicato Polka*) have achieved world renown. Strauss also composed classic Viennese operettas, the finest of which include *Die Fledermaus* (1874), *The Merry War* (1881), *A Night in Venice* (1883), and *The Gypsy Baron* (1885).

Strauss' younger brothers Joseph (1827–70) and Eduard (1835–1916) were also composers and conductors.

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M. M. IAKOVLEV [29–1489–2]

STRAUSS, RICHARD. Born June 11, 1864, in Munich; died Sept. 8, 1949, in Garmisch-Partenkirchen. German composer and conductor.

The son of a horn player, Strauss studied piano and violin as a child. He studied music theory and orchestration under F. W. Meyer. Strauss achieved an international reputation as a conductor, above all for performances of his own works. He regularly toured various countries, traveling to Russia for the first time in 1896. He was the principal conductor of the Royal Opera in Berlin from 1898 to 1918 and of the Vienna State Opera from 1919 to 1924. After the fascists came to power, Strauss was appointed president of the Reichsmusikkammer (State Music Council), but he was removed from the post in 1935.

Strauss' most important compositions are his program symphonies, symphonic poems, and operas. His symphonic poems, which continue the traditions of the program symphony established by H. Berlioz and F. Liszt and of the orchestral style of R. Wagner, often take their plots and subject matter from classical literature, as in *Macbeth* (1886), *Don Juan* (1888), *Till Eulenspiegel's Merry Pranks* (1895), and *Don Quixote* (1897), and from ancient legends. Several of Strauss' works were influenced by F. Nietzsche's philosophy, notably the tone poems *Death and Transfiguration* (1889) and *Thus Spake Zarathustra* (1896).

In his first works for the stage, the operas *Guntram* (1894; years here and below refer to production) and *Feuersnot* (1901), Strauss was influenced by Wagner; he subsequently developed his own style, which reflected elements of expressionism and neoclassicism. In his operas he drew on a variety of traditions: *Salome* (1905), *Elektra* (1908), and *Ariadne auf Naxos* (1912) are in the tradition of the mythologically oriented *opera seria*; *Der Rosenkavalier* (1911) recalls the old comic opera; and *Die ägyptische Helena* (1928) and *Die Lieb der Danae* (1952) are based on subject matter from ancient history and mythology.

At their finest, Strauss' scores are characterized by deep psychological insight, a heightened expressiveness, dramatic tension, and the subtle transmission of states of mind ranging from a profound sense of tragedy and philosophic concentration to joyful humor. Strauss' music is noted for its elegance, its beautiful melodies, its bold and rich harmonies, and its magnificent and colorful orchestration; at the same time, elements of naturalism appear in such works as *Sinfonia domestica* (1903), and certain works exhibit an exaggerated expressiveness and an attempt to create musical "pictures."

In his final period Strauss turned away from large orchestras and strove for a transparent orchestration, a more subtle and simple musical idiom, and a laconic means of expression in such works as the opera *Capriccio* (1941); *Metamorphosen* (1946), for 23 solo strings; and *Three Songs for Voice and Orchestra* (1948).

Strauss, who greatly influenced 20th-century European music, contributed to the development of program music and of the opera and enriched the expressive possibilities of the orchestra. His finest works are marked by a humanist spirit, a love of life, and an affirmation of the ideals of beauty. Strauss was awarded honorary doctorates by the universities of Heidelberg and Munich in 1902 and was elected a member of the Academy of Arts in Berlin in 1909.

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M. M. IAKOVLEV [29–1490–1]

ŠTRBSKÉ PLESO, a mountain climatic health resort in Czechoslovakia, in the Slovak Socialist Republic, in the Tatra Mountains. Štrbské Pleso is situated on the shore of the lake of the same name, at an elevation of 1,350 m. Winters are mild, with an average January temperature of −5.6°C; summers are moderately warm, with an average July temperature of 14.3°C. Precipitation is 955 mm annually. Štrbské Pleso has a sanatorium for children and adults suffering from respiratory diseases other than tuberculosis. The health resort also has facilities for tourism, skiing, and mountain climbing. [29–1493–2]

STRECKER, ADOLF FRIEDRICH LUDWIG. Born Oct. 21, 1822, in Darmstadt; died Nov. 7, 1871, in Würzburg. German organic chemist.

Having studied under J. von Liebig, Strecker became a professor at the University of Christiania (now Oslo) in 1851. He became a professor at the University of Tübingen in 1860 and at the University of Würzburg in 1871.

Strecker's principal works are devoted to the study and synthesis of compounds that occur in nature. In 1850 he developed the process known as the Strecker amino acid synthesis, a method for preparing α-amino acids from aldehydes, hydrocyanic acid, and ammonia. He demonstrated that amino acids, when acted upon by nitrous acid, form hydroxy acids, and in 1851, together with N. N. Sokolov, he prepared glycolic acid from glycine; Strecker also produced lactic acid from alanine. In 1848 he extracted taurocholic acid and taurine from bile. In 1861 he became the first to prepare guanidine by the action of potassium chlorate and hydrochloric acid on guanine. In 1868, Strecker proposed a method for synthesizing the salts of alkanesulfonic acids by the alkylation (with alkyl halides) of sulfites; the process is known as the Strecker synthesis. [29–1495–1]

STREITBERG, WILHELM. Born Feb. 23, 1864, in Rüdesheim; died Aug. 19, 1925, in Leipzig. German linguist.

Streitberg became a professor at the University of Fribourg (Switzerland) in 1889, the University of Münster in 1899, the University of Munich in 1909, and the University of Leipzig in 1920. A neogrammarian, he dealt in his principal works with comparative and historical Germanic linguistics. In addition to conducting research on the Proto-Germanic and Gothic languages, he published Gothic texts (with parallel Greek originals), which he furnished with commentary and *apparatus criticus*. He was also interested in questions of general Indo-European studies. In 1892, Streitberg founded, with K. Brugmann, the journal *Indogermanische Forschungen*.

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A. A. KOROLEV [29–1494–3]

STRESEMANN, GUSTAV. Born May 10, 1878, in Berlin; died there Oct. 3, 1929. German political figure.

From 1903 to 1918, Stresemann was deputy chairman of the League of Saxon Manufacturers. In 1903 he joined the National Liberal Party of Germany, and in 1907 he was elected for the first of several times to the Reichstag. During World War I, Stresemann was an active supporter of annexation. After the war he was one of the organizers and leaders of the German People's Party. During this period he shunned the extreme right groupings of the bourgeoisie and cooperated with Social Democratic leaders. From August to November 1923, Stresemann as chancellor headed the so-called Great Coalition (including representatives ranging from the German People's Party to the Social Democrats), which helped the German bourgeoisie deal with a severe political crisis. In August 1923, Stresemann became foreign minister. Strengthening German imperialism under cover of peacemaking rhetoric, Stresemann concluded international agreements (Dawes Plan, Locarno Treaties of 1925) and arranged for

Germany's entry into the League of Nations (1926)—all of which constituted a revision of the Versailles Treaty of 1919. Stresemann carried out a policy of rapprochement with the Western countries while advocating development of relations with the USSR (the Berlin Treaty concerning neutrality of 1926).

L. I. GINTSBERG [29–1494–1]

STRIKEBREAKER, in capitalist countries, an individual used by employers to disrupt strikes and to weaken workers' unions. Strikebreakers are recruited from déclassé elements and from people without class consciousness, as well as from unemployed people who are pressed by need. Unemployment is the economic foundation of strikebreaking. In many capitalist countries, especially the USA, there are legal organizations that supply strikebreakers to firms whose employees are involved in job actions. Bourgeois propaganda uses any means to hide the profound amorality of strikebreaking by evoking the right to work that labor allegedly enjoys under capitalism. Bourgeois labor law actively encourages strikebreaking. [29–1494–2]

STRITTMATTER, ERWIN. Born Aug. 14, 1912, in Spremberg. German writer of the German Democratic Republic (GDR). Member of the Academy of Arts of the GDR (1959). Member of the Socialist Unity Party of Germany. First secretary (1959–61) and vice-president of the Writers' Union of the GDR.

Strittmatter, a soldier in the Wehrmacht, deserted toward the end of the war. Since 1945 he has lived in the countryside. The success of his first novel, *The Oxherd* (1950), encouraged him to become a professional writer. His play *Katzgraben*, which was performed by the Berliner Ensemble in 1953 and published in 1954, was highly praised by B. Brecht. The novel *Ole Bienkopp* (1963; Russian translation, 1965) portrayed the development of socialist consciousness in the postwar German countryside.

Strittmatter's novel *Miracle Worker* (part 1, 1957; Russian translation, 1960; part 2, 1973) is written in the *Bildungsroman* genre. Against a panorama of German history, it depicts a man evolving from a naïve peasant youth into a socially aware Communist grown wise from experience. Strittmatter also wrote several collections of short stories and novellas. His work strongly reflects the traditions of classic German literature and folklore.

Strittmatter has been awarded the National Prize of the GDR (1953, 1955, 1964, 1976), the G. Lessing Prize (1961), and the T. Fontane Prize (1966).

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STROBILUS THEORY, a theory on the origin of the flower according to which the flower is a special reproductive and primary bisexual shoot or sprout, the anthostrobile, which developed as a result of modifications in the entomophilous cone, or strobile. The strobilus theory contradicts the pseudanthous theory.

[29–1634–5]

STROBL, ALAJOS. Born June 21, 1856, in Liptóújvár; died Dec. 13, 1926, in Budapest. Hungarian sculptor.

Strobl studied at the Vienna Academy of Fine Arts in the 1870's. His monumental works, such as the monuments to J. Arany (bronze, 1893) and other figures of Hungarian history and culture in Budapest, are dominated by a tendency toward superficial effects. Strobl's portrait work, including his self-portrait (terra-cotta, 1878, Hungarian National Gallery, Budapest), is characterized by moving, realistic expressiveness.

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STROHEIM, ERICH VON. Born Sept. 22, 1885, in Vienna; died May 12, 1957, at Château Maurepas, near Paris. American director and actor; Austrian by nationality.

Stroheim moved to the USA in 1909. He began his career in 1915 as an actor. He wrote the screenplays and painted the sets for his films and sometimes acted the leading role. In his acting and directing he combined sarcasm, satire, and elements of the grotesque with documentary realism. He exposed in telling fashion the venality, depravity, callousness, and hypocrisy of bourgeois society. Stroheim created variations on the role of the cynic of refined cruelty, who was often a maniac. His films include *Greed* (1924), his greatest motion picture; *Blind Husbands* (1918); *The Merry Widow* (1925); and *Wedding March* (1928).

Stroheim's films provoked angry protests from producers and the press. His motion pictures were often subjected to cutting and distortion, with other directors being called in to remake them. An artist who refused to compromise, Stroheim gave up directing in the 1930's to work mainly as an actor. Stroheim's most famous roles include von Rauffenstein in *The Grand Illusion* (1937), the Spy in *Gibraltar* (1938; released in the USSR under the title *The Spy Network*), General Rommel in *Five Graves to Cairo* (1943), and the Butler in *Sunset Boulevard* (1950). [29–1497–1]

STRONG GALE, a wind with a force of nine points on the Beaufort scale and a velocity of 20.8–24.4 m/sec. In order of increasing strength, winds with a force greater than nine points are termed whole gale, storm, or hurricane. A strong gale often causes destruction on land and high waves at sea and is most often associated with tropical and extratropical cyclones. [29–1486–1]

STROSSMAYER, JOSEPH GEORGE (also Josip Juraj Štrossmajer). Born Feb. 4, 1815, in Osijek; died Apr. 8, 1905, in Djakovo. Croatian political figure.

Strossmayer received a theological education; he became a doctor of philosophy in 1834 and a doctor of theology in 1842. In 1850 he was named bishop of Djakovo.

One of the leaders of the liberal Narodna Stranka (National Party) from 1860 to 1873, Strossmayer advocated an Austro-Slav program that included the federalization of the Hapsburg empire and the unification, with broad autonomy, of the Croatian lands. At the same time he was a supporter of Yugoslavism, a movement that called for the cultural and political union of the Slavic peoples and the creation of a united federated South Slavic state. Strossmayer hoped that Russia would liberate the South Slavs and defend them against German expansion.

In 1869 and 1870, at Vatican Council I, Strossmayer opposed the dogma of papal infallibility. Strossmayer helped organize the Yugoslav Academy of Sciences and Arts in 1867 and the University of Zagreb in 1874. [29–1497–3]

ŠTROUGAL, LUBOMÍR. Born Oct. 19, 1924, in Veselí nad Lužnicí. Czechoslovak state and political figure.

The son of a worker, Štrougal was educated as a lawyer. He joined the Communist Party of Czechoslovakia in 1945. In 1958 he became a member of the Central Committee of the CPC. He was minister of agriculture, forestry, and water resources from 1959 to 1961 and minister of internal affairs from 1961 to 1965. He served as secretary of the Central Committee of the CPC from 1965 to 1968.

In 1968 and 1969, Štrougal was deputy prime minister of the Czechoslovak Socialist Republic (CSSR). From 1968 to 1970 he was secretary of the Central Committee of the CPC and chairman of the Bureau for Directing Party Work in the Czech Lands of the Central Committee. In November 1968, Štrougal became a member of the Presidium of the Central Committee of the CPC; he

became prime minister of the CSSR in 1970. He was a deputy to the National Assembly from 1960 to 1968 and became a deputy to the Federal Assembly of the CSSR in 1969. Štrougal was awarded the Order of the Republic in 1974. [29–1498–1]

STRUT FRAME (in Russian, *shprengel'*), in structural mechanics, a structural element in the form of an open bar system with a triangular or polygonal shape attached to the principal bearing elements of a structure. As geometrically variable systems, strut frames are used mainly in systems that retain their stability after removal of the frames. They may be designed from the start as part of a structure, or they may be used to reinforce existing systems.

Strut frames have various uses: to increase the number of joints in truss chords (for the suspension of crane equipment and to decrease the free length of panels), to increase the bearing capacity and rigidity of flexible structures (trusses, beams, and plates), and to decrease the flexing of columns subject to buckling. Strut frames are calculated according to the general methods used for bar systems. [29–1409–2]

STUB, in microwave engineering, a section of transmission line that is joined to a main line and through which microwave energy is transmitted from an oscillator to a load. The transmission line may be a hollow-pipe wave guide, a dielectric wave guide, a strip transmission line, a coaxial cable, or a two-wire line. A stub is regarded as a type of two-terminal network with a specified inductive or capacitive reactance. It may be connected to a load either serially or in parallel. A variable-impedance stub may be designed either as a short-circuited or open-circuited section of transmission line of variable length or as a section of transmission line of fixed length with a variable capacitive or inductive reactance.

In microwave engineering, stubs are frequently used to match lines and loads. A stub is connected to a load in parallel in a section of a main line where the conductance of the main line is equal to the line's characteristic admittance $1/\rho$, where ρ is the line's characteristic impedance. The susceptance of the main line is balanced by the admittance of the stub, which is equal in magnitude but opposite in sign. Examples of two-wire matching stubs are the Tatarinov stub and the Nadenenko stub.

Quarter-wave stubs, which have a very high input impedance, are used in coaxial and strip transmission lines as quarter-wave isolators. Systems of open-circuited and short-circuited stubs are employed in the technology of strip-line and coaxial electric filters. Variable-impedance stubs, which can be moved along a line (especially in coaxial and two-wire lines), and systems consisting of several stationary variable-impedance stubs are used as general-purpose impedance transformers; a system of several stationary stubs usually consists of three stubs separated from one another by a distance of $\lambda/8$, where λ is the wavelength in the line.

Variable-impedance stubs with a short-circuiting plunger, which are usually coaxial or wave-guide stubs, are widely used to measure the characteristics of microwave four-terminal networks. Stubs with a variable reactive load are very promising in the technology of adjustable strip-line and coaxial phase shifters, switches, and attenuators. In such stubs, the reactive load may be a *p-i-n* diode, a varactor, or an electrical component containing a ferroelectric.

Systems of stubs in combination with certain types of ion devices are used in antenna switches to switch antennas from the receiving mode to the transmitting mode. The ion devices change the reactive load in the stubs as a function of the power level of the oscillations in the line.

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R. I. PERETS [29–1282–2]

STUCK, FRANZ VON. Born Feb. 23, 1863, in Tettenweiss, Lower Bavaria; died Aug. 30, 1928, in Munich. German painter.

Stuck attended the Munich Academy of Fine Arts in 1885, but he was basically self-taught. He was influenced by A. Boecklin and F. von Lenbach and was one of the founders of the art association known as the Munich Sezession. Stuck's allegorical and mythological canvases, such as *Sin* and *War* (both in the Bavarian State Collections of Paintings, Munich), are full of pretentious, intentionally brutal symbolism; they combine features of academic naturalism and *Jugendstil*. Stuck was also a portrait painter and sculptor.

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STUMPF, CARL. Born Apr. 21, 1848, in Wiesentheid; died Dec. 25, 1936, in Berlin. German psychologist, idealist philosopher, and musicologist. Student of F. Brentano and R. H. Lotze.

Stumpf was a professor in Würzburg (1873), Prague (1879), Halle (1884), Munich (1889), and Berlin (1894–1921). He served as joint president with T. Lipps of the Third International Congress of Psychology (Munich, 1896). Stumpf was a pioneer in the empirical psychological study of musical perception (*Tone Psychology*, vols. 1–2, 1883–90) and was the author of *The Psychological Origin of Space Perception* (1873). He anticipated the main ideas of Gestalt psychology (W. Köhler was one of Stumpf's students). As a philosopher, Stumpf was a theorist of phenomenology. His ideas were the connecting link between Brentano and E. Husserl, who was Stumpf's student in Halle. Stumpf founded the institute of psychology at Berlin University.

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D. N. LIALIKOV [29–1500–1]

ŠTÚR, L'UDOVÍT. Born Oct. 29, 1815, in Uhrovec, central Slovakia; died Jan. 12, 1856, in Modra, near Bratislava. Slovak poet, philologist, and public figure. Ideologist of the national liberation movement in the 1840's.

Štúr studied philosophy and philology at the Bratislava Lycée from 1829 to 1833 and at the University of Halle from 1838 to 1840. With J. Hurban and M. M. Hodža, he carried out a reform of the literary language that based the language on the Central Slovak dialect; he organized the cultural and educational society Tatrin. From 1845 to 1848, Štúr published *Slovenskje narodňje novini*, the first Slovak political newspaper, and a literary supplement, *Orol tatrański*.

In 1847 and 1848, Štúr was a deputy to the Hungarian Diet. At the Slavic Congress in Prague in 1848 he demanded recognition of the Slavic peoples' rights to free national and cultural development. He took part in the Prague Uprising of 1848, and in the Revolution of 1848–49 he led the struggle of the Slovaks for national liberation.

The refusal of the Hungarian bourgeois revolutionary government to satisfy the national aspirations of the oppressed peoples brought about Štúr's conversion to Austro-Slavism and the camp of counterrevolution. After 1848 he lived in Modra under police surveillance; he engaged in literary, scholarly, and publicist activities.

Štúr's socioeconomic, political, and cultural program, which was objectively bourgeois-democratic in nature, became the foundation of the national ideology and of romanticism in Slovak literature. The program called for the abolition of feudalism, the introduction of democratic freedoms, and the creation of condi-

tions for socioeconomic progress and the development of the national culture within the framework of the multinational Kingdom of Hungary.

In the political treatise *Slavdom and the World of the Future* (published 1867, in Russian), Štúr argued that it was possible for the Slovak people to follow a noncapitalist path of development in the form of the peasant commune. In his lectures on Slavic history, aesthetics, and philosophy, he attempted to apply G. Hegel's philosophical method to the analysis of the historical development of the Slavic peoples and their prospects for future development.

In his works on literature and aesthetics, such as *On the Folk Songs and Stories of the Slavic Tribes* (1853), Štúr apotheosized folklore as an expression of the national spirit and the national cultural tradition. In poetry Štúr helped develop the genres of the patriotic lyric and the epic with his collection *Lyrics and Songs* (1853) and the narrative poems *Sviatoboj* (1853) and *Matúš From Trenčin* (1853).

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I. A. BOGDANOVA [29–1501–1]

STÜRGKH, COUNT KARL VON. Born Oct. 30, 1859, in Graz; died Oct. 21, 1916, in Vienna. Austrian statesman.

From 1908 to 1911, Stürgkh was Austria's minister of education, and in 1911 he became head of the government. In March 1914, Stürgkh disbanded parliament; his government's foreign policy contributed to the outbreak of World War I. Stürgkh was assassinated by F. Adler. [29–1510–1]

STURM, JACQUES CHARLES FRANÇOIS. Born Sept. 29, 1803, in Geneva; died Dec. 18, 1855, in Paris. French mathematician. Member of the Académie des Sciences (1836); foreign corresponding member of the St. Petersburg Academy of Sciences (1836).

In 1840, Sturm became a professor at the Ecole Polytechnique in Paris. His principal works deal with the solution of boundary value problems of the equations of mathematical physics and the associated problem of finding the eigenvalues and eigenfunctions for ordinary differential equations. He gave a general method for determining the number of roots of an algebraic equation that lies on a given interval. Sturm also contributed papers on optics and mechanics. [29–1502–1]

STURM, JOHANN CHRISTOPH. Born Nov. 3, 1635, in Hippolstein, Bavaria; died Dec. 25, 1703, in Altdorf. German mathematician, astronomer, and physicist.

Sturm became a professor of mathematics and physics at the University of Altdorf in 1669. In 1670 he published a German translation, with a detailed commentary, of works by Archimedes. Sturm also wrote mathematics textbooks and observed comets. [29–1502–2]

STURM-LIOUVILLE PROBLEM, the problem of finding nonzero solutions of the differential equation

$$-[p(x)y']' + q(x)y = \lambda y \tag{1}$$

that satisfy boundary conditions of the form

$$A_1y(a) + B_1y'(a) = 0$$
$$A_2y(b) + B_2y'(b) = 0$$

and of finding the values of the parameter λ for which these solutions exist. Such solutions are called eigenfunctions, and the corresponding values of λ are called eigenvalues. Under certain conditions on the coefficients $p(x)$ and $q(x)$, the Sturm-Liouville problem can be reduced to the consideration of the analogous problem for an equation of the form

$$-y'' + q(x)y = \lambda y \tag{2}$$

The problem was first investigated between 1837 and 1841 by J. Liouville and J. C. F. Sturm.

The solution of some types of equations of mathematical physics by the Fourier method leads to the Sturm-Liouville problem. For example, the problem of the vibrations of a string of uniform density that is fastened at the ends leads to a Sturm-Liouville problem for the equation $-y'' = \lambda y$ with the boundary conditions $y(0) = y(\pi) = 0$. In this case there is an infinite sequence of values $1^2, 2^2, \ldots, n^2, \ldots$ to which the eigenfunctions $\sin nx$, which form a complete orthogonal system of functions on the interval $[0, \pi]$, correspond. A similar situation obtains in the general case, which arises, for example, in the study of the flow of heat in a heterogeneous bar. Here too, if the function $q(x)$ in equation (2) is continuous and real on the interval $[a, b]$ and A_1, B_1, A_2, and B_2 are real numbers, then there exists an increasing sequence of real eigenvalues $\lambda_1, \ldots, \lambda_n, \ldots$ that tends to infinity. To each λ_n there corresponds an eigenfunction $\phi_n(x)$ that is defined to an accuracy of a constant factor and that has n zeros on the interval $a < x < b$. The functions $\phi_n(x)$ form on $[a, b]$ a complete orthogonal system of functions; for equation (1) the eigenfunctions are orthogonal with respect to the weight function $p(x)$.

The completeness of the system of eigenfunctions was proved by V. A. Steklov in 1896. In 1904, D. Hilbert, using the theory of linear integral equations, proved extremely general theorems on the expansion of functions in Fourier series with respect to the system $\phi_n(x)$. As n increases, the eigenvalues and eigenfunctions of the Sturm-Liouville problem for equation (2) tend to the eigenvalues and eigenfunctions for the equation $-y'' = \lambda y$ under the same boundary conditions. The majority of the orthogonal systems of functions encountered in mathematics, such as Legendre polynomials and Hermite polynomials, are systems of eigenfunctions of some Sturm-Liouville problems.

Also sometimes called a Sturm-Liouville problem is the boundary value problem of equation (1) under the more general boundary conditions

$$\alpha_i y(a) + \beta_i y'(a) + \gamma_i y(b) + \delta_i y'(b) = 0 \qquad i = 1, 2$$

where α_i, β_i, γ_i, and δ_i are constants. The most important boundary conditions of this form are $y(a) = y(b)$ and $y'(a) = y'(b)$ (periodic conditions) and $y(a) = -y(b)$ and $y'(a) = -y'(b)$ (semiperiodic conditions).

Many problems of mathematical physics, such as the problem of the flow of heat in an infinite heterogeneous bar, lead to a Sturm-Liouville problem on a half axis or on the entire axis. In the first case, solutions of equation (2) that satisfy the condition $A_1y(0) + B_1y'(0) = 0$ are considered; instead of a sequence of eigenfunctions, we have the set of eigenfunctions $\phi(x, \lambda)$, which depend on the continuously changing parameter λ. Instead of an expansion in Fourier series, expansions of the following form are considered:

$$f(x) = \int_{-\infty}^{\infty} F(\lambda)\phi(x, \lambda)\, d\rho(\lambda)$$

where $\rho(\lambda)$ is some nondecreasing function. These expansions are analogous to the Fourier integral. Here

$$F(x) = \int_0^{\infty} f(x)\phi(x, \lambda)\, dx$$

and

$$\int_{-\infty}^{\infty} F^2(\lambda)\, d\rho(\lambda) = \int_0^{\infty} f^2(x)\, dx$$

A similar situation occurs for the Sturm-Liouville problem on the entire axis.

For some problems of mathematical physics the inverse Sturm-Liouville problem, or the problem of reconstructing the differential equation from the function $\rho(\lambda)$, is of great importance. This problem, which was posed in a special case by V. A. Ambartsumian and in a more general case by the Swedish mathematician G. Borg, was solved by M. G. Krein, I. M. Gel'fand, and B. M. Levitan.

The Sturm-Liouville problem also arises in some problems of quantum mechanics and the calculus of variations.

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[29–1503–1]

STURM'S THEOREM, a theorem that provides a basis for finding nonoverlapping intervals such that each contains one real root of a given algebraic polynomial with real coefficients. The theorem was given in 1829 by J. C. F. Sturm.

For any polynomial $f(x)$ without multiple roots, there exists a system of polynomials

$$f(x) = f_0(x), f_1(x), \ldots, f_s(x)$$

for which the following conditions are fulfilled: (1) $f_k(x)$ and $f_{k+1}(x)$, $k = 0, 1, \ldots, s - 1$, do not have common roots; (2) the polynomial $f_s(x)$ has no real roots; (3) it follows from $f_k(\alpha) = 0$, $1 \leq k \leq s - 1$ that $f_{k-1}(\alpha)f_{k+1}(\alpha) < 0$; and (4) it follows from $f(\alpha) = 0$ that the product $f(x)f_1(x)$ is increasing at the point α. Let $w(c)$ be the number of changes of sign in the system

$$f(c), f_1(c), \ldots, f_s(c)$$

If the real numbers a and b ($a < b$) are not roots of the polynomial $f(x)$, then the difference $w(a) - w(b)$ is nonnegative and equal to the number of real roots of the polynomial $f(x)$ that lie between a and b. Thus, the number line may be divided into intervals each of which contains one real root of the polynomial $f(x)$. [29–1502–5]

ŠTURSA, JAN. Born May 15, 1880, in Nové Město, Moravia; died May 2, 1925, in Prague. Czech sculptor.

Štursa studied at a school for masons and sculptors in Hořice from 1894 to 1898 and at the Academy of Arts in Prague under J. V. Myslbek from 1899 to 1903. His statues reveal the influence of symbolism. They include human figures of sensuous beauty, for example, *Eve* (1908), and of dramatic power, such as *Wounded Man* (1920–21); both works are housed in the National Gallery, Prague. Štursa designed many monuments and monumental decorative compositions, such as the sculptural groups *Labor* and *Humaneness* for the Hlávkův Bridge in Prague (1911–13) and a monument to S. Čech, also in Prague (1921–22). His works also include expressive portraits, notably a likeness of B. Němcová (1924, National Gallery, Prague).

Štursa worked mainly in bronze. His statues, which are distinguished for their emotional force, had a great influence on the development of Czechoslovak realist sculpture in the 20th century.

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[29–1505–2]

STUTTGART, a city in the Federal Republic of Germany (FRG), on the Neckar River. Capital of the *Land* (state) of Baden-Württemberg. Population, 600,400 (1976).

Stuttgart, an important financial and cultural center of the FRG, forms the nucleus of an industrial conurbation (area, 1,500 sq km; population, approximately 1.5 million) that accounts for about one-third of the industrial output of Baden-Württemberg. The city is an important transportation hub: the railroad system handles 12 million tons of freight annually, and the river port, 1.0 million tons (1974).

The city's machine-building industry produces motor vehicles, primarily at the Daimler-Benz and Porsche plants. The electrical engineering industry is represented by the Robert Bosch and Standard Electric Lorenz plants; the precision engineering and optical industry is represented by the Kodak and Zeiss-Ikon firms. The city produces armaments and military gear and has enterprises of the publishing, food-processing, textile, garment, leather, and footwear industries. Stuttgart lies on the Mannheim-Karlsruhe-Stuttgart-Göppingen-Aalen petroleum pipeline.

I. A. Basova

At the center of Stuttgart lies the Old Town, to the north of which is the Reiche Vorstadt (second half of the 15th century), which is laid out on a grid pattern. Heavily damaged during World War II, the city underwent extensive reconstruction from the 1950's to 1970's. Notable buildings include the Romanesque and Gothic Stiftskirche (collegiate church; 12th and 15th centuries), the Gothic St. Leonard's Church (1463–66, architect A. Jörg), the Old City Hall (1456–58), the Renaissance Old Palace (begun 1553, architect A. Tretsch), and the baroque New Palace (1744–60, architects L. Retti and P. de la Guêpière).

Important examples of modern architecture include the Weissenhof Housing Estate (1927, architects Le Corbusier and L. Mies van der Rohe), the television tower (1954–55, architect F. Leonhardt), and the high-rise apartment buildings "Romeo and Juliet" (1957–59, architects H. Scharoun and W. Frank).

The Württemberg Landesmuseum, of the National Collections of Art, houses primarily primitive, medieval, and folk art. The State Art Gallery of Stuttgart has holdings mainly of German art, from the Middle Ages to the 20th century.

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[29–1505–3]

STYRIA (also Steiermark), a historical region of Central Europe, in the basin of the Mur River. The historical nucleus of Styria was the Carinthian Mark, which was one of several territories that remained when Greater Carantania broke up in the early 11th century. In 1180 the Carinthian, or Styrian, Mark became a duchy of the Holy Roman Empire. Inhabited chiefly by Slovenes, Styria was subjected to German colonization and germanization. It became a possession of the Babenberg dukes of Austria in 1192 and passed to the Hapsburgs in 1282. From 1867 to 1918 it was a crown land of the Austro-Hungarian Empire. Under the Treaty of St. Germain (1919), most of Styria went to Austria, forming the *Bundesland* (federal state) of Styria; the remainder, including the city of Maribor, was incorporated into the Kingdom of the Serbs, Croats, and Slovenes, which became the Kingdom of Yugoslavia in 1929. [29–1479–3]

STYRIA (also Steiermark), a *Bundesland* (federal state) of Austria. Area, 16,400 sq km. Population, 1,193,600 (1975). The capital is the city of Graz. Styria is divided according to relief into two regions: Upper Styria, an area of high mountains in the northwest that includes the Niedere Tauern, Dachstein, and the Eisenerz Alps, and Lower Styria, a hilly area in the southeast.

Upper Styria is primarily an industrial region. Its rich natural resources include iron ore at Erzberg and Radmer; magnesite at Breitenau, Veitsch, and Trieben; brown coal; graphite; and salt. Considerable electric power is produced at fossil-fuel-fired steam power plants and by hydroelectric power stations. Ferrous metallurgy is represented by the production of pig iron, steel, and rolled steel products in Leoben-Donawitz and steel and rolled steel products in such cities as Kapfenberg, Kindberg, and Mürzzuschlag. The wood-products enterprises of various cities, notably Niklasdorf and Pöls, produce for the entire country. Upper Styria also has light industry and enterprises of the machine-building, chemical, and food-processing industries. Agriculture is represented by dairy farming, swine raising, and the cultivation of rye and barley, maize, and potatoes.

Lower Styria is an important agricultural region. In the Graz "bay" livestock are raised for meat and dairy products, and grain crops are grown; the area also has orchards and vineyards. Industry includes machine building in Graz, Weiz, and Andritz, and there are enterprises of the wood-products and the pulp and pa-

per industries in Gratkorn and Gratwein. Lower Styria has a printing industry, and footwear is manufactured in Graz.

A. I. MUKHIN [29–1479–4]

STYRIAN ALPS, the part of the Eastern Alps situated in Austria, in the *Land* of Styria. Elevations range to 2,995 m (Dachstein). [29–1479–2]

ŠUBAŠIĆ, IVAN. Born May 27, 1892, in Vukova Gorica, Karlovac; died Mar. 22, 1955, in Zagreb. Yugoslav political and state figure. A lawyer by education.

Šubašić was one of the leaders of the Croatian Peasant Party. From 1939 to 1941 he was *ban* (chief executive) of the *banovina* of Croatia, in the Kingdom of Yugoslavia; he emigrated from Yugoslvavia in April 1941. From June 1944 to March 1945, Šubašić was premier of the Yugoslav government in exile. He signed the Tito-Šubašić agreements of 1944, and from March to November 1945 he was minister of foreign affairs in the Provisional Government of Democratic Federal Yugoslavia. Šubašić retired in November 1945. [29–1512–1]

ŠUBIC, Slovenian painters; brothers.

Jurij Šubic. Born Apr. 15, 1855, in Poljane; died Sept. 8, 1890, in Raschwitz, near Leipzig. From 1873 to 1879, Šubic studied at the Academy of Arts in Vienna. Šubic, whose style evolved from academicism to plein-air painting, executed portraits and intimate genre pictures, such as *Before the Hunt* (1882, National Gallery, Ljubljana).

Janez Šubic. Born Oct. 26, 1850, in Poljane; died Apr. 25, 1889, in Kaiserslautern. A representative of the academic style, Šubic produced altar paintings, murals (in the National Theater in Prague, 1881–83), portraits, and genre compositions.

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SUBULARIA (awlwort), a genus of annual plants of the family Cruciferae. The plants are dwarf, usually aquatic herbs with a rosette of awl-shaped leaves and a leafless stem (scape). The white, frequently cleistogamous flowers are in few-flowered racemes. The fruit is a bulging ellipsoid silicle. There are two species in the temperate belt of Eurasia and in the hills of East Africa. The USSR has one species, *S. aquatica.* The plant grows in shallow waters and on the sandy shores of reservoirs in the European USSR, in the southern part of Western Siberia, and in the Far East. It apparently is eaten by swimming birds. [29–1197–2]

SUDRA, the lowest of the four ancient Indian varnas.

The Sudra varna, which became established during the formation of a class society in India, was made up of conquered tribes and of outsiders who were admitted into the community; the latter included persons who had become separated from their own tribes and persons whose tribes had broken up. In the ancient Indian slaveholding society, the Sudras were servants, artisans, and dependent and subordinate workers. In confirmation of their lowly status, they were forbidden to undergo the initiatory rite ("second birth") that would entitle them to full civil rights; as a result, the Sudras, unlike the three higher varnas, were "once born."

The Sudras were subject to many social restrictions: they were forbidden to own land, hold priestly or governmental office, or take part in politics or religious ceremonies. Their unequal status was reflected in various practices; for example, if convicted of a crime, Sudras were punished more severely than members of the higher varnas would be in similar circumstances, and money could be lent to them at unusually high rates of interest.

In the first centuries of the Common Era, the Sudras achieved higher status, and many restrictions disappeared; their social position came to resemble that of the Vaisyas. In various parts of India, castes were classified as Sudra regardless of their actual status, and the term lost a fixed meaning for India as a whole.

G. F. IL'IN [29–1522–1]

SUDRAKA, the name or, more likely, pen name of the author of one of the most significant works of ancient Indian drama—the Sanskrit play *The Little Clay Cart* (Russian translation, 1956). No reliable information about Sudraka exists, although he is referred to as a legendary king in many old works of literature and folklore. It is usually assumed that the play was written no earlier than the fourth century and no later than the eighth.

The main characters of *The Little Clay Cart* are city dwellers; the everyday life and mores of an ancient Indian city are described with considerable accuracy, a rare feature for ancient Indian literature. The play skillfully combines romantic and political themes. It also expresses contempt for the caste system and contains elements of social satire. *The Little Clay Cart* has a dynamic, dramatically powerful plot with tragic scenes alternating with comical, lyrical, and farcical ones. The play is well known in India, as well as in Europe (including the USSR) in numerous translations and stage productions.

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ŠUFFLAY, MILAN. Born Nov. 9, 1879, in Lepoglava; died Nov. 19, 1931, in Zagreb. Croatian historian and political figure.

A graduate of the University of Zagreb, Šufflay was a professor of subsidiary historical disciplines at the university from 1908 to 1918. After the establishment in December 1918 of the Kingdom of the Serbs, Croats, and Slovenes (since 1929, Yugoslavia), he became a leader of the Croatian nationalist Party of Rights. Šufflay incorporated a broad range of sources in his works on the history of Croatian-Byzantine relations in the 11th and 12th centuries, the history of medieval Albania, and the study of sources for medieval Dalmatia.

WORKS

Städte und Burgen Albaniens hauptsächlich während des Mittelalters. Leipzig, 1924. [29–1554–1]

ŠUMAVA, mountains on the border of Czechoslovakia with the Federal Republic of Germany and Austria, forming the southwestern border of the Bohemian Massif. The Šumava consists of two parallel ranges with a length of approximately 140 km. The maximum elevation, at Mount Grosser Arber, is 1,456 m. The mountains are composed mainly of granites, gneisses, and schists. The smoothed surface of the peak shows traces of ancient glaciation. The slopes are covered with beech and spruce forests and meadows. [29–1533–1]

SUMER, a historical region in southern Mesopotamia, between the Tigris and Euphrates rivers, in what is now the southern part of Iraq.

Until the end of the third millennium B.C., Sumer was inhabited primarily by Sumerians and, to a lesser extent, the Akkadians, an Eastern Semitic people who circa 2400 B.C. founded the city of Agade, from which the northern regions of Sumer, as far as the latitude of the modern city of Baghdad, came to be called Akkad. The time when the Sumerians settled southern Mesopotamia remains obscure; during the period of the Jemdet Nasr archaeological culture and probably during the period of earlier cultures—the Uruk and Ubaid (Ubayd or Obeid) cultures (fifth and fourth millennia B.C.)—the population was Sumerian (*see* JEMDET NASR). A class society and state emerged in Sumer circa 3000 B.C. (the Protoliterate period). Researchers refer to the period 2700–2300 B.C., when a genuine writing system—the cuneiform system—had developed, as the Early Dynastic period.

The Early Dynastic period was characterized by numerous city-states, whose centers were vast temple domains, surrounded by large family communities. The chief producers were the community members, who possessed full rights, and temple clients, or dependents who were deprived of the ownership of the means of production. Slavery was a recognized institution. There was a wealthy community elite. The economy was based on river irriga-

tion; floodwaters were collected in reservoirs, a practice that gave rise to continuous wars for head channels and irrigated fields. The military chieftains of individual city-states alternately achieved temporary hegemony over neighboring cities; the earliest well-known chieftains were the rulers of the First Dynasty of Kish and the First Dynasty of Uruk (or Erech) (28th and 27th centuries B.C.) and later rulers of Ur, Lagash, and other city-states. (*See* KISH; URUK; UR; and LAGASH.)

Within the cities a struggle was waged for power over the temple domains between the priestly-clan nobility and the secular palace nobility, which supported the ruler's claims. The best-known manifestation of this struggle was the reform instituted by Urukagina (Uru'inimgina) in Lagash in the 24th century B.C. (*see* URUKAGINA). The last Early Dynastic ruler was Lugal-zaggesi, the ruler of Umma, which bordered on Lagash, and later of Uruk as well (*see* LUGAL-ZAGGESI and UMMA). The king of the city of Agade, Sargon I the Ancient (*see* SARGON I THE ANCIENT), subjugated Umma, Uruk (Erech), Lagash, and other independent Sumerian states and established the Kingdom of the Four Regions of the World in Mesopotamia (Akkadian dynasty, 24th to 22nd centuries B.C.). The state of Akkad was destroyed by the onslaught of mountain Guti tribes. At the end of the 22nd century B.C., the Guti were driven out by the king of Uruk, Utu-khegal, after whose death power passed to Ur-Nammu, founder of the Third Dynasty of Ur and the Kingdom of Sumer and Akkad. The economy of this state was based on vast royal domains administered by an enormous apparatus of officials and overseers. Workers were reduced, in effect, to the status of slaves. The economic, political, and cultural life of the communities died out. Under the Third Dynasty of Ur, the pantheon of gods was unified, and kings were deified during their lifetimes. The idea of man's slavelike dependence on the gods was inculcated. Circa 2000 B.C., the Third Dynasty of Ur fell as a result of the incursion of the Amorites, Western Semitic stock raisers, and the Elamites, a mountain people. (For information on Sumerian culture, *see* BABYLONIAN AND ASSYRIAN CULTURE.)

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I. M. D'IAKONOV [29–1538–2]

SUMERIAN, the language of the Sumerians, spoken until the late third millennium B.C.

Sumerian, whose linguistic affinity has not been established, is attested in cuneiform texts written in the period beginning in the 29th or 28th century B.C. and ending between the third and first centuries B.C. The texts are classified as Archaic Sumerian (before the 25th century); Classical Sumerian (24th–22nd centuries); New Sumerian (21st century); Late Sumerian (early second millennium), which is attested mainly in literary texts but also in business documents; and Post-Sumerian, which appeared in written form when Sumerian was retained only as a second literary language, after Akkadian.

Sumerian grammar includes an ergative construction, in which the subject of a transitive verb is marked by means of a special case and the subject of a verb of state (including a state resulting from an action—that is, an object) is unmarked. Verbs of action have two aspects; there is no category of tense. Sumerian has affixes that express agreement with the subject of a verb of action or of state, as well as with all indirect objects and several adverbial expressions.

Case relationships are marked by suffixes that are added sequentially to the noun; these suffixes, which may reach approximately ten in number, also serve as subordinating elements in nominalized constructions that replace subordinate clauses. There are markers for several types of plural, including, in addition to the collective and definite plurals, a plural that expresses all the objects in a given class. All nominal grammatical markers appear at the end of such syntagms as "headword—modifier" or "noun–subordinate clause" in inverse order with respect to the words they refer to. Certain words and phonemes were taboo for women.

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I. M. D'IAKONOV [29–1540–1]

SUMERIANS, an ancient people inhabiting southern Mesopotamia. Judging from the existing scanty linguistic and toponymic data, the Sumerians were not indigenous to the region, although they had inhabited it as early as the fifth millennium B.C. Anthropologically they belonged to the Mediterranean and Balkan-Caucasian races of the major Europeoid race.

In the middle of the third millennium B.C., the Sumerians began to intermix with the Akkadians, an eastern Semitic people who had settled in the northern part of southern Mesopotamia. In the second half of the second millennium B.C., the Sumerians merged with the eastern Semites into a single Akkadian people. The Sumerian language remained the language of scholarship and religion in Mesopotamia until the second or first century B.C. The Sumerians were the inventors of the first writing system in Mesopotamia, the cuneiform writing system.

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[29–1540–2]

ŞUMLA, the Turkish name for the Bulgarian city of Shumen, frequently encountered in Russian and Soviet works on the Russo-Turkish wars. [29–1542–4]

ŠUMPERK, a city in Czechoslovakia, in the Czech Socialist Republic; situated in northern Moravia, in the foothills of the Jeseníky. Population, 26,200 (1974). Šumperk is an old center of the silk and linen industry. Alloyed steel bands are also produced in the city. [29–1544–1]

SUOJELUSKUNTA (Swedish, Skyddskår), a paramilitary organization of the Finnish bourgeoisie and Finnish kulaks.

Founded in 1921, the Suojeluskunta was formed from volunteer detachments of White Guards that had helped suppress the Finnish Revolution of 1918. A law enacted on Dec. 22, 1927, named the president of the republic the commander of the Suojeluskunta and made the organization an auxiliary unit of the national defense system. In 1939, the membership of the organization numbered more than 100,000. The first children's detachments of the Suojeluskunta were formed in 1929.

Formally incorporated into the armed forces in 1940, the Suojeluskunta took part in fighting against Soviet troops during World War II. It was disbanded on Nov. 3, 1944, in accordance with the terms of the Soviet-Finnish armistice. [29–1565–3]

SUPPORT, a device for mounting a motion-picture camera during filming or a still camera during shooting or for mounting a geodetic, astronomical, or other instrument during work with such an instrument.

The most widely used type of support is the collapsible tripod, which may be made of metal or wood. A camera or instrument is attached to a tripod by means of a projecting stud, which is screwed into a threaded socket in the base of the camera or instrument. As a rule, tripods are equipped with movable heads, which make it possible to mount a camera in various positions with respect to the vertical axis. In professional motion-picture filming, panoramic heads are also used.

Portable devices are also used as camera supports (*see* TRAVELING SHOTS, EQUIPMENT FOR). During filming with a handheld motion-picture camera, a gunpod, which fits into the cameraman's shoulder, is often used.

In a number of cases, a clamp may be used as a support for a still camera. A clamp is employed to attach a camera to the back

of a chair, to the edge of a table, or to some other firmly standing object.

The use of camera supports permits exposures longer than 1/30 sec. S. V. KULAGIN [29–1458–2]

SUPPORT, TELESCOPE, a simplified base for mounting small amateur telescopes and special portable telescopes used for the visual observation of artificial earth satellites, meteors, and other objects.

A telescope support consists of a collapsible tripod or vertical column with three bases and heads to which the telescope is secured. The head is fitted with two mutually perpendicular axes. Altazimuth mounting (with horizontal and vertical axes) is used in the simplest telescope supports. The telescope is rotated manually after loosening the tightening screws, and fine adjustment is accomplished by micrometer screws.

To observe celestial bodies moving as a result of the apparent diurnal rotation of the sky, a telescope mounted on such a support must be rotated simultaneously about two axes. More convenient is a telescope support with parallactic, or equatorial, mounting, in which one axis is directed toward the earth's pole and the other is directed perpendicularly to the first axis. The micrometer screws and reading dials on the axes make it possible to direct a telescope at a body according to its celestial coordinates —its hour angle and declination. More advanced telescope supports are fitted with clockwork mechanisms for tracking a star with the telescope.

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SURFACE ROUGHNESS, the aggregate of the irregularities that form the microrelief of a part's surface. Surface roughness results mainly from plastic deformation of the surface layer of a workpiece during machining. It is caused by, for example, irregularities of a tool's cutting edges, friction, the tearing of particles of material from the surface of the workpiece, and vibration of the workpiece or the tool.

Surface roughness is an important index in the specifications of a manufactured article. It affects the service properties of machine parts and assemblies, such as the wear resistance of rubbing surfaces, fatigue strength, corrosion resistance, and the maintenance of negative allowance in tight fits. Surface-roughness requirements are specified on the basis of the designated purpose of the surfaces of parts and the design characteristics of the parts. For a long time, a system characterizing the finish of a surface by means of classes of surface roughness was used in Soviet production. A new system, which was introduced on Jan. 1, 1975, replaced the classes of surface roughness that were previously used in the USSR.

The extensive set of parameters of the new system facilitates the specification of precise requirements for surfaces intended for various purposes. When numerical values of surface roughness are determined, reference is made to a single datum line, for which the mean line m of a surface profile is used. Measurements are performed within the limits of a roughness-width cutoff l, that is, the length of the surface segment chosen for the measurement of roughness without taking into account other types of irregularities, such as waviness, whose spacing is greater than l. The numerical value of the roughness-width cutoff may be 0.01, 0.03, 0.08, 0.25, 0.8, 2.5, 8, or 25 mm. Quantitatively, surface roughness is evaluated by means of one or more of the following main parameters: the arithmetical average deviation of the surface profile (R_a), the height of irregularities at ten points (R_z), the maximum height of irregularities (R_{max}), the average spacing of irregularities (S_m), the average peak spacing of irregularities (S), and the sampling length of the profile (t_p).

The numerical values of the roughness parameters and the types of roughness lays—for example, parallel, perpendicular, and circular—are specified by a standard. The choice of roughness parameters depends on the design of the parts and the designated purpose of their surfaces. For example, permissible values of R_a or R_z, R_{max}, and t_p, as well as the roughness lay, are specified for rubbing surfaces of critical parts, while R_{max}, S_m, and S are specified for the surfaces of critical parts subjected to fluctuating loads. Surface-roughness specifications are indicated by the numerical value or a range of values of one or more parameters and by the roughness-width cutoff. For noncritical surfaces, surface-roughness requirements are dictated by the requirements of industrial design, corrosion resistance, and manufacturing methods.

Nowadays, the above parameters are used in the USSR instead of the classes of surface roughness that were in use until 1980.

The surface roughness that parts have after their manufacture and assembly is altered when the parts are worn in. The surface roughness of parts after wearing-in is known as optimum surface roughness; it is produced by, for example, rolling friction or sliding friction. Optimum surface roughness assures minimum wear and is retained during the long-term operation of machinery. The parameters of optimum surface roughness depend on the design and material of parts that rub together, the quality of the lubrication, and other service conditions.

Surface roughness is usually measured by means of contact or noncontact methods. Stylus-type instruments, such as profile meters or profilographs, are used in the contact methods; optical instruments are employed in the noncontact methods. In machine building, a visual method is often used. In the visual method, a comparison is made between the surface under inspection and the surface of a specimen or part whose surface roughness has been certified.

O. A. VLADIMIROV and A. A. PARKHOMENKO [29–1143–2]

SUTURE, the surgical uniting, chiefly by a surgical needle and suture material, of tissues cut during surgery or separated by an injury. Threads made of silk, linen, or Dacron and other polymeric materials are used in superficial sutures. In buried sutures, which are applied to internal organs and tissues, absorbable materials, such as catgut or biologically inert polymeric threads, are used; buried sutures are not removed.

One type of superficial suture, cosmetic suture, which is applied to the face, is made using threads of horsehair or thin capron. Osteorrhaphy (osteosynthesis) is a type of buried suture. Primary, primo-secondary, and secondary sutures are distinguished on the basis of when the sutures are applied, which depends on the type of wound. The sutureless union of tissues is achieved with various adhesives made from polymeric materials (for example, cyanoacrylate) or with metal clamps. [29–1329–4]

ŠVABINSKÝ, MAX. Born Sept. 17, 1873, in Kroměříž; died Feb. 10, 1962, in Prague. Czech graphic artist and painter. People's Artist of Czechoslovakia (1945).

Švabinský attended the Prague Academy of Fine Arts from 1891 to 1898. He was an easel painter, a painter of murals, and a stained-glass artist. He became particularly famous, however, for his graphic work, which included drawings in pencil, ink, and charcoal, and for his engravings, which included lithographs, etchings, drypoint, mezzotints, and wood engravings.

Although influenced by symbolism, Švabinský generally preferred life-affirming, romantic subjects. Characteristic of his work are compositions in which luxuriant natural scenes are populated by real or fairy-tale, allegorical characters; such works include *The Tiger Hunt* (drypoint, 1914) and *The Harvest* (drypoint, 1927). Landscapes imbued with emotion and portraits are also characteristic.

Švabinský is known for his portraits of Czechoslovak cultural figures, such as J. Mánes (wood engraving, 1917) and J. Fučik (drypoint, 1950). In addition, he illustrated works by such writers as V. Hugo (1944) and S. P. Shchipachev (1955). Švabinský received the State Prize of the Czechoslovak Socialist Republic in 1952.

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[29–923–3]

ŠVEHLA, ANTONÍN. Born Apr. 15, 1873, in Hostivař; died there Dec. 12, 1933. Czechoslovak state and political figure. Landowner.

A leader of the Agrarian Party, Švehla became chairman of the Central Committee of the party in 1909. Between 1916 and 1918 he was secretary and then deputy chairman of the National Committee, a group made up of representatives of seven bourgeois parties in Prague. Minister of internal affairs of the bourgeois Czechoslovak state from 1918 to 1920, he took part in the suppression of the December political strike of 1920. Švehla was prime minister for most of the period from 1922 to 1929. [29–932–5]

ŠVENČIONĖLIAI, a city in Švenčionys Raion, Lithuanian SSR. Švenčionėliai is a junction for railroad lines to Vilnius, to Utena, and to Daugavpils in the Latvian SSR; it is located 75 km northeast of Vilnius. The city has a brickyard, an ironworks, a branch of a Vilnius winery, and a logging and timber distribution establishment. [29–997–5]

ŠVENČIONYS, a city and the administrative center of Švenčionys Raion, Lithuanian SSR. Švenčionys is located 86 km northeast of Vilnius. Industry is represented by a garment factory, a pharmaceutical factory for the processing of medicinal plants, and a butter factory. The city has a museum of local lore. [29–997–6]

ŠVENTOJI, the name of two rivers in the Lithuanian SSR:

(1) A right tributary of the Neris of the Neman basin. The Šventoji is 249 km long and drains an area of 6,890 sq km. It rises on the Baltic Ridge, where it flows through a number of lakes. The river is fed by various sources and has an average flow rate of approximately 56 cu m per sec. Ice appears on the river from November through early April. The cities of Anikščiai, Kavarskas, and Ukmergė are on the Šventoji.

(2) A river which empties into the Baltic Sea north of Palanga. The Šventoji is 73 km long and drains an area of 472 sq km. [29–1063–3]

ŠVERMA, JÁN. Born Mar. 23, 1901, in Mnichovo Hradiště; died Nov. 10, 1944. Figure in the Czechoslovak and international communist movements. Hero of the Czechoslovak Socialist Republic (1969, posthumously).

The son of a lawyer, Šverma was educated in the law. He became a member of the Communist Party of Czechoslovakia in 1921 and the editor of a newspaper of the CPC, *Večerni rudé právo*, in 1924. From 1926 to 1928 he studied at the Lenin School in Moscow. He became a member of the Central Committee and of the Politburo of the Central Committee of the CPC in 1929 and a candidate member of the Executive Committee of the Communist International in 1935.

From 1935 to 1938, Šverma served as a Communist deputy to the National Assembly of Czechoslovakia. From 1936 to 1938 he was editor in chief of the central organ of the CPC, the newspaper *Rudé právo*. After the signing of the Munich Pact of 1938, he was sent by the Central Committee of the CPC to work with its foreign bureau in Paris; he moved to the USSR in 1940. Šverma worked on the Czechoslovak editorial staff of Moscow Radio and in 1942 undertook political work among Czechoslovak military units in the USSR; he also edited the newspaper *Československé listy*.

Šverma helped develop the Košice program. After the Slovak national uprising began on Aug. 29, 1944, he was sent to Slovakia by the leadership of the CPC. He was killed during the uprising. The author of works on the history of Czechoslovakia and the national question, Šverma was awarded the Order of Lenin in 1969.

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SWABIA, initially a medieval German duchy, later a historical region of southwestern Germany.

Swabia was originally settled by a German tribe, the Alamanni (Suevi), and comprised southwestern Germany, Alsace, and eastern Switzerland; in the tenth century it became one of the tribal duchies that made up the Kingdom of Germany. In the 11th century ducal power over most of Swabia was seized by the von Staufens (Hohenstaufens), who ruled until 1268; a smaller area was taken by the Zähringens, who ruled until 1218.

In the second half of the 13th century, Swabia disintegrated into a number of secular and ecclesiastical principalities, including Württemberg, Baden, the Hapsburg lands, and the bishoprics of Augsburg and Konstanz (Constance); the imperial cities, notably Augsburg, Ulm, and Konstanz, possessed large territories. Gradually all the Swabian lands in southwestern Germany—the areas that make up the historical region of Swabia—became part of Württemberg. [29–924–1]

SWABIAN JURA (also Swabian Alps), a cuesta in the southern part of the Federal Republic of Germany, extending southwest from the Franconian Jura. The Swabian Jura is approximately 200 km long and rises to an elevation of 1,015 m at Mount Lemberg. It is composed primarily of Jurassic limestones. At its higher elevations, the Swabian Jura forms a karst plateau; the northwestern slope is steep, and the southeastern slope is gentle. The Swabian Jura is dissected by tributaries of the Neckar and Danube rivers. In addition to coniferous, beech, and oak forests, there are meadows, shrubs, and wasteland. [29–924–3]

SWABIAN LEAGUE, a confederation of imperial knights and the imperial cities of southwestern Germany that was established in 1488 in the city of Esslingen, Swabia. Soon after its formation, the league was joined by several princes, including the electors of Mainz, Trier, and the Palatinate, the landgrave of Hesse, and the duke of Bavaria. In practice, the Swabian League became an instrument with which the princes carried out a policy designed to further divide Germany into feudal principalities, preserve feudal privileges, and subordinate the cities. The league played a major role in suppressing the insurgents in the Peasant War of 1524–26. Internecine strife among the members of the Swabian League resulted in its disintegration in late 1533 and early 1534. [29–925–1]

SWABIAN LEAGUE OF 1376, a union of 14 imperial cities, including Ulm, Konstanz (Constance), and Ravensburg, that was formed to resist oppressive taxation, the arbitrary rule of the princes, and feudal anarchy in Germany. The league's successes, notably its victory over the count of Württemberg at Reutlingen in 1377, attracted nearly all the cities of Swabia to its side. In 1381 the league merged with the League of the Rhine; they were soon joined by the cities of Franconia and by some Swiss cities, the total number reaching 89. As the Swabian League grew, it became a powerful political force and was opposed by the emperor, the princes, and the knights. In a battle at Döffingen on Aug. 23, 1388, the league's troops were routed. The Swabian League disintegrated in 1389. [29–925–2]

SWABIAN WAR OF 1499 (also Swiss War of 1499), a war begun in February 1499 by the Hapsburg Maximilian I—the Holy Roman emperor—and the Swabian League against the Swiss Confederation. The immediate cause of the war was the rejection by the Swiss of the decrees of the Diet of Worms of 1495 on implementing imperial reform. The reforms, which included the introduction of a common imperial tax and the creation of common imperial institutions, would have meant the de facto subordination of the Swiss Confederation, which had become essentially independent, to the empire. After the Swiss won victories at Schwaderloh on April 11, Frastanz on April 20, Calven on May 22, and Dornach on July 22, the Peace of Basel was concluded between the Swiss and the emperor on September 22. The treaty amounted to a recognition of Switzerland's independence from the empire. [29–924–2]

SWATOW (also Shant'ou), a city in China, in Kwangtung Province, on the coast of the South China Sea, in the delta of the Han Chiang. Population, more than 300,000 (1970). Swatow is a transportation hub and seaport. The city's machine-building industry produces ships, diesel locomotives, machine tools, hydraulic generators, agricultural implements, and instruments. The chemical industry produces photographic paper and film,

plastics, and caustic soda. There are enterprises of the rubber, match, textile, tobacco, canning, and sugar industries. Craftsmen make bamboo articles, lacquer ware, umbrellas, and fans. Swatow is a center of the fishing industry. [29–845–1]

SWEDEN (Sverige), Kingdom of Sweden (Konungariket Sverige).

GENERAL INFORMATION
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General information

A state in northern Europe, occupying the eastern and southern parts of the Scandinavian Peninsula, Sweden is bounded by Norway on the west and north, Finland on the northeast, the Baltic Sea and the Gulf of Bothnia on the south and east, and the straits of Öresund (dividing Sweden from Denmark), Kattegat, and Skagerrak on the southwest. The Baltic islands of Gotland and Öland are part of Sweden. The country has an area of 450,000 sq km (excluding inland bodies of water, 411,500 sq km) and a population of 8,268,000 (1978). Stockholm is the capital.

For administrative purposes Sweden is divided into 24 counties (see Table 1). Historically, the country has been divided into the geographic regions of Götaland, Svealand, and Norrland.

Table 1. Administrative divisions of Sweden

County (län)	Area (sq km)[1]	Population (1976)	Administrative center
Älvsborg	11,400	418,000	Vänersborg
Blekinge	2,900	155,000	Karlskrona
Gävleborg	18,200	294,000	Gävle
Göteborg och Bohus	5,100	715,000	Göteborg
Gotland	3,100	54,000	Visby
Halland	5,400	220,000	Halmstad
Jämtland	49,900	134,000	Östersund
Jönköping	9,900	302,000	Jönköping
Kalmar	11,200	241,000	Kalmar
Kopparberg	28,400	281,000	Falun
Kristianstad	6,000	272,000	Kristianstad
Kronoberg	8,500	170,000	Växjö
Malmöhus	4,900	740,000	Malmö
Norrbotten	98,900	264,000	Luleå
Örebro	8,500	274,000	Örebro
Östergötland	10,600	387,000	Linköping
Skaraborg	7,900	263,000	Mariestad
Södermanland	6,100	252,000	Nyköping
Stockholm	6,500	1,494,000	Stockholm
Uppsala	7,000	230,000	Uppsala
Värmland	17,600	284,000	Karlstad
Västerbotten	55,400	236,000	Umeå
Västernorrland	21,800	268,000	Härnösand
Västmanland	6,300	260,000	Västerås

[1]Excluding lakes

Constitution and government

Sweden is a constitutional monarchy whose present constitution went into effect on Jan. 1, 1975. The constitution consists of three basic laws, adopted Feb. 27, 1974: the Instrument of Government, the Act of Succession, and the Freedom of the Press Act. The head of state is the king, who exercises representative functions. The highest legislative body is the Riksdag, a unicameral parliament whose 349 deputies are popularly elected for three-year terms on the basis of proportional representation. All citizens who have attained the age of 18 may vote. The Riksdag enacts laws, adopts the budget, establishes taxes and levies, regulates government borrowing, ratifies international treaties, elects the prime minister, confirms the government (cabinet), and appoints standing committees, financial inspectors, and ombudsmen.

The government prepares legislation, and at the request of the Riksdag may adopt acts having the force of law. It appoints diplomats, governors, and high officials, and it directs the armed forces and governmental bodies.

The central government is represented in the counties (*län*) by a governor, who heads a special administrative bureau consisting of ten members, half of whom are appointed by the cabinet and half by the Landsting. The governor supervises the local governing bodies: the Landstings in the counties and the assemblies of deputies in the cities and rural communities. These local bodies are elected by the population for three years.

The judicial system includes the Supreme Court, six appellate courts, and municipal and district courts. Special courts exist for certain types of cases, for example, cases relating to the division of property, land ownership, and police matters. There are also administrative courts.

M. A. MOGUNOVA

Natural features

Sweden is located in the Atlantic sector of Europe, in the northern part of the temperate zone. The land is part of the Fennoscandia geographical region.

Coastline. The Swedish coast, generally low and rocky, is fringed by small islands and skerries that hinder coastal navigation. Stretches of low, primarily sandy, aggradation shores are found along the northern and southwestern ends of the Gulf of Bothnia. The Skåne Peninsula in the south has an abrasion coast.

Topography. The northern and western regions of Sweden are occupied by the Scandinavian Mountains, rising to 2,123 m on Mount Kebnekaise. The mountains consist of ranges with stretches of alpine relief, high plateaus, and intermontane basins. More than 200 small glaciers, chiefly cirque but also some valley and diffluent glaciers, cover a total area of about 400 sq km. There are traces of ancient continental glaciation. The Norrland Plateau in the north, with elevations of 200–800 m, descends in several broad steps, bounded by escarpments, from the Scandinavian Mountains to the Gulf of Bothnia. The plateau is deeply dissected by fractures in which river and lake valleys have formed. To the south lies the Central Swedish Lowland, where low ranges and isolated ridges eroded by ancient glaciers alternate with flat depressions, many of them occupied by lakes. Glacial landforms such as eskers and moraine hills and ridges are widely found in the lowland. In the southern part of the country rises the Småland Upland, divided into ridges and massifs by a system of radiating valleys.

Geological structure and minerals. Sweden is located on the Baltic Shield of the Eastern European Platform and on the Caledonian folded structures surrounding the platform. The structure of the shield includes Proterozoic metamorphic complexes (leptites, granites, gneisses, quartzites, phyllites, spilites) of the Svecofennian, Karelian, Gothian, and Dalslandian and nonmetamorphosed strata of the sub-Jotnian (Rapakivi), Jotnian (sandstones, shales, and diabases), Sparagmite (sandstones and limestones), and Varegian (quartzites, tillites, and banded clays). The mantle is composed of some Cambrian-Silurian residual rock but chiefly of Quaternary glacial deposits. The Caledonides in northwestern Sweden contain Upper Proterozoic (Jotnian, Sparagmite and Varegian) deposits and Cambrian-Silurian sandstones, alum and clay shales, and bituminous limestones.

The principal minerals are iron ore (reserves of 3.4 billion tons with an iron content of 58–68 percent) and ores of copper (1.6 million tons), lead (about 2.3 million tons), and zinc (2.4 million

tons). The largest iron ore deposits (apatite-magnetite), associated with Svecofennian metamorphic rocks, occur in northern Sweden at Kiruna, Gällivare, and other sites. Sulfide deposits of copper, zinc, and lead ore—sometimes containing gold, silver, and arsenic—are found at Boliden, Kristineberg and other places in the Skellefteå region. In northern and central Sweden deposits of iron ore (Grängesberg), zinc and lead (Laisvall), and copper (Aitik) are associated with Svecofennian leptites, and the uranium deposit at Ronstad is associated with Cambrian bituminous shales. The country also has small ore deposits of manganese, tungsten, rare elements, and fluorite, as well as mineral springs.

Climate. Sweden has a temperate climate that is strongly affected by the warming Gulf Stream. The January temperature is 10°C higher than the average for these latitudes and the July temperature 3°C higher. The climate is harsher in the northern regions, where continental temperate and arctic air masses play a greater role. The climate in the central and southern regions is transitional between marine and continental, although some places have a clearly marine climate. The mean January temperature ranges from 0° to 5°C in the south and from −6° to −14°C in the north. Summers are cool, with mean July temperatures of 15°–17°C in the south and 10°–11°C in the north.

The annual precipitation in the mountains is 1,500–1,700 mm, increasing to 2,000 mm in some places. The southern plains receive 700–800 mm and the northeast, 300–600 mm. The snowpack lasts six or seven months in the northern mountains, diminishing to one month toward the south; in some areas a stable snow cover is not formed during the winter.

Rivers and lakes. Most of the rivers are short and full, fed chiefly by snow and rain. The largest rivers are the Dal, Torne, Klar, Ångerman, and Göta. The rivers have significant gradients with many rapids and waterfalls. The maximum flow occurs in the spring and summer, although fluctuations in water level are small because of the regulating effect of the numerous lakes and swamps. The rivers freeze over for three or four weeks in the south and for five or six months in the north. Sweden's hydroelectric potential, about 80 billion kilowatt-hours a year, is the third largest in Europe after the Soviet Union and Norway. Lakes cover about 9 percent of the country's area. The largest lakes are in the Central Swedish Lowland: Vänern, the largest lake in Europe outside the USSR, Vättern, Hjälmaren, and Mälaren. Numerous lakes in tectonic basins are found in Norrland. The lakes are frozen over for six or seven months in the north and three or four months in the south.

Soils and vegetation. Forests occupy more than half of the country's area. Taiga forests growing on podzolic soils form vast tracts north of 60° N lat.; they consist chiefly of pine and spruce with some birch, aspen, and other deciduous species. To the south, mixed forests of conifers and broadleaf species occur on soddy podzolic soils. Broadleaf forests of oak and beech grow on brown forest soils on the Skåne Peninsula. Sweden has timber reserves of about 2.4 billion cu m (the largest in Europe outside the Soviet Union), of which about 2 billion cu m are conifers (1972). Swamps, found chiefly in Norrland, cover about 14 percent of the country.

Mountain taiga vegetation, growing on mountain podzolic soils, covers the slopes of the Scandinavian Mountains to elevations of 900–950 m in the south and 350–400 m in the north. At higher elevations the taiga gives way to birch krummholz, which in turn are supplanted by a swampy mountain tundra of mosses, lichens, junipers, dwarf birch, and berry bushes, growing on mountain tundra and marsh soils. Tundra vegetation occupies about 15 percent of Swedish territory. Heaths and meadows are found on the plains and along the coast.

Wildlife. The forests are inhabited by elk, brown bears, wolves, lynx, foxes, squirrels, marten, and blue hares. Badgers and hedgehogs are found in the south, and wolverines, arctic foxes, and lemmings live in the tundra. Waterfowl, chiefly ducks and geese, are common. Salmon, trout, perch, and pike are commercially valuable freshwater fish; cod, herring, and other marine species are obtained from the coastal waters of the Baltic.

Protected territories. In 1975, Sweden had 16 strictly protected national parks and 850 preserves. The principal parks are Abisko, Muddus, Peljekaise, and Sareks-Sjöfallets.

Natural regions. Sweden has five natural regions: the Scandinavian Mountains, Norrland, the Central Swedish Lowland, Småland, and Skåne. In the Scandinavian Mountains individual ranges alternate with plateaus and intermontane basins. The region has modern glaciers and landforms created by ancient glaciation. The vegetation consists of taiga and mountain tundra. Norrland is a plateau in northern Sweden crossed by numerous turbulent rivers and bearing traces of ancient glaciation. It is covered by taiga vegetation.

The Central Swedish Lowland is a region of lake plains, moraine hill landscapes, and rocky outliers. A significant part of this densely populated region has been brought under cultivation. Småland is an upland in southern Sweden with a moraine hill topography. It has conifer and mixed forests. In the Skåne Peninsula in the extreme south plains, mostly under cultivation, alternate with ridges of granite and gneiss. There are small tracts of oak and beech woods.

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Population

Ethnically, Sweden is a homogeneous land, with Swedes making up about 96 percent of the population. Lapps, the indigenous inhabitants of the north, constitute a national minority of some 10,000 persons. There is also a small Finnish population. The official language is Swedish, and Lutheranism is the state religion. The Gregorian calendar is used.

The average annual birth rate has tended to decline, while the death rate has stabilized. Between 1971 and 1975 the annual rate of natural increase averaged 3.5 per 1,000 population. The male and female populations are approximately equal. A low birth rate and a long life expectancy (72 years for men and 76 years for women) has caused a substantial "aging" of the nation. Between 1950 and 1975 the proportion of children under 15 declined from 23 percent to 20 percent of the population, while the proportion of people over 60 increased from 15 percent to 20 percent.

Of the total work force of 3.7 million (1975), 34 percent were employed in industry, 7 percent in agriculture, forestry, and fishing, 8 percent in construction, 7 percent in transportation and communications, and 44 percent in commerce and other service sectors. The low natural increase of the population has put a strain on the country's labor resources. The number of foreign workers reached 200,000 in 1975, and foreigners accounted for more than 10 percent of the country's industrial workers. The population density averages 20 per sq km (1976), with most of the population being concentrated in the central and southern regions. Some four-fifths of the population lives in cities and urban-type settlements. In 1976 the largest metropolitan areas were Stockholm (1,358,000 inhabitants), Göteborg (691,000), and Malmö (454,000).

Historical survey

Primitive communal system and origin of class society (to the 12th century). The earliest traces of man on the territory of modern Sweden date from the eighth and ninth millennia B.C. Around the third millennium B.C., the inhabitants, who had hitherto engaged in hunting and fishing, shifted to livestock raising and agriculture. In the next millennium, Sweden was invaded by livestock-raising tribes, presumably Indo-European, which subjugated the indigenous inhabitants. Property and social stratification, which began in the Bronze Age (1500–500 B.C.), was somewhat arrested in the early Iron Age (from the second half of the first millennium B.C.). Tacitus and other classical writers mention the Suiones (Svear), Götar (Goths), and other northern Germanic tribes that inhabited the area in the first centuries A.D. The disintegration of the

primitive communal system among these tribes accelerated in the middle of the first millennium. Tribes and tribal confederations, subordinate to a military chief (*konung*), traded first with Rome and its Germanic provinces and, from the fifth century, with the Franks, Frisians, western (maritime) Slavs, and peoples of the eastern Baltic region.

Between the late eighth and mid-11th centuries, the Swedish Vikings, known in Western Europe as the Normans and in Russia as the Varangians, traded with and plundered not only the neighboring lands but also Rus', Byzantium, the Volga Bulgars and Khazars, and the Arab Caliphate. The first Swedish city, Birka (founded c. 800), and somewhat later the island of Götland became trade centers on the Baltic. Christianity gained a foothold in Sweden at the beginning of the 11th century. At that time the kingdom of the Svear, Svitiod, subjugated all but the coastal areas of the state created by the Götar in the west and south. The Swedish, Norwegian, and Danish nations began to emerge from the conglomeration of ancient Scandinavian tribes.

Feudalism (12th to 17th centuries). ESTABLISHMENT OF FEUDAL RELATIONS (12TH AND 13TH CENTURIES). Feudal relations developed slowly in Sweden, where tribal-clan vestiges were firmly rooted. The labor of slaves (*träls*) and semifree men (*brytes*) was employed in the land communes. A feudally dependent peasantry evolved from among free peasants who had lost their land and slaves who had been emancipated and settled on the land; both became the temporary holders of land belonging to the king, the church, or the secular aristocracy. The peasants remained personally free in Sweden.

A class of feudal lords emerged from the ranks of the king's retinue and other royal servitors, the tribal aristocracy, and the upper echelons of the *bönder* (free farmers). The adoption of Christianity also promoted the development of feudal relations; an archbishopric was established in 1164 at Uppsala, the religious and political center of ancient Sweden. In return for the support of the church, the kings of Sweden granted land to monasteries and the high clergy. New commercial centers sprang up, among them Sigtuna, Visby, Kalmar, and Lödöse. The Swedes began establishing shaft mines and smelting iron and copper. The free population was gradually divided into a tax-paying majority not subject to military duty (the exploited peasantry) and a non-tax-paying minority, the *frälse* (knights), who performed mounted military service. Slavery was not abolished until 1335.

The early-feudal centralization of Sweden was completed by Birger Jarl and his sons, who founded the Folkung dynasty (ruled 1250–1363). In this period stone fortress-castles were erected, among them Stockholm (mid-13th century), Sweden's capital from the late 14th century. By the end of the 13th century Swedish society was divided into estates. Crusades against the Finnish tribes, begun in the mid-12th century, culminated in the final conquest of Finland in the early 14th century. After repeated defeats, notably the rout at the battle of the Neva (1240), Swedish attempts to conquer northwestern Rus' resulted in the establishment of a boundary between Sweden and Rus' under the Orekhovets Peace, concluded between Sweden and Novgorod in 1323.

FEUDAL UNIONS (14TH TO EARLY 16TH CENTURIES). After the election of the Norwegian king Magnus Eriksson (ruled 1319–63) to the Swedish throne in 1319, Sweden was united with Norway until 1355. From this time, royal power was limited by a king's council of secular and ecclesiastical magnates, later renamed the state council, or Riksråd. A national law code, the Landslag (c. 1350), was compiled, and the country was divided into *läns* headed by royal viceroys called lords of the *läns*. Weakened by feudal strife, Sweden in 1389 entered into a union with Denmark, a move that foreshadowed the Union of Kalmar (1397–1523) between Denmark, Sweden, and Norway. Under King Erik of Pomerania (ruled 1412–39), Denmark began to gain ascendancy over economically weaker Sweden. Oppressive taxation and a war against the Hanseatic League (1426–32) sparked the anti-Danish uprising led by Engelbrekt Engelbrektsson (1434–36). The first four-estate Riksdag, representing the nobility, clergy, townspeople, and peasants (excluding those on noblemen's domains), was convened in 1435–36.

The union with Denmark effectively broke up in 1448, and Sweden achieved relative independence in 1471 after its victory over the Danes at the battle of Brunkeberg. From 1471 to 1520 it was ruled by regents of the aristocratic house of Sture, under whom the central government was consolidated, the national culture strengthened (in 1477 the first university in northern Europe was opened at Uppsala), and the guild system was established in a number of cities. With the support of the Catholic Church, the Danish king Christian II forcibly reestablished the Danish-Swedish union in 1520 (*see* STOCKHOLM BLOODBATH). The large popular uprising of 1521, led by the nobleman Gustav Eriksson, put an end to the dominance of the Danes. Elected king of Sweden (Gustavus I) in 1523, Gustav Eriksson founded the Vasa dynasty.

SWEDISH HEGEMONY ON THE BALTIC AND THE BEGINNING OF CAPITALISM (EARLY 16TH TO LATE 17TH CENTURIES). The support given to the Danes by the Catholic prelates became the grounds for secularizing church holdings and carrying out the Lutheran Reformation (1527–39), which strengthened the authority of Gustavus I Vasa (ruled to 1560). The deterioration of the peasants' condition, largely owing to the restrictions placed on their land rights for the benefit of the crown, touched off a series of uprisings, notably the Dal uprisings of 1524–25, 1527–28, and 1531–32 and the uprising of "forest robbers" of 1542–43.

In the middle of the 16th century the strengthened national monarchy (hereditary from 1544) joined the struggle for Baltic supremacy, renewing its aggression in the east during the Russo-Swedish War of 1555–57. Taking advantage of the Livonian War of 1558–83, King Erik XIV (ruled 1560–68) captured Revel and northern Estonia in 1561. Hostility to the strengthened Russian state temporarily drew Sweden closer to the Polish-Lithuanian Commonwealth in the late 16th century. A personal union between the two countries under King Sigismund III Vasa (1592–99) ensured a favorable outcome in the war of 1570–95 against the Russian state, but it exposed Sweden to the threat of the Catholic Counter-Reformation, actively encouraged by Sigismund. After the breakup of the union, Sweden and the Polish-Lithuanian Commonwealth became embroiled in a long struggle for control over the Baltic. In the course of this struggle, Sweden initially aided Tsar V. I. Shuiskii against the Polish interventionists, but in the summer of 1610 it embarked on overt aggression against Russia (*see* POLISH AND SWEDISH INTERVENTION OF THE EARLY 17TH CENTURY).

Sweden's foreign trade, especially metal exports, grew steadily from the late 16th century. The metallurgy industry expanded in the first half of the 17th century in conjunction with the increased mining of copper and iron. By the middle of the century early-capitalist enterprise was developing, primarily in mining and metalworking, and Swedish capital was accumulating. Under the command of King Gustavus II Adolphus (ruled 1611–32), the Swedish Army won victories in the war of 1610–15 against Russia, its conquests confirmed by the Peace of Stolbovo (1617). Sweden's wars against the Polish-Lithuanian Commonwealth (1600–11 and 1617–29) ended in its seizure of Livonia and the Truce of Altmark (1629).

From 1630, Sweden fought on the side of the anti-Hapsburg coalition in the Thirty Years' War (1618–48), acquiring a number of north German territories under the Treaty of Westphalia (1648). The wars against Denmark (1643–45 and 1657–60) concluded with the seizure of Danish possessions in the southern Scandinavian Peninsula (principally Skåne) and part of eastern Norway, ceded to Sweden by the Roskilde Peace (1658). Sweden's conquests in the Baltic region during the Northern War of 1655–60 were confirmed by the Peace of Oliva (1660). The Treaty of Kardis (1661), which ended the Russo-Swedish War of 1656–58 in an "eternal peace," reiterated the terms of the Peace of Stolbovo. As a result of the 17th-century wars, Sweden became one of the most powerful countries in Europe.

The burden of conscription, taxes, and duties grew heavier in the 17th century. Peasant holdings (taxpaying) and crown lands fell into the hands of the nobility, chiefly the aristocracy, on various terms. Under Queen Christina (ruled 1632–54), when nearly 70 percent of the arable and meadow land passed to the nobility, feudal reaction reached its peak. Exploiting the hostility of the tax-paying estates in the Riksdag to the aristocracy, King Charles X Gustavus (ruled 1654–60) began a partial reduction (recovery of crown lands) in 1655. From 1680 to 1682, King Charles XI (ruled 1660–97) carried out an extensive reduction, as a result of which more than 50 percent of the crown land previously ac-

quired by the nobility was returned to the king. The implementation of a reduction heralded Sweden's transformation into a bourgeois state. The Riksdag of 1680 declared that the king's power was absolute and that the Riksråd was solely an advisory body. An absolute monarchy was thus established, its main support drawn from the middle-level nobility, the officials and officers of noble birth, and the commercial-manufacturing bourgeoisie.

Decline of feudal relations and further development of capitalism (18th century). By the beginning of the 18th century Sweden had become Europe's chief iron exporter, as well as a major importer of grain. Noble landowners increasingly leased small holdings to peasants in exchange for their labor (*see* TORPARE) or employed hired laborers. Some of the nobility began investing in industry. Exploiting its military and economic superiority, Sweden achieved successes in the early stages of the Northern War of 1700–21. In 1708–09, Swedish forces invaded Russian soil, but they were routed at the battle of Poltava (1709); on the seas, they were defeated at the battle of Hangö (1714). Under the Treaty of Nystadt (1721), Sweden lost its possessions in the eastern Baltic, as well as southwestern Karelia and Vyborg. The majority of Sweden's German possessions were also renounced.

With the death of Charles XII (ruled 1697–1718), the period of Swedish absolutism came to an end; moreover, military defeat had undermined Sweden's status as a great power. Between 1719 and 1723 royal power was substantially restricted in favor of the Riksråd and Riksdag, marking an important stage in the bourgeoisification of the state. The government headed by Chancellor A. Horn, in power from 1720 to 1738, carried out a series of reforms aimed at strengthening the country economically; in foreign affairs it supported the maintenance of peace with Russia. The revanchist party that formed in the 1730's, known as the Hats, concluded an alliance between Sweden and France in 1738 and brought down the Horn government. (The supporters of peace with Russia were nicknamed the Caps.) The war against Russia (1741–43) unleashed by the Hats government (in office from 1735 to 1765) ended in Sweden's defeat. Under the Åbo Peace Treaty (1743) southeastern Finland passed to Russia. Sweden was also defeated in the Seven Years' War (1756–63), which it joined in 1757.

From 1765 to 1769 and in 1772 the government of the Young Caps, a party founded in the early 1760's, introduced a series of social and economic reforms, including freedom of the press and equal opportunity for advancement in government service, irrespective of class origin. The mounting hostility to the nobility led to clashes in the Riksdag session of 1771–72 and to peasant antilandlord disturbances in Skåne from 1772 to 1776.

In August 1772, King Gustavus III (ruled 1771–92) carried out a bloodless coup d'etat. Political parties were banned, and the constitution adopted that year curtailed the rights of the Riksdag, strengthened royal power, and confirmed the privileges of the nobility. In view of the growing strength of commercial-manufacturing capital, however, Gustavus was obliged to pursue a policy of enlightened absolutism. Agreeing to a number of bourgeois reforms—including the equalization of privileges of 1789, giving the peasants equal rights with the other tax-paying estates—and suppressing the gentry constitutionalists of the Anjala League, Gustavus temporarily restored absolutism in Sweden.

Consolidation of capitalist relations (19th century). THE BOURGEOIS REVOLUTION AND REFORMS OF 1800–50. Feudal relations rapidly disintegrated in Sweden in the first quarter of the 19th century. The agrarian reforms introduced between 1807 and 1827 and the partition and sale of forest tracts, which continued throughout the 19th century, destroyed the land commune and made the individual farm the basis of agriculture. Dispersed manufacture, wherein the entrepreneur bought up goods produced by independent artisans, became widespread; mine owners and merchants formed an influential segment of the propertied elite; and the gentry was bourgeoisified. Sweden's military defeats under the despotic king Gustavus IV, who ruled in his own right from 1796, led to the king's overthrow in March 1809 by gentry officers and high officials. The coup was equivalent to a bourgeois revolution of the elite. The constitution adopted in June 1809, which remained in force, with modifications, until 1974, again limited royal power in favor of the Riksdag, proclaimed various civil liberties, and abolished many of the nobility's privileges. Under the Treaty of Fredrikshamm (1809), which concluded the Russo-Swedish War of 1808–09, Sweden lost Finland and the Åland Islands.

In 1810 the Riksdag elected as heir to the throne the former French marshal J. B. Bernadotte, who immediately became the de facto ruler of the country. (He ruled as Charles XIV John from 1818 to 1844.) Bernadotte secretly violated the continental blockade, which Sweden joined in 1810, when it declared war on Great Britain. Although he concluded a treaty of alliance with Russia in 1812, Bernadotte did not actually make war on Napoleon until the spring of 1813, after forming an alliance with Great Britain. In the fall of 1813, Swedish troops invaded the German possessions of the Danish crown. By the Treaties of Kiel (1814), Denmark ceded Norway to Sweden, paving the way for a personal union (*see* SWEDISH-NORWEGIAN UNION OF 1814–1905). Sweden sold Swedish Pomerania—the last of its German holdings—to Prussia in 1815.

The economic revival that began in the 1830's coincided with an industrial revolution, as the Swedes shifted to mechanical spinning, introduced new methods of forging iron, and began producing machinery. The Liberal opposition, led by L. Hierta, called for parliamentary reform and freedom of trade and industry. Guilds were abolished and semifeudal labor legislation was modified in the late 1840's. In March 1848 there were popular disturbances in Stockholm, as in a number of other European capitals. In its foreign policy Sweden tried to steer a middle course between Great Britain and Russia, issuing a declaration of neutrality in 1834. Pan-Scandinavianism became a popular cause in Sweden.

PREMONOPOLY CAPITALISM (1850–1900). The building of the first railroads and telegraph system in the 1850's and 1860's coincided with the founding of large private banks and joint-stock companies. Complete freedom of commercial and industrial activity was proclaimed in 1864. The creation of large-scale industry did not keep pace with the agrarian revolution, however, and large numbers of rural people emigrated, mainly to the USA. Local government was reorganized and expanded in 1862, and in 1865–66 the four-estate parliament was replaced by a bicameral Riksdag whose members were to be elected by qualified propertied voters. After a law providing for universal public education was enacted in 1842, the spread of public schools resulted in the complete elimination of illiteracy.

Industrialization reached its peak in the last third of the century, a time when the foreign trade turnover increased by a factor of 5, reaching 1 billion gold kronor. Large forest tracts and ore deposits were developed in the north, and railroad construction expanded (Stockholm-Boden trunk line, 1863–94). The peasant cooperative movement spread from the 1880's, and numerous workers' consumer cooperatives were organized in the 1890's. By 1900 industrial and agricultural laborers made up 57 percent of the gainfully employed population. One of the first large strikes took place in the sawmills of Sundsvall in 1879. Trade unions were established in the first half of the 1880's, and the Swedish Trade Union Confederation was founded in 1898. In 1889, A. Palm, K. H. Branting, and others organized the Social Democratic Labor Party of Sweden. Under King Oscar II (ruled 1872–1907), Sweden established a tradition of neutrality, although leaning toward Germany.

Twentieth century. TO 1918. By the outbreak of World War I, Sweden had become an industrial and agricultural nation. Various branches of machine building had been established, and large private banks were playing a larger role in financing industry. A protectionist customs policy encouraged the domination of the domestic market by cartels; in 1911 there were about 150 monopolistic associations, chiefly cartels.

Capitalist industrialization was accompanied by an upsurge in the workers' movement, manifested in the metalworkers' strikes of 1905 and the general strike of 1909, which V. I. Lenin rated highly despite its defeat. The Liberal Coalition Party, founded in 1900 and led by K. Staaff, and the Social Democratic Labor Party worked for parliamentary reform. (At the beginning of the 20th century, only 9.5 percent of the population had the right to vote.) In 1905 the Swedish government agreed to a peaceful dissolution of the union with Norway (*see* KARLSTAD, TREATY OF). The limited

parliamentary reform carried out between 1907 and 1909 instituted universal suffrage for men (with partial retention of the property qualification) in elections to the second chamber of the Riksdag, with the first chamber remaining the organ of the upper classes. With tensions growing in Europe, right-wing (pro-German) circles, calling for intensified military preparations, were able to bring the Conservative government of H. Hammarskjöld to power in 1914 with the support of King Gustavus V (ruled 1907–50).

In World War I, neutral Sweden in fact took a pro-German position. From 1914 to 1916 the country's economy was deluged with foreign orders, but from late 1916, the submarine war and blockade brought on a fuel shortage and an industrial crisis. Calling for "civil peace," the Social Democratic leaders espoused a policy of social patriotism. The leftist opposition, led by Z. Höglund, J. Vennerström, and F. O. Ström, seceded to found the revolutionary Left Social Democratic Party of Sweden in May 1917. The leftists welcomed the October Revolution in Russia. Under pressure from the Entente, Sweden in late 1918 ceased trading with Soviet Russia, breaking the Soviet-Swedish trade agreement signed in June of that year. Although it joined the anti-Soviet blockade, Sweden refrained from participating in the armed intervention.

1918 TO 1939. The revolutionary situation that developed in Sweden in 1917—partially in response to the October Revolution in Russia—reached its peak in late 1918 under the impact of the November Revolution of 1918 in Germany. However, the right-wing Social Democrats kept the masses under their control. Confronted with a mass strike movement, which lasted from 1918 to 1920, the government in 1918–19 carried out an electoral reform giving women the right to vote in parliamentary elections, democratizing the first chamber, and essentially abolishing the voter property qualification in elections to the second chamber. A law providing for an eight-hour workday was adopted in 1919. The next year a Social Democrat, K. H. Branting, headed the government for the first time. Sweden became one of the founders of the League of Nations. At its Fourth Congress in 1921 the Left Social Democratic Party accepted the 21 conditions for membership in the Comintern and was renamed the Communist Party of Sweden (since 1967, the Left Party–Communists).

At the end of 1920 the postwar boom gave way to a crisis of overproduction, and in the course of 1921, the value of exports declined by two-thirds in comparison with the previous year. The transition of Swedish capitalism to the monopoly stage was completed in the 1920's, when Sweden became a major exporter of capital (2 billion kronor between 1922 and 1937), and its companies gained international renown. From 1920 to 1932 the governments of Sweden, which changed nine times, were generally headed by Liberals. Trade with the Soviet Union was resumed in 1920, and in March 1924 diplomatic relations were established between the two countries. In 1928 the Liberal government adopted laws on collective bargaining and on arbitration in labor conflicts (of a legal nature) between workers and entrepreneurs.

The world economic crisis reached Sweden at the end of 1930. Industrial production declined by 11 percent from 1930 to 1932, and in 1932–33 one-fifth of the trade union members were unemployed. The government used force against the expanding mass strike movement, which was headed by the Communist Party. (In 1931 troops fired on a workers' demonstration at Ådalen.) Promising to combat the economic crisis by government regulation of the economy, the Social Democrats were victorious in the parliamentary elections of 1932. Until 1946 the government of Sweden was headed by the Social Democratic leader P. A. Hansson, who ushered in the "Social Democratic era." Among the social reforms instituted between 1936 and 1939 were government aid to mothers and children, partial subsidies for unemployment assistance and housing construction, a two-week paid vacation for all workers, and compulsory seven-year education.

A shift from monopoly capitalism to state-monopoly capitalism became apparent in the 1930's as indirect forms of economic regulation (taxation and credit-monetary policy) came to predominate, and national and municipal government investments gave priority to the infrastructure, chiefly transportation, energy, and communications. At the same time, the public sector continued to represent a comparatively small share of industrial production, and the nationalization of private means of production was virtually renounced. Consolidating its ranks in the second half of the 1930's, the Communist Party intensified its struggle on behalf of the working class, stiffened its opposition to war and fascism, and redoubled its efforts to create an antifascist front.

WORLD WAR II. At the outbreak of World War II, Sweden proclaimed a policy of strict neutrality and hastened to conclude trade agreements with both Germany and Great Britain. During the Soviet-Finnish war of 1939–40, Sweden took the position of a "nonbelligerent," while providing military aid to Finland. The coalition government of national unity created in December 1939 and headed by the Social Democrats resisted the efforts of Great Britain and France to draw Sweden into the war. A threat to Sweden's security was posed by the German invasion of Scandinavia in April 1940. To a degree, Germany refrained from occupying Sweden because of the position of the Soviet government, which in a note to the German government on Apr. 13, 1940, declared the desirability of maintaining Swedish neutrality.

After the victories of fascist Germany in Western Europe, Sweden agreed to allow German soldiers on leave to use its railroads in going to and from Norway, and it redirected about half of its exports to Germany. In September 1940, Sweden concluded a trade agreement and a credit agreement, the first such pact, with the USSR. Sweden also maintained economic ties with Great Britain and the USA, which together chartered half of Sweden's maritime transport. After fascist Germany's attack on the USSR, Sweden increased its aid to the fascist bloc, permitting the passage of German troops and armaments to Finland. In August 1943, after the Soviet Army's victories at Stalingrad and at Kursk, Sweden forbade German military transit, and in the fall of 1944 it broke off trade with Germany. In May 1945, Sweden severed diplomatic relations with Germany. During the war a marked shift to the left took place in Swedish society. The influence of the Communist Party increased among the masses: in the parliamentary elections of 1944 it won 15 seats in the second chamber.

SINCE 1945. Although industrial production increased by 13 percent between 1937 and 1945, inflation and unemployment (3.3 percent of trade union members in 1946) plagued Sweden's economy, and the living standard of the population declined. In view of the growing militancy of the workers' movement, reflected in the five-month strike of 130,000 metalworkers between February and June 1945, entrepreneurs were obliged to begin raising wages at the end of 1945.

In July 1945 the coalition government was replaced by a single-party Social Democratic government headed by Hansson and after his death in October 1946, by T. Erlander, who also became the party's chairman. The Social Democratic government pledged to base its policies on the Postwar Program of the Workers' Movement, calling for radical socioeconomic and political reforms and the "transformation of society in a socialist direction." The program had been adopted in 1944 by the Social Democratic Labor Party and the Swedish Trade Union Confederation. Supported by a majority of the representatives of the workers' parties in the Riksdag, the government carried out a series of progressive measures. Universal health insurance was introduced in 1946, although it was not fully implemented until 1955. In 1946 the government enacted a worker safety law, established family allowances for every child, increased old age pensions (called national pensions), and raised income taxes for the wealthier strata of the population and joint-stock companies.

Growing economic difficulties and the cold war atmosphere of the late 1940's caused the Social Democratic government to curtail its reform program and to concentrate on stabilizing the economy in the interest of big capital. In 1948 it adopted a program of modernizing the country's armed forces under which military expenditures increased from 860 million kronor in 1948 to 2,026,000,000 kronor in 1953. Although Sweden agreed to participate in the Marshall Plan in 1949, it refused aid under the plan in 1951. Seeking to strengthen their parliamentary base, the Social Democrats in 1951 formed a coalition government with the Farmers' Party, which had been founded in 1913. (In the 1948 elections the Social Democrats had lost five seats in the second chamber of the Riksdag and the Communists, eight seats.) The

country's progressive forces, above all the Communists, stepped up their struggle against the threat of war. The Swedish Peace Committee was established in 1949, and the next year the Permanent Committee of the World Congress of Partisans of Peace, meeting in Stockholm, issued an appeal for a ban on nuclear weapons.

Sweden's postwar foreign policy was defined in a government declaration, issued Oct. 25, 1945, as one of noninvolvement in military-political blocs with the aim of maintaining neutrality in the event of war. In 1946 Sweden became a member of the UN; in 1948 it joined the Organization for European Economic Cooperation (from 1961, the Organization for Economic Cooperation and Development); and in 1949 it joined the Council of Europe. In 1948–49 the Swedish government tried to prevent its neighboring Scandinavian countries from joining NATO, proposing as an alternative a neutral defensive alliance between Sweden, Denmark, and Norway. In 1952, Sweden founded the Nordic Council jointly with Denmark, Norway, and Iceland. Sweden actively developed its relations with the USSR and the other socialist countries. The trade and credit agreements signed by the USSR and Sweden in 1946 promoted the growth of commodity exchange between the two countries.

In the 1950's Sweden's economy underwent periods of stagnation, notably in 1952–53 and in 1958. Much of the working class secured an increase in real wages in this period. In 1951 the coalition government led by the Social Democrats pushed through the Riksdag a law establishing a three-week paid vacation (effective as of 1953), and in 1957 it sponsored a law providing for a 45-hour work-week (introduced in 1960). The pension question dominated domestic political life in the late 1950's. Supported by the Communists, the Social Democrats proposed the introduction of a labor pension, supplementing the national pension, for all industrial and office workers, to be financed by employers. The Social Democrats' draft legislation obtained 46 percent of the votes in a consultative referendum held on Oct. 13, 1957.

Sharp disagreement over the pension issue and other questions of economic policy led to the breakdown of the government coalition and the establishment on Oct. 31, 1957, of a one-party Social Democratic minority government headed by Erlander. On Apr. 25, 1958, the government's labor pension bill was rejected by the bourgeois majority of the second chamber of the Riksdag, resulting in the chamber's dissolution. In the early elections of June 1, 1958, the Social Democratic Labor Party and the Communist Party together obtained a one-vote majority in the second chamber of the Riksdag. On May 14, 1959, the labor pension law was adopted. Although the pension age was set at 67 and the law was not to take full effect until 1981, the reform was the most important social victory won by Sweden's working class after 1945.

The state sector of the economy expanded somewhat in the mid-1950's. As early as 1949 a law had been enacted establishing a state commercial bank, the Swedish Credit Bank, and in 1955 the Riksdag adopted a resolution to buy up half of the privately owned shares of the Lapland iron mines. Subsequently, the Social Democratic Labor Party retreated further and further from its plans to "socialize" the economy, confining itself to state-monopolistic regulation within the limits of a "mixed economy." On the basis of an agreement between the Social Democrats and the bourgeois parties, the Riksdag in 1958 adopted a new program to build up the country's armed forces, as a result of which military expenditures rose from 2,706,000,000 kronor in 1958 to 3,839,000,000 kronor in 1963. Despite the demands of the military and the bourgeois opposition, the government opposed equipping the Swedish Army with nuclear weapons. The public organization known as the Campaign Against Swedish Atomic Weapons, founded in 1958, played a major role in keeping Sweden from being drawn into the nuclear arms race.

In the 1950's Sweden's government advocated a policy of nonalignment for all the Scandinavian countries. In 1956 it condemned the aggression of Great Britain, France, and Israel against Egypt. Although it favored the ban on nuclear weapons testing and the creation of a nuclear-free zone in Central Europe, Sweden's government did not support the Finnish proposal (1959) that northern Europe be declared a nuclear-free zone. The tradition of reciprocal visits by Soviet and Swedish heads of state began with Prime Minister Erlander's official visit to the USSR in 1956.

In the parliamentary elections of 1960 the Social Democrats won 114 out of 231 seats in the second chamber of the Riksdag, more seats than all the bourgeois parties taken together. The Social Democratic government continued its policy of reforms: in 1963 the Riksdag adopted a law providing for a four-week paid vacation (instituted in 1965), and in 1962 and 1963 the national pension and the annual child allowances were increased. Nevertheless the problem of improving the condition of low-paid workers, who in 1967 constituted one-third of the membership of the Swedish Trade Union Confederation, remained unresolved and grew more acute. Increased rationalization of production, entailing the closing of unprofitable enterprises, aggravated the unemployment problem. The Communist Party and leftist forces in the trade union movement and in the Social Democratic Labor Party demanded that decisive measures be taken to counteract the power of the monopolies, guarantee employment for industrial and office workers, to end inflation, to increase wages, particularly for low-paid groups, and to reduce the workweek to 40 hours. They also called for the development of backward regions, primarily through the construction of large state enterprises, and for the transfer of large banks, insurance companies, and the petroleum-product and pharmaceutical industries to the ownership of the national government, local governing bodies, or cooperatives.

In 1967–68 the Social Democrats took steps to strengthen the regulatory role of the state in the economy by creating a state investment bank and a concern to manage state industrial enterprises AB Statsföketag. In the parliamentary elections of 1968 the Social Democrats received more than 50 percent of the votes for the first time since 1940. In 1968 and 1969 the Riksdag approved a partial constitutional reform, although the new constitution did not take effect until 1975. The two-chamber Riksdag was replaced by a one-chamber parliament elected on a proportional basis. The king retains mainly a representative function. On Oct. 1, 1969, O. Palme was elected chairman of the Social Democratic Labor Party and later that month he became prime minister.

Complex questions of the country's economic and social development still remained unresolved at the beginning of the 1970's. Between 1971 and 1975 the average annual number of unemployed persons was three times higher than it had been in the 1960's. The annual inflation rate, averaging 7–8 percent between 1969 and 1973 was largely owing to the introduction in 1969 of the value-added tax, called *moms*, which replaced the turnover tax. As a result of the rapid increase in prices and in rents, the growth in real wages slowed down or effectively ceased. The strike struggle of the working people gained momentum: the number of strikers and lost workdays increased from 9,000 and 112,000, respectively, in 1969, to 27,000 and 156,000 in 1970 and to 63,000 and 839,000 in 1971. Along with economic concessions, the strikers demanded guaranteed employment, the repeal of antilabor legislation, the restoration of the full right to strike, and limitations on the power of employers in enterprises.

After the parliamentary elections of 1970 the Social Democrats were able to maintain an absolute majority in the Riksdag only by forming a coalition with the Communist Party, which was named the Left Party–Communists in 1976. Between 1971 and 1973 taxes were lowered for low- and middle-income persons, laws were enacted to improve the health insurance system, and a bill was passed providing for the appointment of government representatives to the boards of private banks. In 1972–73 the government succeeded in pushing through the Riksdag laws providing for the representation of industrial and office workers on the boards of enterprises, for occupational safety, and for guaranteed employment, placing certain restrictions on management's right to hire, fire, or transfer workers. The system of unemployment insurance was improved. Although the Communists supported the government's measures, which were opposed by the bourgeois parties, they nevertheless criticized the halfway nature of the measures and the government's concessions to big capital.

In the parliamentary and municipal elections of 1973, the Social Democrats received 43.5 percent of the votes, and the Center

Party, known as the Farmers' Party until 1957, won 25 percent of the votes by expanding its social base among the petite and middle urban bourgeoisie, office employees, and industrial workers. An equilibrium was established in the Riksdag between the Social Democratic Labor Party and the Left Party–Communists on the one hand and the bourgeois parties on the other. Remaining in power with a weakened parliamentary base, the Social Democratic government decided to collaborate with the bourgeois People's (Liberal) Party, founded in 1934, and the Center Party.

Reaching an understanding with the bourgeois parties, the government took steps to stimulate the economy, worked out tax policies, and sponsored various other measures. In 1974 the Riksdag adopted a law lowering the pension age to 65; two years later the Left Party–Communists demanded that the pension age be lowered to 60 for miners and workers in other hazardous occupations. The new program adopted by the Social Democrats in 1975 embodied the reformist concept of a "third path," or "democratic socialism," but it also included certain progressive social and economic demands. Between 1974 and 1976 the government put through the Riksdag laws lowering direct taxes for low and middle-income groups while increasing levies on employers. In 1976 the Riksdag adopted a law on the "participation" of industrial and office workers in the management of enterprises that replaced existing legislation on mediation in labor conflicts (1920), collective bargaining (1928), and trade unions (1936). The new law obliged employers to negotiate with representatives of industrial and office workers on important questions pertaining to the operation of the enterprise. On the other hand, the law put some restrictions on the workers' right to strike and did not precisely define the forms of "participation."

Seeking to replace the government, the bourgeois parties in 1976 launched an extensive demagogic campaign (under the slogan "Social reforms without socialism!") against the "socialization" of Sweden. In the parliamentary elections of 1976, the Social Democrats received 42.8 percent of the votes, losing another four seats in the Riksdag; the Left Party–Communists lost two seats. The bourgeois parties obtained an 11-seat majority. For the first time since 1932, a purely bourgeois coalition government was formed by the Center, the Moderate Coalition, and People's parties, with the Center Party leader T. Fälldin serving as prime minister. In a declaration issued on October 1976 the government pledged to continue carrying out social reforms and stated that Sweden's policy of neutrality would remain unchanged. Dissension within the Left Party–Communists over questions of proletarian internationalism and the class character of the party resulted in the founding of the Workers' Communist Party.

In the second half of the 1970's the world economic crisis spread to Sweden. Industrial production declined by 10 percent between 1975 and 1977 and, despite further economic revival, the production output remained at the 1974 level. The number of unemployed reached between 90,000 and 100,000 in 1977, and about 150,000 persons were employed on special projects for the jobless. Social reforms were suspended as the government focused on stabilizing the economy by lowering the living standard and undermining the social condition of working people.

The importance of foreign policy increased steadily in the 1960's and 1970's. In 1961, Sweden's government appealed to the nonnuclear countries to refrain from producing, acquiring, or stockpiling nuclear weapons. In 1963, Sweden signed the Nuclear Test-ban Treaty and in 1968, the Nuclear Nonproliferation Treaty. Swedish representatives have participated in the work of the Geneva-based UN Committee on Disarmament since 1961. Sweden's expanding cooperation with the other countries of northern Europe was reflected in the founding of the Nordic Investment Bank in 1976 with capital from Sweden, Denmark, Norway, Finland, and Iceland. Sweden was a founding member of the European Free Trade Association (1960). Despite the pressure of the bourgeois opposition, the Social Democratic government did not agree to Sweden's inclusion in the European Economic Community, although a free trade agreement with the EEC was signed in 1972.

During the 1960's and 1970's Sweden's relations with the USSR and other socialist countries developed successfully. Five-year trade agreements between Sweden and the USSR were initiated in 1970, and from 1968 to 1975 the turnover of goods between the two countries increased from 160 million to 545 million rubles. A number of Soviet-Swedish governmental agreements were signed, including a consular convention (1967) and an agreement on economic and scientific-technical cooperation and on cooperation in the peaceful use of atomic energy (1970). In 1975 the two countries adopted a joint program for the development of economic, industrial and scientific-technical cooperation between 1975 and 1985.

In the 1960's and 1970's Sweden expanded its ties with the developing countries. By 1980 its economic aid to these countries exceeded 5,000,000,000 kronor, or 1 percent of the gross national product. In 1969, Sweden was the first capitalist country to recognize the Democratic Republic of Vietnam, and in 1976 its economic aid to that country amounted to 225 million kronor. In 1967, Sweden condemned Israel's aggression against the Arab countries. An information bureau of the Palestine Liberation Organization was opened in Stockholm at the end of 1975. In 1969, Sweden recognized the existing Oder-Neisse boundary, and in 1972 it established diplomatic relations with the German Democratic Republic. After the 1973 fascist coup in Chile, the Swedish government supported the Chilean patriots. Prime Minister Palme signed the Final Act of the Conference on Security and Cooperation in Europe on Aug. 1, 1975, in Helsinki. In 1980, Sweden maintained diplomatic relations with 122 countries.

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Political parties, trade unions, and other social organizations

Political parties. The Social Democratic Labor Party of Sweden (Sveriges Socialdemokratiska Arbetarepartiet), founded in 1889, has more than 1 million members (1979). It draws its strength chiefly from industrial and office workers and also attracts some members of the middle strata of the population. The party belongs to the Socialist International.

The Center Party (Centerpartiet), called the Farmers' Party until 1957, was founded in 1913. Its 141,000 members (1979) include farmers, members of the petite and middle urban bourgeoisie, and office and industrial workers. The Moderate Coalition Party (Moderata Samlingspartiet), founded in 1904 and called the Conservative Party until 1969, has about 150,000 members (1979). It is supported by various strata of the bourgeoisie, high officials, and the intelligentsia, and it represents the interests of the big industrial and financial bourgeoisie. The People's, or Liberal Party (Folkpartiet), founded in 1934, has 60,000 members (1978). It brings together representatives of the petite, middle, and big bourgeoisie, office workers, and a certain number of industrial workers. The Christian Democratic Party (Kristen Demokratisk Samling), founded in 1964, expresses the interests of right-wing clerical circles.

The Left Party–Communists (Vaensterpartiet Kommunisterna), founded in 1917, was initially called the Left Social Democratic Party of Sweden (1917–21) and then the Communist Party of Sweden (1921–67). It includes industrial workers, office workers, and members of the intelligentsia. The Workers' Communist Party (Arbetarepartiet Kommunisterna) was founded in 1977 by disaffected members of the Left Party–Communists.

Trade unions and other social organizations. The Swedish Trade Union Confederation, founded in 1898, has 2,100,000 members (1979), united in 25 affiliated trade unions. It works closely with the Social Democratic Labor Party and belongs to the International Confederation of Free Trade Unions. The Central Organization of Salaried Employees, founded in 1944, has 1,100,000 members (1979), united in 24 affiliated unions. The Confederation of Professional Associations, founded in 1947, has 203,000 members (1979).

The Cooperative Union of Sweden, founded in 1899, has more than 1.5 million member-shareholders (1979). The Worker Educational League, founded in 1912, has about 4.5 million members (1979) and operates under the auspices of the Social Democratic Labor Party. The Social Democratic Youth League of Sweden, founded in 1917, has about 70,000 members (1979); the Youth League of the Center Party has more than 40,000 members (1979); the Youth League of the Moderate Coalition Party, founded in 1934, has about 40,000 members (1979); and the Youth League of the People's Party, founded in 1934, has about 25,000 members (1975). Communist Youth, founded in 1973 to replace the Leftist Youth League, established in 1958, is the youth organization of the Left Party–Communists. The Communist Youth League of Sweden, founded in 1977, is the youth organization of the Workers' Communist Party. Two other important organizations are the Swedish Peace Committee, founded in 1949, and the League of Sweden—Soviet Union Societies, founded in 1935. E. A. VOROZHEIKIN

Economic geography

General state of the economy. Sweden is one of the highly developed industrial capitalist countries of Western Europe, noted for its intensive agriculture and broad foreign economic ties, With just 0.3 percent of the population of the capitalist world, Sweden produces more than 1 percent of the industrial output of the capitalist countries and accounts for more than 2 percent of the world capitalist exports. Few countries surpass Sweden in per capita gross national product, amounting to $8,400 in 1975. This high level of economic development was reached through an exceptionally favorable combination of historical circumstances (not only has Sweden avoided war for more than 150 years, but it has enriched itself during the two world wars) and natural resources (the richest timber and iron ore reserves in Western Europe and enormous hydroelectric potential).

Industries engaged in the processing of wood and iron ore were the mainstay of industrial production and export until the mid-20th century. In the present economy wood, iron ore, and the semifinished products made from them have slipped into second place behind machinery, chiefly ships, motor vehicles, aircraft, and electrical and electronic equipment. Nevertheless, Sweden continues to be one of the world's largest producers and exporters of iron ore, high-grade steel, lumber, and pulp and paper goods. In 1974 industry accounted for 32 percent of the gross national product and agriculture, including forestry and fishing, for just 6 percent.

One of the most important features of the Swedish economy is its strong export orientation: one-fourth of the gross national product and more than one-third of industrial output is sold on the foreign market. At the same time, the country depends heavily on imports, which satisfy as much as one-fourth of Sweden's demand for goods and services. Crises in the world capitalist economy have an unhealthy effect on the country's market forces and cause frequent recessions, accompanied by declining employment.

In times of economic difficulty the large Swedish monopolies increase their export of capital; between 1961 and 1977 direct foreign investments by Swedish firms exceeded 24 billion kronor. Monopolistic industrial companies are clearly shifting from the export of goods to the export of capital. Whereas in the early 1960's the value of the output of foreign enterprises belonging to Swedish companies was about half the value of goods exported from Sweden, by the mid-1970's it was more than nine-tenths of the value of exports. The rise in foreign capital investment has caused national wealth to shift abroad in the interest of monopoly capital. By the mid-1970's the value of the output of the foreign enterprises of Swedish companies had reached one-fifth of the gross national product.

The Swedish economy is marked by a high degree of concentration of production and capital. A small number of large concerns, many of which have become multinational monopolistic associations, dominate the leading sectors of industry, merchant shipping, banking, and insurance. The SKF, ASEA, L. M. Ericsson, Elektrolux, Volvo, Saab-Scania, and Alfa-Laval companies dominate the machine-building sectors; Sandvik and Fagersta are the giants in high-grade metallurgy; and Svenska Cellulosa and Mo och Domsjö produce most of the country's pulp and paper. These and many other companies have close financial ties to the country's largest banks, the Skandinaviska Enskilda Bank (SEB) and the Svenska Handelsbanken. The country's industry and banks are actually controlled by the 20 to 25 families of the Swedish financial oligarchy, among them the Wallenbergs, who control SEB and as much as 15 percent of Swedish industry, including 25 percent of machine building, the Jönssons, the Broströms, and the Bonniers.

The state sector accounts for more than 15 percent of the gross national product and for up to 30–40 percent of gross investments. State enterprises produce about 10 percent of Sweden's industrial output. The state sector is most important in the production of iron ore (four-fifths of output), electricity (more than two-fifths), and steel (more than one-fifth). Sweden has also attracted considerable foreign capital investments; about 10 percent of the capital of joint-stock companies operating in Sweden belongs to foreign firms.

In the mid-1970's the Swedish economy went into a recession caused primarily by the falling demand for Swedish industrial goods on foreign markets. From 1975 to 1977 industry was operating at 75–80 percent of capacity; the annual industrial output dropped an average of 3 percent; and gross capital investments declined by 1.5 percent. As the balance of trade and payments grew worse, Sweden resorted to foreign loans to cover the deficit, borrowing about 25 billion kronor between 1975 and 1977. The average annual rate of inflation exceeded 10 percent. Full or par-

tial unemployment affected 2.5–3.5 percent of the economically active population. The steady rise in prices (the consumer price index rose 62 percent between 1970 and 1976), high direct taxes (30–35 percent of the average family's total income), high indirect taxes, high rents, and the high cost of transportation are a heavy burden on the working people.

Industry. Sweden's limited domestic market and labor resources, characteristic of a country with a small population, force Swedish industry to concentrate on the production of a comparatively small assortment of high-quality products. In the output of a number of important industrial products Sweden is on a par with the principal capitalist countries, and in several cases it even surpasses some of them, for example, in shipbuilding, pulp and paper manufacture, and high-grade metallurgy.

In 1974 industry employed 929,000 production and office workers and had a gross output of 179 billion kronor and a conventional net output of 82 billion kronor. Capital investments totaled 12.5 billion kronor.

There are two main groups of sectors: the metal industry, including mining, metallurgy, metalworking, and machine building, and the forest industry, comprising lumbering, woodworking, and pulp and paper production. These two groups of sectors account for more than two-thirds of the total number of persons employed in industry, for more than three-fifths of the gross industrial output, and for more than two-thirds of all industrial capital investments. Products from the metal and forest industries also constitute nine-tenths of the value of Swedish exports. Both groups of sectors are clearly oriented toward export: up to two-fifths of the output of the metal industry and more than half of the output of the forest industry are sold on the foreign market. They determine Sweden's specialization in the international division of labor. The rapid development of machine building has brought about an important shift in the sectorial structure of industry since World War II. Table 2 shows the structure of industry.

POWER INDUSTRY. The country's primary sources of energy are imported mineral, chiefly liquid, fuel and waterpower. Imported petroleum and petroleum products (26.4 million tons in 1975) provide more than 70 percent of the total energy consumption, and imported hard coal and coke (about 3 million tons), 5 percent. Hydroelectric power accounts for about another 15 percent of the total energy used; electricity generated by atomic power plants, 2–3 percent; and electricity produced using local fuel (primarily waste from sawmills), 6–8 percent. Petroleum refineries, which had a capacity of 22 million tons at the end of 1976, are located on the west coast at Göteborg and Lysekil and in the Stockholm region at Nynäshamn.

Table 2. Structure of industry
(percentage, 1974)

	Total number of employees	*Gross output*	*Conventional net output*	*Capital investment*
Mining	1.5	1.7	2.8	4.0
Manufacturing	98.5	98.3	97.2	96.0
Food and condiments	7.7	13.1	7.4	7.5
Textile, garment, and footwear	6.5	3.9	4.2	2.4
Woodworking and furniture	8.7	8.6	9.1	10.0
Pulp and paper	6.4	11.0	11.1	18.0
Chemical and petroleum refining	7.3	10.5	9.0	11.6
Metallurgy	7.5	9.5	8.1	9.0
Machine building and metalworking	45.5	35.7	40.1	33.6
Other sectors	8.9	6.0	8.2	3.9

In per capita electricity production (10,500 kW-hr in 1977) Sweden is surpassed only by Norway and Canada. Hydroelectric power plants, most of them located on the rivers of northern Sweden, supply about two-thirds of the country's electricity. The largest plants are Stornorrforsen on the Ume River (capacity, 375 megawatts); Harsprånget (330 MW), Vietas (320 MW), Messaure (300 MW), Letsi (290 MW), and Seitevare (225 MW) on the Lule River; Kilforsen (270 MW) on the Ångerman; and Krångede (210 MW) on the Indals. The power plants operate in a unified grid that is connected with the power systems of Denmark, Norway, and Finland. In the 1970's construction began on large atomic power plants in central and southern Sweden. By late 1977 atomic power plants were in operation at Oskarshamn (1,000 MW), Ringhals (1,500 MW), and Barsebäck (1,200 MW).

Table 3. Output of leading industrial products

	1950	*1960*	*1976*
Electricity (billion kW-hrs)	18.2	34.7	84.3
hydroelectric power plants	17.3	31.1	54.3
Iron ore (million tons)	13.6	21.8	30.5
Pig iron (million tons)	0.8	1.5	3.0
Steel (million tons)	1.4	3.2	5.1
Rolled ferrous metal products (million tons)	0.9	2.2	3.6
Electrolytic copper (tons)	26,000	38,000	60,000
Refined lead (tons)	24,000	45,000	49,000
Primary aluminum (tons)	5,000	16,000	83,000
Conifer lumber (million cu m)	5.2	6.8	11.3
Cellulose and wood pulp (million tons)	3.2	5.0	8.3
Paper and cardboard (million tons)	1.2	2.0	5.0
Cement (million tons)	1.9	2.9	2.9
Synthetic resins and plastics (tons)	12,000	85,000	570,000
Petroleum products (million tons)	1.0	2.5	13.8
Cars	14,000	109,000	317,000
Trucks and buses	3,000	20,000	51,000
Merchant vessels (launched, gross tonnage)	340,000	711,000	2,367,000

MINING. Sweden ranks second in Western Europe, after France, in the extraction of commodity iron ore (first if the ore output is calculated in terms of metal content). About three-fourths of the iron ore reserves and more than four-fifths of the extraction are concentrated in the extreme north at Kiruna and Gällivare. The Grangesberg mine is the largest in central Sweden. More than four-fifths of the ore is exported (32 million tons in 1974). The extraction of nonferrous metals in 1974 was as follows: copper, 40,000 tons; lead, 73,000 tons; and zinc, 109,000 tons. The largest mines are at Aitik (copper) and Laisvall (lead). In addition to copper, zinc, and lead, the complex sulfide ores mined in the Boliden-Kristineberg region yield pyrite, arsenic, gold, and silver.

MANUFACTURING. Although its output of ferrous metals is relatively limited, Sweden is noted for its development of high-grade metallurgy, chiefly the production of alloy and high-carbon steels. Most of the centers of high-grade metallurgy, among them Sandviken, Hofors, Fagersta, Avesta, Degerfors, and Hagfors, are located in the old Bergslagen mining region of central Sweden, which accounts for two-thirds of the country's steel output, including nine-tenths of its high-grade steel. Large plants with full metallurgical cycles have been built at Borlänge and in the ore-exporting ports of Luleå and Oxelösund. More than 40 percent of the steel is produced in electric furnaces. The principal centers of nonferrous metallurgy are Skellefteå (copper and lead), Sundsvall (aluminum from imported alumina), and Västerås and Finspång (rolled nonferrous metals).

Alongside the prewar machine-building industries, linked to Swedish inventions (bearings, telephone equipment, turbines, separators), new machine-building sectors have arisen since the war whose output has found a steady demand on the domestic and world market. Among these sectors are shipbuilding, the automotive and aviation industries, and the manufacture of calculators and computers. Two-fifths of the machinery and equipment produced is exported.

The shipbuilding industry specializes in the construction of supertankers with deadweights of 100,000–500,000 tons. The largest shipyards are located on the western and southwestern coasts at Göteborg (Götaverken and Eriksberg companies), Malmö (Kockums), Uddevalla, and Landskrona. The electrical engineering industry excels in the production of powerful generators, transformers, and motors, most of them built by ASEA's plants in Västerås and Ludvika, and in the manufacture of telephone

and other communications equipment, produced chiefly by the L. M. Ericsson Company in Stockholm. The SKF Company, with large plants in Göteborg and in the Federal Republic of Germany, France, Italy, the USA, and other capitalist countries, produces about one-fifth of the ball and roller bearings manufactured in the capitalist world; four-fifths of this output comes from the company's foreign enterprises. The automotive industry is represented by the Volvo Company, which has a truck factory in Göteborg, a car factory in the city's suburb of Torslanda, and a vehicle assembly plant in Kalmar, and by Saab-Scania, which produces trucks at Södertälje and cars at Trollhättan. The Saab-Scania Company also owns a large aircraft plant in Linköping, which manufactures military aircraft and guided missiles.

Sweden ranks fourth in the capitalist world, after the USA, Canada, and Japan, in the output of paper pulp, three-fourths of which is chemical pulp and one-fourth mechanical pulp. It produces about 10 percent of the capitalist world's paper pulp. About half of the output is exported and the remainder is made into paper and cardboard. Sweden is second only to Canada in the export of paper pulp (5 million tons in 1974) and paper and cardboard (3 million tons). Most of the country's pulp and paper enterprises and sawmills are located along the Bothnian coast of northern Sweden (near Sundsvall, Kramfors, Örnsköldsvik, and Umeå) and along the northwestern and northern shores of Lake Vänern (Karlstad-Säffle).

The chemical industry does not have a broad raw material base. The annual capacity of the country's chlorine-alkali plants, using imported raw material (salt) and supplying products to the paper and pulp enterprises, reached 400,000 tons of chlorine and about 500,000 tons of caustic soda in 1975. The capacity of the sulfuric acid plants, which draw on local pyrites, exceeds 1 million tons. The launching of a large petrochemical complex in Stenungsund has opened the way for the production of synthetic materials.

The various sectors of light industry (textiles, garments, leather footwear) produce almost exclusively for the domestic market, depend heavily on imported raw material, and face sharp competition from foreign goods. The number of persons employed in light industry is steadily decreasing. Borås is the major textile and garment center.

Table 3 shows the output of major industrial products.

Agriculture. Sweden's highly productive and market-oriented agriculture supplies more than four-fifths of the country's demand for foodstuffs, including virtually all its milk, meat, grain, and livestock feed and nine-tenths of its sugar and vegetable oil. Capitalist farms dominate agricultural production. The concentration of landed property has been promoted by government measures supporting large farms, such as the 1947 law On the Rationalization of Agriculture, extending credit and other privileges to farms of at least 20–30 hectares (ha). Between 1951 and 1975 the total number of farms declined by more than half. But while the number of farms with less than 20 ha decreased by a factor of 2.5, the number of farms with more than 30 ha grew by a factor of 1.4. The distribution of land by farm category is shown in Table 4.

Table 4. Distribution of cultivated land by category of farms (1975)

Farm size (hectares)	Farms		Area	
	number	percentage	hectares	percentage
Less than 10	55,000	42	328,000	11
10–20	33,000	25	479,000	16
20–50	32,000	24	1,016,000	34
More than 50	12,000	9	1,157,000	39
Total	132,000	100	2,980,000	100

Swedish agriculture has become highly mechanized: in 1974 there were 184,000 tractors, or one per 16 ha of arable land, and 47,000 grain combines, or one per 34 ha of grain crops. Consequently, although the number of farm workers declined by a factor of more than 2.5 between 1950 and 1975, the volume of agricultural output increased by a factor of 1.2. In the structure of agricultural production animal husbandry predominates, producing three times as much income as crop farming. In 1975, Sweden had 3,347,000 ha of farmland (covering 8 percent of the country's area), including 2,980,000 ha of arable land and 367,000 ha of pastures and meadows. This represented a 28 percent decrease in agricultural land since 1950, including a 20 percent reduction in arable land.

ANIMAL HUSBANDRY. In livestock raising the income from meat is 1.5 times greater than the income from milk. Although the number of cattle has decreased, productivity has risen. In 1976 the average yield per dairy cow was about 4,500 kg, and the average fat content of the milk exceeded 4 percent. Table 5 shows the changes in livestock population. In 1976, Swedish farms produced 3 million tons of milk (deliveries to dairies), 434,000 tons of meat, 44,000 tons of butter, 83,000 tons of cheese, and 109,000 tons of eggs.

Table 5. Livestock population

	1950	1960	1970	1976
Cattle	2,648,000	2,501,000	1,926,000	1,900,000
cows	1,654,000	1,298,000	758,000	736,000
Hogs	1,300,000	1,915,000	2,074,000	2,500,000

CROP FARMING. About three-fourths of the cultivated land is allocated for fodder crops, chiefly grain and grasses. Feed grains, primarily barley and oats, occupy 41 percent of the total arable land; grasses, 32 percent; food grain (primarily wheat), 13 percent, and oil crops (chiefly rape), 6 percent. Table 6 gives the sown area and yield of the main crops.

FISHING. The annual fish catch, obtained chiefly from the Baltic and North seas, averages about 150,000 tons.

FORESTRY. The lumber industry exploits productive forests covering 23.4 million ha (1968–72 assessment). The annual increase in timber is 70 million cu m. In 1974–75 timber production totaled 52.6 million cu m.

Transportation. Rail shipping is the principal means of transporting domestic freight, but it is facing rapidly growing competition from trucking. The length of the rail network decreased from 16,000 km in the early 1950's to 12,100 km in 1976; 7,500 km, or 62 percent of the network, have been electrified. More than nine-tenths of railroad freight is hauled by electric traction. Ferries connect the Swedish railroads with those of Denmark, the Federal Republic of Germany, and the German Democratic Republic. At the beginning of 1978 the country's motor vehicle pool included 2,857,000 cars and 182,000 trucks and buses. In 1977 the merchant fleet had a tonnage of 6.8 million gross registered tons. The principal ports are Göteborg, which handled 20.2 million tons of cargo in 1975, Luleå (7.7 million tons), Hälsingborg (6.7 million tons), and Stockholm (5.5 million tons). The main international airport is Arlanda near Stockholm.

Foreign trade. Sweden ranks tenth among the developed capitalist countries in volume of foreign trade. In 1976 its exports were valued at 80.2 billion kronor and its imports at 83.3 billion kronor. The principal exports are machine-building and metalworking goods (49 percent by value in 1976), woodworking and pulp-paper industry output (20 percent), and metallurgical products (8 percent). The main imports are machinery and equipment (36 percent), fuel (18 percent), chemicals (8 percent), and metals (7 percent). The geographical orientation of Sweden's foreign trade attests to its strong economic and commercial-political affiliation with Western Europe, which accounts for three-fourths of Swedish exports and imports. Half of the foreign trade is conducted with the Common Market countries. Sweden's principal trading partners in 1976 were the Federal Republic of Germany (which bought 10 percent of its exports and provided 19 percent of its imports), Great Britain (11 and 10 percent), Norway (11 and 6 percent), Denmark (10 and 7 percent), Finland (6 and 6 percent), and the USA (5 and 7 percent).

The socialist countries of the Council for Mutual Economic Assistance account for 6 percent of Swedish foreign trade; commercial and economic ties are most extensive with the USSR, Poland, and the German Democratic Republic. Sweden imports

Table 6. Sown area and yield of principal crops[1]

	Area (hectares)			Yield (tons)		
	1951–55	*1961–65*	*1971–75*	*1951–55*	*1961–65*	*1971–75*
Wheat	366,000	278,000	250,000	797,000	897,000	1,149,000
Rye	120,000	59,000	96,000	245,000	147,000	350,000
Barley	166,000	436,000	644,000	363,000	1,185,000	2,003,000
Oats	491,000	519,000	520,000	809,000	1,277,000	1,547,000
Mixed grain	311,000	190,000	72,000	656,000	469,000	194,000
Potatoes	127,000	92,000	45,000	1,607,000	1,559,000	1,083,000
Sugar beets	54,000	45,000	45,000	1,767,000	1,615,000	1,880,000
Oil crops	125,000	87,000	160,000	181,000	173,000	340,000
Sown grasses (hay)	1,209,000	1,044,000	847,000	4,428,000	4,146,000	3,650,000

[1]Average annual

liquid and solid fuels, metals, chemicals, and machine tools from the USSR, to which it sells primarily machinery and equipment. Production cooperation between Swedish and Soviet enterprises is expanding in industry, power engineering, and transportation.

Each year 3–4 million foreign tourists visit Sweden. Its monetary unit is the kronor. By the exchange rate of the USSR State Bank, 100 kronor equaled 14 rubles 96 kopecks in April 1978.

Economic regions. Central Sweden, encompassing the lowlands around the large lakes and stretching from the Baltic Sea in the east to the Kattegat in the west, emerged historically as the economic nucleus of the Swedish state. The combination of iron ore, timber, and waterpower resources promoted early industrial development. Although it occupies less than one-third of the country, the region accounts for three-fifths of the population and two-thirds of Swedish industrial production. The chief production specialization is the metal industry. The region produces more than two-thirds of the country's machine-building output (including three-fourths of its electrical equipment and more than two-thirds of its ships) and more than four-fifths of its steel.

Southern Sweden, including the Småland Upland south of Lake Vättern, the adjacent coast of the Baltic Sea and Kattegat, and the Skåne Peninsula in the extreme south, developed historically as the principal agricultural region. Occupying just one-eighth of the country's territory and inhabited by one-fourth of its population, the region includes more than one-third of the cultivated land and produces two-fifths of the agricultural output. Southern Sweden also manufactures one-fourth of the country's industrial output.

Northern Sweden is a vast, sparsely populated land rich in resources. With about two-thirds of the country's area and one-eighth of its population, northern Sweden possesses more than half of the nation's timber reserves, three-fourths of its iron ore reserves, nine-tenths of its nonferrous metal ore reserves, and four-fifths of its hydroelectric resources. The region clearly specializes in lumbering, mining and metallurgy, and electricity generation, producing half of the country's timber, about half of its wood products, four-fifths of its iron ore, and about two-thirds of its electric energy. It has large enterprises of ferrous (Luleå) and nonferrous (Skellefteå) metallurgy. In general, however, the region's share of the country's economic potential is small, inasmuch as it provides only one-tenth of the industrial output.

M. N. Sokolov

Armed forces

Sweden's armed forces, consisting of an army, an air force, and a navy, are under the ultimate direction of the government and the direct command of the supreme commander. The three services, numbering 68,000 men in 1977, are recruited on the basis of conscription. The term of active duty is 7½–15 months in the army, 8–15 months in the air force, and 10–17½ months in the navy.

The army, numbering about 46,000 men, consists of 50 infantry, artillery, tank, and other mobilizable training regiments that in wartime can be expanded into brigades and battalions. The air force of about 10,000 men comprises more than 30 squadrons of various kinds (about 600 fighter planes) and ten helicopter groups, each having two to four helicopters. The navy of about 12,000 men is equipped with 17 submarines, six destroyers, six frigates, about 40 torpedo boats, 16 patrol boats, three mine-layers, and more than 30 minesweepers. There are about 65 mobile and stationary coastal artillery units. The largest naval bases are at Horsfjärd (Stockholm skerries), Karlskrona, and Göteborg, and the rocky indented coast provides many shelters for ships. The armaments of all the branches of the armed forces are of Swedish or foreign manufacture.

Health and social welfare

In 1976 the birth rate was 11.9 per 1,000 inhabitants, the mortality rate 11, and infant mortality 8.7 per 1,000 live births. Cardiovascular diseases, malignant neoplasms, and lung diseases are the leading causes of illness and death. Infectious diseases include influenza, childhood diseases, epidemic hepatitis, and venereal diseases.

The public health service is under the jurisdiction of the Ministry of Health and Social Affairs and the National Council of Public Health and Social Insurance. Direct supervision over medical treatment and disease prevention is exercised by the county councils, which have departments of medical services.

In 1972 there were 721 hospitals with 123,100 beds (15 per 1,000 population). Outpatient care was provided by 200 hospital clinics, 11 independent clinics, and 848 public health centers. There were 11,900 practicing doctors (one for every 680 persons), 7,000 dentists, 3,400 pharmacists, and more than 100,000 other medical personnel. Doctors are trained at six medical faculties and secondary medical personnel, at 34 medical schools. Public health expenditures amounted to 4.4 percent of the state budget in 1972.

The best-known spas are the balneological resorts of Medevi and Ronneby, the pelotherapy resorts of Gustafsberg and Loka, and the climatic resort of Marstrand.

Sweden's unified, state-run, compulsory social insurance system was improved substantially by the reforms of 1973 and 1975. Social insurance is financed by the state, by employers, and to a lesser degree by the citizens themselves, for example, unemployment insurance, available under a voluntary program financed by payroll deductions. Sickness insurance covers up to 90 percent of the lost earnings of most workers as well as the greater part of medical expenses. Maternity benefits have also been instituted. Old-age pensions consist of a national pension, a fixed amount that all citizens are eligible for upon reaching the age of 65 (since 1975), and a pension based on length of employment, which is financed by employers. Family allowances are paid for each child up to the age of 16.

O. A. Aleksandrov and A. G. Kan (social insurance)

Veterinary services. Sweden is free of the majority of infectious and parasitic animal diseases. Isolated cases of cattle vibriosis have been recorded (one outbreak in 1976); cysticercosis of cattle and hogs is prevalent in some regions; and leukosis of cattle and Marek's disease (among fowl) are encountered.

The veterinary service is under the jurisdiction of the National Agricultural Council. Supervision over foodstuffs, including meat, is exercised by the National Food Administration. Veterinary services, available in all the counties, were provided by

1,312 veterinarians in 1976. One of the oldest higher veterinary schools in Europe, the Veterinary School of Uppsala, functions as a faculty of the Swedish University of Agricultural Sciences. Veterinary research is conducted by the National Veterinary Institute and a number of Veterinary research institutions. The production of biologicals has been initatied. Two veterinary journals are published.

M. G. TARSHIS

Education

The first schools in Sweden, founded in the 13th century, were either monastic schools established by the Dominican and Franciscan orders or urban schools offering instruction in arithmetic and writing. By the 16th century there were 20 church and monastery schools and ten urban schools. The Lutheran Reformation of the 16th century promoted the spread of literacy. Schools were controlled by the church down to the middle of the 19th century. Under a law enacted in 1842 compulsory elementary schools were established for the lower estates. A law providing for compulsory seven-year education was adopted in 1936, and in 1962 the length of compulsory schooling was extended to nine years. Public education is directed by the Ministry of Education.

Kindergartens and play schools are available for children between the ages of three and six. At the age of seven children are enrolled in the compulsory basic nine-year school, which is divided into three levels each consisting of three grades. All pupils receive the same general education during the first six years of instruction. The curriculum of the seventh, eighth, and ninth grades includes both required and elective subjects. After completing the nine-year school, students continue their education in secondary schools—integrated *Gymnasiums* with 22 departments. The technical, natural sciences, humanities, economics, and social sciences departments offer three- or four-year programs that prepare students for entry into higher educational institutions; the other departments offer two-year programs of vocational and technical training.

In the 1974–75 school year 1,195,000 pupils were enrolled in the basic schools, including 311,000 in the seventh, eighth, and ninth grades. The *Gymnasiums* had an enrollment of 221,000. The higher educational system includes 35 institutions, in which 101,800 students were enrolled in the 1976–77 academic year. The course of study ranges from three to six years. University faculties of humanities and natural sciences have an open admissions policy; admission to faculties of medicine, pharmacy, and dentistry, as well as to specialized higher schools, is based on competition and is contingent on having work experience in the chosen field. The largest higher educational institutions are the University of Stockholm, the universities in Uppsala (founded 1477), Lund (1668), Göteborg (1891), Umeå (1963), and Linköping (1970), the Royal Institute of Technology in Stockholm (1827), the university of technology in Göteborg (1829), and the Caroline Institute (Karolinska Institutet) in Stockholm (1810).

The major libraries are the Royal Library in Stockholm (1 million volumes), where V. I. Lenin did research; the libraries of the universities in Uppsala (more than 2 million volumes), Lund (more than 1.3 million volumes), and Göteborg (1.25 million volumes); and the city libraries of Stockholm (more than 1.4 million volumes) and Göteborg (more than 1 million volumes). Important museums in Stockholm include the National Museum, the Contemporary Art Museum, the Ethnographical Museum, the City Museum of Stockholm, the Museum of National Antiquities, the Nordic Museum, the Museum of Natural History, the National Maritime Museum, and Skansen, an open-air museum exhibiting ancient rural structures and utensils. Several fine museums are found in Göteborg, notably the Art Gallery, the Museums of the City of Göteborg (history, archaeology, and ethnography), and the Maritime Museum. Also noteworthy is the Cultural History Museum in Lund.

L. G. MOZHAEVA

Science and scientific institutions

Natural and technical sciences. The development of natural science in Sweden was linked to the founding of the first universities in Uppsala and Lund and to the opening of astronomical observatories in Uppsala (1650) and Lund (1670). In the 18th century Swedish science was influenced by Enlightenment ideas emanating from France and Great Britain. The Royal Society of Sciences was established in Uppsala in 1710 and the Royal Academy of Sciences in Stockholm in 1739.

The first president of the Royal Academy of Sciences was C. Linnaeus (honorary member of the St. Petersburg Academy of Sciences from 1754), who greatly influenced the development of science in the country. Linnaeus worked out a system for classifying plants and animals (published 1735) that was, for its time, all-embracing, and he was the first to begin systematically using binomial nomenclature. The Royal Academy of Sciences began publishing the first Swedish scientific journal in 1739. A founder of the academy, M. Triewald, promoted experimental physics in Sweden, built the first steam engine in Scandinavia, and wrote a work on mining.

The Stockholm Observatory was founded in 1753 by P. V. Wargentin (honorary member of the St. Petersburg Academy of Sciences from 1760). Systematic scientific work in astronomy was begun by A. Celsius, the director of the observatory in Uppsala, who proposed a 100-degree temperature scale. S. Klingenstierna was known for his work in mathematics. P. Artedi worked out a system of classifying fish, and E. Acharius laid the foundation for lichenology. Significant advances were made in chemistry in the 18th century. T. O. Bergman perfected qualitative analysis. K. Scheele, a skillful experimenter, discovered manganese and was the first to obtain chlorine, potassium manganate, glycerol, a number of acids, and other compounds. He also described the properties of oxygen, as well as a method of obtaining it. A. F. Cronstedt discovered nickel and worked out a classification of minerals based on their chemical properties (*An Essay Toward a System of Mineralogy*, 1758).

The 17th and 18th centuries saw considerable progress in the technology of metallurgy and metalworking, naval shipbuilding, and the manufacture of cold weapons and firearms. C. Polhem had a marked influence on the development of technology, primarily mining and metallurgy.

In the 19th century, when most research was conducted at higher educational institutions, the leading branches of science were chemistry and mineralogy. J. J. Berzelius (honorary member of the St. Petersburg Academy of Sciences from 1820) won international recognition for experimentally confirming the atomic theory and introducing it into chemistry. He introduced the system of designating chemical elements that is used today. Berzelius and his students, notably C. G. Mosander, made a major contribution to the discovery and study of the rare-earth elements lanthanum, yttrium, terbium, and erbium. These studies were continued by L. F. Nilson, who discovered scandium, and by P. T. Cleve, who isolated thulium and holmium. J. A. Arfvedson discovered lithium. C. W. Blomstrand developed the chemistry of complex compounds. A. Nobel, who established the Nobel Prizes, invented dynamite in 1867 and initiated its industrial production. In 1888 he developed ballistite. One of the greatest achievements of 19th-century chemistry was the electrolytic theory of dissociation proposed by S. A. Arrhenius (honorary member of the Academy of Sciences of the USSR from 1925), the first Swedish scientist to receive the Nobel Prize (1903).

The physicist and astronomer A. J. Ångström measured with great precision the wave lengths of the solar spectrum and introduced the unit of length that bears his name. His son, the geophysicist K. J. Ångström, invented a compensation pyrheliometer and pyrgeometer. The research of J. R. Rydberg on the systematization of atomic emission spectra was important to atomic physics; in 1890 he introduced the fundamental physical constant that bears his name. H. J. Holmgren became known for his work on differential equations. M. G. Mittag-Leffler (elected honorary member of the Academy of Sciences of the USSR in 1926) initiated the Swedish school of the theory of functions of a complex variable. In 1882 he founded one of the most important mathematical journals, *Acta mathematica*. At his invitation S. V. Kovalevskaia came to teach at the University of Stockholm. L. Ahlfors studied methods of topology in the theory of analytic functions. J. A. H. Gulden (corresponding member of the St. Petersburg Academy of Sciences from 1882) developed the theory of the perturbation of comets and small planets and worked out its mathematical apparatus. E. Jäderin invented a reference device in 1880.

The meteorologist H. Hildebrand-Hildebrandsson (corre-

sponding member of the St. Petersburg Academy of Sciences from 1882) studied general air circulation and conducted important observations of clouds and the upper strata of the atmosphere with the aid of sounding balloons. A. Erdmann, the founder of the Geological Survey of Sweden (1858), holds a prominent place in the development of mineralogy and geology. G. J. De Geer (honorary member of the Academy of Sciences of the USSR from 1925), who did pioneering work in Quaternary geology, established the origin of annual strata in banded clays. At the end of the 19th century, J. R. Sernander conducted systematic studies of the climate and flora of Scandinavia in the postglacial period; he was also concerned with the protection of Sweden's natural environment. N. A. E. Nordenskjöld (corresponding member of the St. Petersburg Academy of Sciences from 1879) made a major contribution to the study of the arctic. In 1878–79 he was the first to navigate the Northeast Passage from the Atlantic to the Pacific, wintering along the way. In 1897, S. A. Andrée made an attempt to reach the north pole in an air balloon of his own design.

Between 1850 and 1853, C. Andersson crossed the Kalahari Desert and the Damara Plateau in Africa. S. Hedin explored Tibet, the Gobi Desert, and other regions of Central Asia from 1893 to 1902. In another expedition, lasting from 1905 to 1908, he reached the sources of the Brahmaputra and the Sutlej and discovered the Trans-Himalayas. The first Swedish expedition to the antarctic was organized in 1901 under the direction of O. Nordenskjöld.

A significant contribution to 19th-century biology was the work of the algologists K. A. Agardh (who devised a classification system for algae and whose work was continued by his son, J. G. Agardh), J. Areschong, F. Kjellman, and G. Lagerheim. The botanist E. M. Fries (corresponding member of the St. Petersburg Academy of Sciences from 1850) was one of the founders of mycology. C. J. Hartman compiled a basic guide to Scandinavian flora. S. Loven (corresponding member of the St. Petersburg Academy of Sciences from 1860) was noted for his work on the fauna of Sweden's lakes and the Baltic Sea. F. Holmgren, who established the first physiology laboratory in Sweden, worked out a method for revealing color blindness. Outstanding work in medical physiology was done by G. M. Retzius (corresponding member of the St. Petersburg Academy of Sciences from 1895). A. Gullstrand revised the theory of the refraction of light in the eye (Nobel Prize, 1911). J. G. Zander founded medical mechanotherapy.

A major engineering project of the first half of the 19th century was the Göta Canal, built under the direction of N. Ericson. His brother, J. Ericsson, introduced into shipbuilding the screw propeller with blades (1836) and is remembered in the history of technology as the designer of steamships (including the *Monitor*) and steam locomotives.

Swedish industrial inventions and improvements of the second half of the 19th and early 20th centuries became known throughout the world. After G. E. Pasch invented safety, or Swedish, matches in 1844, J. E. Lundström worked out the technology and equipment to mass produce them. C. D. Ekman invented a method of producing high-quality sulphite cellulose, and the first chemical pulp factory went into operation in 1874. L. M. Ericsson, credited with numerous improvements in telephony, founded a telephone firm in 1896. C. G. P. de Laval invented a continuous-operation centrifugal cream separator in 1878 and an impulse steam turbine in 1889. He also developed a theory of nozzles and proposed one of the first designs for milking machines in 1896. J. A. Brinell developed a method for determining the strength of metals that is widely used today. N. G. Dalen invented a device for automatically lighting (nightfall) and extinguishing (daybreak) acetylene lighthouse lamps (Nobel Prize, 1912). S. Wingquist invented spherical roller bearings, putting them into mass production in 1907. Hydroelectric construction expanded at the turn of the century; the Trollhättan hydroelectric power plant, the world's largest at the time, went into operation in 1910.

In the 20th century, Swedish mathematicians continued to work on the theory of functions of a complex variable (Mittag-Leffler's students E. Lindelöf and O. Frostman), on differential and integral equations (E. I. Fredholm and E. A. Holmgren), on the theory of functions and integral equations (T. Carleman), and on algebra and number theory (T. Nagell). H. Cramér did fundamental work on probability theory and mathematical statistics. L. Carleson has won acclaim for his work on the theory of multiple-valued analytic functions, and L. Hörmander for his work on the theory of differential operators. C. Charlier applied methods of mathematical statistics to the study of the spatial distribution of stars in the Milky Way Galaxy. E. Bergstrand worked on problems of stellar astronomy, and K. Lundmark studied spiral galaxies. T. Elvius and his wife, A. Elvius, have gained international recognition for their work in stellar astronomy.

Major contributions to physical chemistry were made by T. Svedberg, who developed a method of ultracentrifugation (Nobel Prize, 1926), by A. Tiselius, who worked on electrophoresis and adsorptive analysis (Nobel Prize, 1948), and by A. Ölander and S. Claesson (member of the Academy of Sciences of the USSR since 1976). Internationally acclaimed biochemical studies of enzymes and vitamins were carried out by H. von Euler-Chelpin (Nobel Prize, 1929; member of the Academy of Sciences of the USSR from 1927), A. H. Theorell (Nobel Prize, 1955), and E. Brunius. The biochemist S. Bergström (honorary member of the Academy of Sciences of the USSR since 1976) did major work on prostaglandins.

Among eminent Swedish physicists of the 20th century are K. M. G. Siegbahn, the founder of nuclear spectroscopy (Nobel Prize, 1924; member of the Academy of Sciences of the USSR from 1958), and his son K. M. Siegbahn, who has worked on problems of nuclear and photoelectron spectroscopy. H. Alfvén has achieved international renown for his work on the physics of plasma and cosmic radiation and on astrophysics (Nobel Prize, 1970; member of the Academy of Sciences of the USSR from 1958). Alfvén formulated the basic principles of magnetohydrodynamics. Outstanding research in atomic physics has been done by P. Ohlin, T. Gustafson, and S. E. Nilsson, and B. Lehnert has done important work in plasma physics and the physics of thermonuclear reactions. In solid-state physics, G. Ising proposed the model of magnetics that bears his name. A. K. Ångström has conducted research in geophysics, notably the physics of the atmosphere, climatology, and actinometry. Research is under way on the isostasy of the Baltic Shield.

In oceanography, V. W. Ekman worked out a theory of drift and gradient currents. H. Pettersson directed the deep-water expeditions of the *Albatross* in the middle Atlantic in 1947–48. F. Malmgren studied the physical and chemical properties of sea ice; he perished in the expedition of the dirigible *Italia*. Meteorological research has been advanced by C. G. A. Rossby, who studied the thermodynamics of atmospheric processes, by T. Bergeron, who founded dynamic climatology, and by B. Bolin, who developed mathematical methods of weather forecasting.

Well-known geological studies have included H. G. Backlund's research on the petrography and tectonics of the Baltic Shield, the mineralogical investigations of P. Quensel and G. Lindström (corresponding member of the St. Petersburg Academy of Sciences from 1886), the work of L. von Post, who developed methods for spore and pollen analysis in geology, and the research of A. Hadding, the author of a basic work on the geology of Sweden. Important contributions to the study of the geology of Sweden's ore deposits were made by P. Geijer and S. Gavelin. W. Lindgren has done valuable research in metallogeny and H. Ahlmann in glaciology.

In the biological sciences, there have been major achievements in zoology (S. Ekman, B. Hanström, S. Hörstadius, K. Curry-Lindahl), cytology (J. Runnström), and embryology (T. Gustafson, member of the Academy of Sciences of the USSR from 1976). The development of paleontology owes much to the work of A. G. Nathorst (corresponding member of the St. Petersburg Academy of Sciences from 1901), E. J. G. Holm (corresponding member of the St. Petersburg Academy of Sciences from 1910), and E. Stensiö (member of the Academy of Sciences of the USSR from 1929). Among botanists, outstanding work has been done by O. Rosenberg in plant cytology, by H. Lundegårdh, J. E. Melin, and G. Borgström in plant physiology, by J. A. Nannfeldt in floristics, and by K. Björling in phytopathology. G. Erdtman became known for his work in palynology.

The main center of research in medicine and physiology is the Caroline Institute (founded 1810) in Stockholm. G. Forssell was one of the first to use X-ray diagnosis and X-ray therapy for cancer; R. Granit studied the neurophysiological processes of vision (Nobel Prize, 1967); and U. von Euler established the role of noradrenaline in the transmission of nerve impulses (Nobel Prize, 1970). Among other medical men who have won acclaim for their scientific work are H. Olivecrona (neurosurgery), C. Crafoord (lung and heart surgery), G. Nylen and E. Mannheimer (cardiology), T. Sjöstrand (hematology), and S. Friberg (orthopedics and traumatology; member of the Academy of Medical Sciences of the USSR since 1967).

In the agricultural sciences, important results have been achieved in the selective breeding of cereals and fodder grasses at the Svalöv and Weibullsholm institutes. E. Åkerberg (member of the V. I. Lenin All-Union Academy of Agricultural Sciences [VASKhNIL] since 1967) is noted for his work on plant breeding, and K. Fröier (member of VASKhNIL since 1972) is a leading agricultural geneticist. Important contributions to the study of the genetics and hybridization of crops were made by N. H. Nilsson-Ehle (corresponding member of the Academy of Sciences of the USSR from 1932) and E. Åkerberg.

Scientific research and development in technology has expanded rapidly in the 20th century. Theoretical and applied research in electrical engineering has been conducted by E. H. Norinder (transmission of high-tension currents and lightning protection), F. Dahlgren (theory of electrical machines), and E. Velander. Research and development in high-tension technology are largely confined to the ASEA firm, and research in radio electronics and its application to communications are conducted by the L. M. Ericsson firm and Televerket, the government department of electric communications. The principles of modern telegraph and telephone technology have been developed by T. Laurent, E. Löfgren, E. Hallén, and H. Sterky.

The postwar period saw the rapid expansion of aviation research and development, conducted chiefly by the National Aeronautical Research Institute (founded 1940) and the Saab-Scania industrial firm. E. Pettersson and G. Drougge did important work in aviation aerodynamics. The *Draken* and *Viggen* supersonic fighter interceptors were designed in the 1960's and 1970's. Sweden is engaged in joint space research with other Scandinavian and Western European countries. In shipbuilding, research and development are carried out by the State Shipbuilding Experimental Establishment (founded 1940) and the leading shipbuilding firms—Götaverken, Eriksberg, and Kockums. The Arendal shipyard, built in Göteborg in the 1960's, is the world's first facility for the rapid continuous sectional construction of supertankers. The "safe car" developed by the Volvo Company was put into assembly-line production in 1975. Since the 1950's large hydroelectric power plants with underground machine rooms have been built on the rivers of northern Sweden. A number of nuclear power plants have also been constructed.

Significant contributions to physical metallurgy have been made by A. Westgren (X-ray structural analysis), O. Forsman (fatigue in steel and stress in welding), and A. Hultgren (methods of testing metals). In the technology of ferrous metallurgy, the work of G. Wallquist and M. Wiberg holds an important place. B. Kalling developed a process, subsequently known as the Kal-Do process, for smelting steel in an oxygen converter. Much of the country's scientific research and development is carried out within the framework of inter-Scandinavian scientific cooperation. In 1975 the Royal Swedish Academy of Sciences and the Royal Swedish Academy of Engineering Sciences concluded an agreement with the Academy of Sciences of the USSR providing for scientific cooperation and the exchange of scientific personnel.

M. N. SOKOLOV

Social sciences. PHILOSOPHY. In the Middle Ages the development of philosophical thought in Sweden was closely linked to Christian mysticism and Scholasticism, as illustrated by the *Revelations of St. Bridget*, a 14th-century Thomist work. The teachings of P. Ramus, the French philosopher whose followers opposed the scholastic method, spread to Sweden in the late 16th century.

An independent, secular philosophy emerged in Sweden in the 17th century with the incipient secularization of cultural life. The first significant Swedish philosopher and poet was G. Stiernhielm, whose works eclectically combined Pythagoreanism, Neoplatonism, and Renaissance natural philosophy. The adherents of R. Descartes, who came to Stockholm in 1649, attacked medieval Scholasticism. A. Rydelius propounded a rationalist ethics and theory of knowledge. Materialist empiricism and sensationalism, expounded by P. Christiernin, M. Fremling, C. G. Leopold, and N. von Rosenstein, attracted a large following in the 18th century. Influenced by the Enlightenment, T. Thorild polemicized against Kantianism from the standpoint of "dynamic pantheism." In the 1740's E. Swedenborg abandoned his mechanistic materialist views in favor of a mystical philosophy.

The first follower of Kant in Sweden, D. Boëthius initiated the turn away from sensationalist and materialist trends, derived from English and French thinkers, to German idealist philosophy. Another prominent exponent of Kantian philosophy was B. Höijer. In the first half of the 19th century, philosophical thought was influenced by romanticism, championed by the Phosphorists (*fosforisterna*) and the members of the Gothic Society. The great Swedish historian and poet E. G. Geijer was also an original philosopher whose social views evolved from conservative romanticism to bourgeois liberalism and faith in democracy. The "philosophy of the individual" as a peculiarly Swedish form of idealism was developed by N. Biberg, S. Grubbe, and especially C. J. Boström, all of whom held speculative theistic views.

The early 20th century was marked by a rejection of speculative systems, primarily Boströmianism, and a growing interest in positivism and experimental psychology. Some of Boström's followers embraced neo-Kantianism and the philosophy of life (V. Norström); others gravitated toward logical positivism (P. Wikner). The "new Uppsala school" that emerged around 1910 expounded an early form of logical positivism. Its founders, A. Hägerström and A. Phalén, anticipated many of the basic ideas of the Vienna circle. A spokesman for the antipositivist views of certain Swedish scholars, poets, and writers, H. Larsson attacked Hägerström's theory of the "nihilism of values" and developed a doctrine of intuition in a rationalist manner. Problems of axiology were elaborated by A. Vannérus. The views of J. Landquist, who wrote extensively on the history of philosophy, were similar to those of H. Bergson.

Since World War II, Swedish philosophers have sought to integrate bourgeois philosophy on the basis of neopositivism. The leading exponents of this trend are A. Wedberg, K. Marc-Wogau, M. Moritz, I. Segelberg, and I. Hedenius. Empirical sociology and psychology have become popular. G. Aspelin has studied the history of ideas and their relation to the social milieu. T. Segerstedt has aimed at transcending the limitations of positivist concepts in sociology. The neopositivist "philosophy of science" is also opposed by the neo-Protestant "philosophy of man," many of whose exponents, notably A. Nygren and T. Simonsson, have nevertheless come under the influence of logical analysis.

Known in Sweden as early as the mid-19th century, Marxism gained ground from the 1880's through the efforts of A. Palm and A. Wermelin. The methods of historical materialism and scientific communism were first applied to the analysis of social conditions in Sweden by A. Danielson. After the creation of the Communist Party of Sweden in 1917, the struggle between the Marxist (S. H. Linderot) and the reformist (K. H. Branting) concepts of social development grew more intense. Contemporary Marxist theoretical thought is marked by a concern with such current social issues as the changes taking place in the social-class structure of Swedish society, the question of the allies of the working class, the transition from capitalism to socialism, the development of democracy, and the unity of the workers' movement. The Marxist social science journal *Häften för kritiska studier* has been published since 1968.

The centers for the study of philosophy are the departments of philosophy at the universities of Stockholm, Uppsala, and Lund. *Theoria*, the leading philosophy journal, has been published since 1935.

A. G. MYSLIVCHENKO

HISTORY. Church chronicles, written in Latin, were compiled in Sweden as early as the mid-13th century. In the next century there appeared more detailed rhymed chronicles in Old Swedish, of which the most famous is the *Erikskrönikan*. The first known

Swedish historian was Erik Olai, a professor of theology at Uppsala University in the 15th century. In the second third of the 16th century historical works reflecting a humanist outlook were written by the Lutheran Reformation leader Olavus Petri and two Catholic archbishops, the brothers J. Magnus and O. Magnus.

During Sweden's age of greatness (17th and early 18th centuries), the State Archive was established, and the post of state historiographer was created (1618–1834); in the 17th century the post was occupied for a time by the German S. von Pufendorf, who wrote an apologist history of the 17th-century Swedish kings. The College of Antiquities was founded in 1667 (around 1837 it was reorganized as the Stockholm Historical Museum). The great-power notion that the Swedes were descended from the people of ancient Atlantis was given final form by O. Rudbeck. The late 17th century saw the first studies of Scandinavian antiquities (J. Schefferus) and the publication and scholarly critique of historical sources (Archbishop E. Benzelius). The country's first historical learned society was founded in Uppsala in 1710.

Swedish 18th-century Enlightenment historiography provided a secular periodization of the country's history from earliest times, the first rationalist exposition of national history (O. von Dalin), and the first example of historical scholarship (S. Lagerbring). The establishment of the Statistical Department in 1749 opened the way for the study of the country's population and economy. The Royal Academy of Letters, History, and Antiquities was founded in Stockholm in 1788. The tradition of monarchism and hostility to the aristocracy that characterized Swedish Enlightenment historiography was continued in the romantic historiography that emerged in the first third of the 19th century against the background of the European Restoration. The leading romantic historian was E. G. Geijer, the founder of the bourgeois-conservative Uppsala historical school, which came to prominence in the third quarter of the 19th century. The school's leading exponents were W. Svedelius, C. G. Styffe, F. F. Carlson, and C. G. Malmström. Like the influential German historians of the Ranke school and the *kleindeutsch* school, Swedish historians were primarily interested in political history, centered on the Swedish king. The 19th-century historians embarked on the publication of vast collections of national historical sources, including narratives, medieval laws and documents, and acts of the Riksdag. A number of historical societies, notably the Swedish Historical Society (1880), museums, and journals were founded.

With the onset of the imperialist age, the growing monarchist, antidemocratic, and chauvinist (cult of Charles XII) tendencies in Swedish historiography crystallized in the "new school" founded by H. Hjärne, a professor at the University of Uppsala. The school nevertheless produced a number of eminent historians in the first half of the 20th century, among them S. Tunberg, C. G. Westman, G. Carlsson, H. Almquist, G. Wittrock, S. Clason, and N. Ahnlund. A positivist trend emerged in historiography in the early 20th century, somewhat later than in archaeology and the history of material culture (G. O. A. Montelius, H. Hildebrand). Between 1910 and 1920 positivism had a strong impact on medieval studies through the "critical" Lund school, founded by the brothers L. Weibull and C. Weibull. A liberal, opposition historiography arose in the first decade of the century, leaving its mark on the study of Swedish political history of the 18th and 19th centuries. Its leading exponents were N. Edén, A. Brusewitz, and F. Lagerroth. Right-wing socialist histories of the workers' movement were produced in the 1920's by G. Magnusson and J. Lindgren and later by Z. Höglund.

The first attempts at a Marxist interpretation of Swedish history were made in the 1930's by P. Nyström. In the interwar period there were notable achievements in the study of economic history (E. F. Heckscher), the Viking age (S. Bolin, H. Arbman), feudal Sweden (K. Löfqvist, J. E. Almquist, E. Lönnroth, S. A. Nilsson), and modern popular movements and radical social thought (A. Kjellén, A. Strindberg, C. A. Hessler). Significant contributions were made to runology (O. von Friesen, S. B. Jansson), toponymy (J. Sahlgren), cultural-historical geography (H. Nelson), and some aspects of Oriental studies and the history of the ancient world (M. P. Nilsson). Important work was also done in ethnography (S. Erikson's school) and in the archaeology of prehistoric Europe (M. Stenberger, S. Lindqvist, C. A. Althin), prehistoric Asia (G. Andersson), the classical world (Swedish institutes were founded in Rome in 1926 and in Athens in 1948), and the Middle Ages (T. Arne, B. Nerman, W. Holmqvist, H. Arbman).

Since World War II, Swedish historiography has been profoundly affected both by the gradual radicalization of bourgeois concepts and by the growing influence of neopositivism and the historical-sociological and economic-historical thought of France (primarily the Annales school) and the USA ("the new economic history"), on the one hand, and Marxism on the other. Marxist studies have been published by K. Bäckström, C. H. Hermansson, P. O. Zennström, and L. Herlitz. Swedish historians have shown a heightened interest in socioeconomic and contemporary history and in questions of methodology. Since the 1960's they have frequently collaborated on joint projects (series of monographs) on various themes. Such series have been devoted to the social and financial problems of 17th-century Sweden, the wars of Charles X, the popular movements of the 19th and 20th centuries, and Sweden in World War II. In world history, there have been outstanding studies of classical society, Egyptian antiquities, the Baltic region in the 16th and 17th centuries, World War II, and international relations after 1945.

The leading contemporary historians are R. Torstendahl and B. Gustafsson in methodology; Å. Kromnow in archival studies; L. A. Norborg in source study; C. A. Moberg in prehistoric archaeology; E. Lönnroth, J. Rosén, S. U. Palme, I. Hammarström, G. Westin, B. Odén, and S. A. Nilsson in the study of the Middle Ages; S. Carlsson, F. Lindberg, R. Karlbom, and G. Rystad in modern history; W. M. Carlgren, C. G. Andrae, K. Wahlbäck, S. A. Söderpalm, K. Molin, and J. Torbacke in contemporary history; and A. Attman, L. Jörberg, and R. Adamson in economic history. Since the 1960's Swedish historians have been expanding their contacts with the historians of the socialist countries; Soviet-Swedish symposia were held in Tallinn in 1973 and in Stockholm in 1976.

The centers of historical scholarship are the history and philosophy divisions of the humanities faculties of the universities of Uppsala, Lund, Stockholm, Göteborg, and Umeå. (Some research is also conducted by the social science faculties.) The principal historical journals are *Historisk tidskrift* (1881–1937), *Aktuellt och historiskt* (since 1953), *Economy and History* (since 1958), and the inter-Scandinavian *Ethnologia Scandinavica* (since 1971). *Scandia* (since 1928), *Acta archaeologica* (since 1930), *Scandinavian Economic History Review* (since 1953), and *Scandinavian Journal of History* (since 1976). A. S. KAN

ECONOMICS. The emergence of Swedish economic thought dates from the 17th century, when the prevailing economic doctrine was mercantilism. In the first half of the 18th century, as Enlightenment ideas and notions concerning the bourgeois liberalization of economic life began to penetrate the public consciousness, a sharp controversy broke out between the partisans and opponents of mercantilism. A. Nordencrantz and A. Chydenius were the leading theoreticians of "economic liberalism," calling for the free development of the national economy. The Physiocrats and A. Smith exerted considerable influence on Swedish economic thought in the last third of the 18th century. Economic liberalism became popular in the first half of the 19th century, when protectionist restrictions and precapitalist relations were abolished.

The founder of the national school of political economy was D. Davidson, whose works, written in the late 19th and early 20th centuries, show the influence of both English classical bourgeois political economy, principally D. Ricardo, and the Austrian school of vulgar political economy. In the late 19th and early 20th centuries the Swedish economists G. Cassel and K. Wicksell made a significant contribution to the neoclassical trend in bourgeois political economy by developing mathematical methods of studying problems of prices, income, monetary circulation, and the economic cycle.

Against the background of the world economic crisis of 1929–33, the general restructuring of bourgeois political economy, and the emergence of Keynesianism in Sweden, the Stockholm school evolved as an original school of bourgeois political economy whose main objective was to find practical ways of dealing with economic crises and unemployment. The school's views became the theoretical justification for the economic policy

adopted by the right-wing Social Democrats who came to power. The most prominent representatives of the school were B. Ohlin, G. Myrdal, E. Lindahl, D. Hammarskjöld, and E. Lundberg. Anticipating in many respects the ideas of J. M. Keynes, the economists of the Stockholm school were instrumental in developing and revitalizing the methods of ideologically defending and improving the mechanism of state-monopoly regulation of the Swedish economy. The current views of the Stockholm school, approaching a neoclassical synthesis, integrate neo-Keynesian ideas of state-monopoly regulation of the economy with neoclassical prescriptions for automatic self-regulation based on maintaining the "general conditions of balanced growth."

The idea of a mixed economy, expounded by E. Wigforss and adopted by the Social Democrats as the basis of their economic doctrine, has carried considerable weight in Swedish economics since the early 1930's. Contemporary reformist economists, notably P. Holmberg, T. Lindbom, P. Lindblom, and G. Adler-Karlsson, specialize in socioeconomic problems, studying production relations and the influence on them of technological development. In propounding the idea of so-called democratic socialism, Adler-Karlsson has advanced the most recent version of the convergence theory—the theory of "functional socialism."

Since World War II bourgeois theories concerning the world capitalist economy have attracted a large following among Swedish economists. Ohlin and Myrdal, who subscribe to these theories, have worked out methods for the state-monopoly regulation of currency and trade relations between capitalist countries on the basis of Keynesian or neo-Keynesian concepts of economic growth. Among contemporary Swedish economists, Myrdal has become famous as a leading exponent of institutionalism, as an authority on the economic problems of the Third World countries, and as the author of numerous works on the economic relations between the developed capitalist nations and the developing countries. Since the 1960's the Swedish bourgeois economists S. Carlson, I. Swennilson, and B. Hansson have focused on the practical aspects of the state-monopoly regulation of prices, inflation, and monetary circulation, as well as on problems of taxation.

Swedish bourgeois economists began their polemic with Marxism in the late 19th and early 20th centuries. The country's Marxist economists rallied around the Left Social Democratic Party, founded in 1917. (The party was called the Communist Party from 1921 to 1967, when it was renamed the Left Party—Communists.) The conflict between two conceptions of social development—the Marxist and the reformist—in the Swedish workers' movement intensified after World War II. Contemporary Marxist economic thought is primarily concerned with socioeconomic problems. A central place in the works of such Swedish Marxist economists as C. H. Hermansson is given to analyzing the changes in the social-class structure of the Swedish "welfare state" and to justifying the need for fundamental reforms that would create the preconditions for a socialist transformation of society.

The main centers of economic research are the Institute for International Economic Studies of the University of Stockholm (founded 1962) and the Economic Research Institute at the Stockholm School of Economics (founded 1929). Economists are trained at the Stockholm School of Economics (founded 1909) and at the universities of Göteborg, Lund, Stockholm, Uppsala, and Umeå.

The principal economics journals are *Svensk handelstidning justitia* (since 1890), *Ekonomisk tidskrift* (since 1899), *Ekonomisk revy* (since 1944), *Economy and History* (since 1958), and *Affärsvärlden* (since 1901). Important statistical data are published in the statistical yearbook *Statistisk årsbok för Sverige* (since 1914), the journal *Allmän månadsstatistik* (since 1963), and various specialized statistics series published by the Central Bureau of Statistics. K. V. VORONOV

LINGUISTICS. The first works of a linguistic nature appeared in the 16th century. As the Swedish nation and national language evolved, it became necessary to standardize the language and to develop its national literary norms, a task that long determined the practical bent and normative character of linguistic work. In 1541, L. Petri and O. Petri completed and published the first full translation of the Bible, subsequently called the Bible of Gustav Vasa, which showed considerable uniformity and consistency in orthography and grammar.

In the 17th century there were advances in general philology: the Old Swedish and Icelandic language and literature were studied by J. Bureus; ancient manuscripts were collected and studied by O. Verelius; and the study of runes was begun by J. Peringskiöld, J. Hadorph, and M. Celsius. The scientific study of the Swedish language was initiated in the second half of the century. The first Swedish grammar, written in Latin, was published by E. Aurivillius in 1684; it was followed in 1696 by N. Kjellman's grammar in Swedish. E. Schroderus published dictionaries, and S. Columbus and N. Kjellman addressed themselves to the problems of standardizing the orthography and bringing it closer to pronunciation.

In the 18th century U. Hjärne, C. G. Tessin, S. Hof, J. Ihre, and A. Botin studied questions of orthography. H. Spegel's dictionary (1712) and A. Sahlstedt's *Swedish Grammar* (1769) and *Swedish Dictionary* (1773) were intended to serve a normative function. A collection of engravings of runic monuments, based on drawings assembled by J. Hadorph and J. Peringskiöld in the late 17th century, appeared in 1750. Ihre's etymological dictionary of the Swedish language, published in 1769, laid the foundation for the comparative and historical schools in Swedish linguistics. In the late 18th century, the Swedish Academy took up the problem of correct usage, issuing the Academy Grammar in 1836.

In the 19th century Swedish linguists, among them J. Rydqvist, E. Tegnér, and A. Noreen, continued to work on orthography. A conference was held in 1869 to discuss questions of orthography, and the Orthography Society was founded in 1885. A catalog of Swedish runic inscriptions, the most complete of its time, was compiled by J. Liljegren and published in 1833. C. Schlyter published collections of medieval regional laws. The history of the Swedish language was the subject of works by Rydqvist and G. Cederschiöld, Noreen's *History of the Scandinavian Languages*, and K. Söderwall's *Dictionary of the Swedish Language of the Middle Ages*. The Royal Swedish Academy of Sciences began publishing a historical dictionary of the Swedish language in 1893.

Outstanding 20th-century works include Noreen's *Grammar of Old Swedish* (1904), A. Kock's *Historical Phonetics of the Swedish Language* (1906–29), and E. Wessén's *History of the Swedish Language* (1941–56). The philological study of medieval manuscripts has continued. Runology has been developed by O. von Friesen, Wessén, and I. Lindquist, and Swedish runic inscriptions have been published serially since 1900. The living language and its dialects have been studied. The normative *Academy Dictionary of the Swedish Language* has been published since 1874, and O. Östergren's dictionary of modern Swedish, since 1915. The illustrated Swedish explanatory dictionary came out in 1955. Other major works include Noreen's seven-volume theoretical grammar *Our Language* (1903–25, unfinished) and the descriptive grammars of E. Wellander and N. Beckman. Since the 1960's problems of general linguistics have been elucidated by B. Malmberg, who has also done important phonological research along with G. Fant.

The main linguistics centers are the Scandinavian languages divisions at the universities of Lund, Uppsala, Stockholm, and Göteborg; the general linguistics departments at the universities of Lund and Stockholm; the Institute of Dialectology and Folklore at Uppsala; the Institute of Language Culture at Stockholm; and the Royal Swedish Academy of Sciences. The leading periodicals are *Arkiv för nordisk filologi* (since 1882), *Nysvenska studier* (since 1921), *Språkvård* (since 1965), *Studia linguistica* (since 1947), and *Svenska landsmål och svensk folkliv* (since 1879). G. I. ANDREEVA

Scientific institutions. In the area of research and development an important role is played by the Swedish government, which after World War II adopted a coordinated policy in scientific research. The Science Advisory Council, created in 1962, coordinates scientific work and sets scientific and technical policy. The council is headed by the prime minsiter and includes the ministers of education, finance, industry, agriculture, and defense, as well as representatives of the leading industrial firms and prominent scientists and scholars. The Ministry of Education directs the

scientific research of universities and technical institutions of higher learning; other ministries are responsible for specific areas of applied research and development carried out by both state and private scientific research institutions. Supervision over the development of scientific research and design work is exercised by eight government research councils: for the natural sciences, the technical sciences (Board for Technical Development), medicine, agriculture and forestry, the humanities, the social sciences, and atomic research. A special body, the Scientific Preparatory Commission, is charged with the selection of the most important projects.

The main tasks of the Royal Swedish Academy of Sciences, founded in 1739 and having 160 members and 120 foreign members in 1975, are to promote the development of the mathematical and natural sciences, to organize congresses and symposia, to maintain contacts with foreign and international scientific centers, and to award Nobel Prizes in physics and chemistry. The Academy of Engineering Sciences (founded 1919, 382 members) exercises organizational and informational functions in the technical sciences and maintains attachés for science and technology at the Swedish embassies in the USA, USSR, Japan, and a number of other countries.

Most basic research is done at research centers and institutes attached to universities and other higher educational institutions. Applied research and development is conducted chiefly by the research institutes and design departments of leading industrial firms, as well as by government research centers operating under the direction of ministries, for example, the Research Institute for Atomic Physics and the Aeronautical Research Institute. Among higher educational institutions, the universities of Uppsala, Lund, Stockholm, and Göteborg, the Royal Institute of Technology in Stockholm, and the Chalmers University of Technology in Göteborg have the greatest research capability. The Caroline Institute in Stockholm conducts scientific research in medicine and physiology and awards the Nobel Prizes in those fields.

About 1.5 percent of the gross national product is spent annually on scientific research, in which some 26,000 people are engaged (1975). Approximately three-fifths of the 4.2 billion kronor spent on research and development in 1975 came from private industrial companies and foundations (Wallenberg, Wenner-Gren). State budgetary funds are used primarily to finance basic research, as well as military, energy-related, and ecological research and development.

In 1975 industry spent about 2.7 billion kronor on research and development, about three-fifths of all the money allocated for scientific research. A breakdown of this amount by branch of industry shows that electrical engineering and radio electronics accounted for an estimated 25 percent, transportation machine building for about another 25 percent, other machine building for 15 percent, metallurgy for 10 percent, the paper and pulp industry for 5 percent, the chemical industry for 5 percent, and other branches for 15 percent. Universities and higher technical schools received more than one-fourth of all the money spent on research and development; government organizations obtained one-tenth. About 3 percent of those employed by industrial firms (21,000 persons in 1975) are engaged in scientific research and development, which accounts for about 4 percent of the value of the net industrial product. Of the funds allocated from the state budget in 1972–73, and distributed through the government research councils, 47 percent went for technological research, 18 percent for the natural sciences, 16 percent for medical research, 8 percent for atomic research, 4 percent for agricultural research, 4 percent for the social sciences, and 3 percent for the humanities.

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Press, radio, and television

In 1979 the country's more than 145 daily newspapers had a combined circulation of 4.6 million copies; some 2,500 other newspapers and periodicals were also published. The most influential dailies, with their 1977 circulation, are *Arbetet* (since 1887; circulation, 104,000), published in Malmö as the press organ of the Social Democratic Labor Party; *Aftonbladet* (since 1830; circulation, 423,000), published in Stockholm by the Swedish Trade Union Confederation; the Liberal *Göteborgs-Posten* (since 1858; circulation 294,800), published in Göteborg; the Liberal *Dagens Nyheter* (since 1864; circulation, 480,000), published in Stockholm; *Svenska Dagbladat* (since 1884; circulation, 186,000), published in Stockholm; the rightist Liberal *Sydsvenska Dagbladet Snällposten* (since 1848; circulation, 115,700), published in Malmö; and the evening *Expressen* (since 1944; circulation 532,700), published in Stockholm.

The newspaper *Arbetartidningen—Ny Dag*, founded in 1974 and published twice a week in Stockholm, is the organ of the Left Party—Communists. The daily *Norrskensflamman*, founded in Luleå in 1906, has been the organ of the Workers' Communist Party since 1977. Founded in Stockholm in 1921, the Swedish information bureau, called the Newspapers' Telegraph Agency, is a joint-stock company owned by Swedish newspapers.

The country's radio and television broadcasting is conducted by Swedish Radio, a state-supervised joint-stock company founded in 1924 in Stockholm. Since 1979, Swedish Radio has maintained four branches: national radio, local radio, educational radio and television, and television. The country's three domestic radio programs and its foreign radio broadcasts are conducted in English, Spanish, German, Portuguese, Russian, French, and Swedish. Regular television broadcasting was initiated in 1956, after two years of experimental broadcasting; color television is available.

I. N. LOBASHEVA

Literature

The oldest extant literary works are runic stone inscriptions devoted to heroic subjects, such as the alliterative verses on the Rök Stone, dating from the ninth century. Latin-language religious literature appeared during the rise of feudalism and the spread of Christianity. The most famous works of this kind are *The Life of Kristina of Stumbelen* by Petrus de Dacia (1235–89) and *The Revelations of Saint Bridget* (14th century). Many ballads were composed in the 14th and 15th centuries, and historical chronicles and courtly poetry appeared at the beginning of the 14th century. The poet Thomas Simonsson of Strengnäs (died 1443) was known for his patriotic songs. A leader of the Swedish Reformation, O. Petri (1493–1552) wrote the *Swedish Chronicle* and, with his brother L. Petri, translated the Bible. The 17th century saw the birth of dramaturgy in the plays of J. Messenius (1579–1636), devoted to subjects from Swedish history and folklore, and the rise of lyric poetry, written by L. Wivallius (1605–69). A Renaissance spirit animated the poetry of G. Stiernhielm (1598–1672), best known for his narrative poem *Hercules* (1658), and the drinking songs of Lucidor (L. Johansson, 1638–74). Baroque literary trends influenced the poems of J. Runius (1679–1713).

An Enlightenment literature emerged in the early 18th century. In his magazine *Then swänska Argus* (1732–34) and in his satires and narrative poems, O. von Dalin (1708–63) criticized the monarchy and the mores of the aristocracy and clergy. The first Enlightenment novel, *The Adventures of Adalrik and Giöthilda* (1742–44), was written by J. H. Mörk (1714–63). The traveler's narratives of J. Wallenberg (1746–68) and the naturalist C. Linnaeus played an important role in the development of prose. The "builders of thought," a literary society that included

Hedvig Charlotta Nordenflycht (1718–63), G. P. Creutz (1731–85), and G. F. Gyllenborg (1731–1808), championed sentimentalism, as did the poet J. G. Oxenstierna (1750–1818). A writer and publicist of the late Enlightenment who took a critical view of the monarchy and church, J. H. Kellgren (1751–95) defended the principles of classicism without rejecting preromanticism. The poet K. M. Bellman (1740–95), noted for his collection *Fredman's Epistles* (1790), raised the traditional drinking song genre to the level of national poetry by giving his themes a democratic and realistic dimension. The idyls and satires of Anna Maria Lenngren (1754–1817) were also imbued with democratic sympathies. Preromanticism, whose theoretician was T. Thorild (1759–1808), a staunch defender of the French Revolution, steadily gained ground in the struggle against classicism. The poetry of Thorild, B. Lidner (1757–93), and F. M. Franzén (1772–1847) is remarkable for its intensity of feeling and rich imagery.

The struggle against the epigones of classicism, notably C. G. Leopold (1756–1829), and against Enlightenment illusions about the bourgeois system was brought to a close by the Romantics, who rallied around the magazine *Phosphoros* (1810–13). The romantic conflict between the ideal and the real was expressed in religious, mystical terms in the lyrics and dramatic poem *Isle of the Blessed* (1824–27) by the leader of the Phosphorists, P. D. Atterbom (1790–1855), and in the poetry and lyrical plays of E. J. Stagnelius (1793–1823), who shared their outlook. The mystical tendencies of the Phosphorists were attacked by the Romantics of the Gothic Society in their magazine *Iduna* (1811–24), published by their leader E. G. Geijer (1783–1847). The "Goths" called for a revival of heroic traditions and drew inspiration from folklore. E. Tegnér (1782–1846), who was associated with the Goths, embodied their patriotic and humanistic ideals in his narrative poem *The Saga of Frithiof* (1819–25), which became a kind of national epic.

The sharpening of social contradictions in the 1830's impelled writers to a critical examination of society and hastened the birth of realism, trends best exemplified in the prose of K. J. L. Almqvist (1793–1866). From the 1830's to the 1850's daily life was skillfully portrayed in the novels of Fredrika Bremer (1801–65) and Emilie Flygare-Carlén (1807–92), the sketches of C. A. Wetterbergh (1804–89), and the comedies of A. Blanche (1811–68). The upsurge in the bourgeois-democratic movement was reflected in the political verse of O. P. Sturzen-Becker (1811–69) and C. V. A. Strandberg (1818–77). The traditions of romanticism were continued in the historical novels (*The Last Athenian*, 1859; *The Armorer*, 1891) and lyrics of A. V. Rydberg (1828–95).

In the late 1870's and early 1880's, marked by the rapid growth of capitalism and the workers' movement, the writings of the Danish literary critic G. Brandes did much to strengthen realism. An important work of this period was *The Red Room* (1879), a highly critical novel by A. Strindberg (1849–1912). The Young Sweden writers grouped around Strindberg—Anne Charlotte Leffler-Edgren (1849–92), Victoria Benedictsson (1850–88), and G. Geijerstam (1858–1909)—explored pressing problems of Swedish life. In the late 1880's naturalist tendencies grew stronger in the works of Strindberg, Geijerstam, and the novelist and playwright T. Hedberg (1862–1931). Strindberg's naturalist plays *The Father* (1887) and *Miss Julie* (1888) marked a new phase in the development of European drama. The poetry and prose of O. Hansson (1860–1925) reflected the evolution from naturalism to impressionism and symbolism

In the 1890's the neoromantics, led by V. von Heidenstam (1859–1940), launched an attack on naturalism. In his literary manifesto *Renaissance* (1889), his lyrics, and his novel *Hans Alienus* (1892) Heidenstam contrasted humdrum bourgeois existence with a highly aesthetic vision of Renaissance and Oriental life and the cult of pleasure. Aestheticism and a withdrawal into the past or a dream world characterized the lyrics of O. Levertin (1862–1906) and the short stories of P. Hallström (1866–1960). Images of a patriarchal rural way of life, derived from folklore, were evoked in the neoromantic poetry of G. Fröding (1860–1911), noted for his collection *Guitar and Concertina* (1891), and A. Karlfeldt (1864–1931). The early work of Selma Lagerlöf (1858–1940), who drew heavily on folk tales and legends, was influenced by the neoromantic movement. Her novel *Gösta Berlings Saga* (1891) was imbued with humanism and a rejection of bourgeois utilitarianism. In the 1890's Strindberg became interested in mysticism and Nietzscheanism, which simultaneously attracted and repelled him, as revealed in the novel *By the Open Sea* (1890). His refusal to accept the bourgeois world was reflected in the dramas *To Damascus* (parts 1–3, 1898–1904) and *The Ghost Sonata* (1907), which heralded European expressionist drama.

In his psychological novels and short stories H. Söderberg (1869–1941) took an ironic and skeptical view of the moral, religious, and social conventions of bourgeois society. Söderberg's works, as well as the lyrics and short stories of B. Bergman (1869–1967), center on life in Stockholm and the fate of the "little man."

At the beginning of the 20th century, against the background of capitalist industrialization and the upsurge in the workers' movement, the first significant works about the working class were produced by M. Koch (1882–1940), G. Hedenvind-Ericksson (1880–1967), and D. Andersson (1888–1920). The novelists L. Nordström (1882–1942), G. Hellström (1882–1953), and Elin Wägner (1882–1949) wrote about the everyday life of various strata of Swedish society. The psychological novel *Downstream* (1920) by P. S. Siwertz (1882–1970) sharply satirized bourgeois mores. Keen psychological insight, a feeling for the grotesque, and symbolism distinguished the cycle of novels by H. Bergman (1883–1931) about the industrial region of Bergslagen (*God's Orchid*, 1919).

The sense of confusion and anguish engendered by World War I was conveyed by P. Lagerkvist (1891–1974) in his collection of expressionist poems *Fear* (1916) and by B. Sjöberg (1885–1929). Under the influence of the October Revolution in Russia, revolutionary themes appeared in the poetry of E. Blomberg (1894–1965). A Swedish section of the international society Clarté, which promoted the spread of socialist ideas, was organized in 1924 by the poets Karin Boye (1900–41) and A. Ljungdal (1901–68). In 1929 a group of five poets—G. Sandgren (born 1904), H. Martinson (1904–78), A. Lundkvist (born 1906), J. Kjellgren (1907–48), and E. Asklund (born 1908)—published the poetic anthology *Five Youths*. The group championed nebulous socialist ideals and primitivism and indulged in a romantic celebration of the "machine age" and "free love." Albeit utopian, their convictions helped bring literature closer to life. Lundkvist's verse collection *Naked Life* (1929) evoked the modern city and the life of workers, and Kjellgren's novel *People and a Bridge* (1935) was imbued with the spirit of proletarian solidarity. A romanticism of the sea pervaded the poems of Martinson.

The social autobiographical novel flourished in the 1930's; the finest examples of this genre are *Flowering Nettle* (1935) and its sequel *The Way Out* (1936) by Martinson, the cycle of novels about Olof (1934–37) by E. Johnson (born 1900), and the Knut Toring trilogy (1935–39) by W. Moberg (1898–1973). A strong social consciousness marked the works of the *statare* school, a group of writers who described the poverty and social inequality of farm laborers. The leading writers of the school were Moa Martinson (1890–1964), J. Fridegård (1897–1968), and I. Lo-Johansson (born 1901). The cycle *The Misses von Pahlen* (1930–35) and other novels by Agnes von Krusenstjerna (1894–1940) portrayed the degeneration of the gentry in a naturalist manner. The novels of F. Nilsson-Piraten (1895–1972), notably *Bombi Bitt and I* (1932), and those of O. Hedberg (1899–1974) satirized bourgeois morality. A quest for new artistic means of expression is discernible in the prose of T. Aurell (1895–1976), W. Ljungqvist (1900–74), and T. Jonsson (1910–50). The poets H. Gullberg (1898–1961) and J. Edfeld (born 1904) continued the traditions of expressionism, and E. Taube (1890–1976) and N. Ferlin (1898–1961) developed the democratic traditions of the urban song. In the poetry of G. Ekelöf (1907–68) surrealistic motifs gave way to philosophical meditation.

A number of outstanding antifascist works were produced before and during World War II, among them the allegorical tale *The Hangman* (1933) by Lagerkvist, Johnson's novel *The Soldier's Return* (1940), the antiutopia *Kallocain* (1940) by Karin Boye, and Moberg's historical novel *Ride This Night!* (1941). In the immediate postwar years some Swedish writers, disillusioned

with bourgeois civilization, began to explore man's inner world. Their works show the influence of existentialism. An intense feeling of fear and guilt pervades the novel *Isle of the Damned* by S. Dagerman (1923–54) and the early lyrics of E. Lindegren (1910–68) and K. Vennberg (born 1910). Man's alienation in bourgeois society is the central theme of the works of S. Arnér (born 1909) and L. Ahlin (born 1915).

The moral conflicts of modern man are echoed in Lagerkvist's cycle of novels on biblical themes (*Barabbas*, 1950). Johnson dealt with important contemporary problems in his philosophical historical novels *Surf* (1946) and *The Age of His Greatness* (1960). Martinson's fantasy epic *Aniara* (1956) is a pessimistic antiutopian work. In his cycle of autobiographical novels, published between 1951 and 1960, Lo-Johansson painted a picture of Swedish life in the first third of the 20th century. Between 1949 and 1959, Moberg published a cycle of novels about the emigration of Swedish peasants to America in the middle of the 19th century. The traditions of the realistic novel were also continued in the 1940's and 1950's by Lundkvist, F. Fridell (born 1904), Å. Wassing (born 1919), and Sara Lidman (born 1923).

A central theme of the 1960's and 1970's was the polemic against the official thesis of the "universal welfare state." For Birgitta Trotzig (born 1929), material and spiritual poverty may be transcended through religion. Social and spiritual vices were exposed by L. Jörling (1931–66) and B. Runeborg (born 1937), by the satirists P. Rådström (1925–65) and P. C. Jersild (born 1935), and by the coauthors of detective novels with a social message P. Wahlöö (1926–75) and Maj Sjöwall (born 1935). The intellectual and analytical novels of P. O. Sundman (born 1922), L. Gyllenstein (born 1921), and P. O. Enquist (born 1930) were directed against moral and ideological stereotyping. The anti-imperialist and anticolonial movement engendered its own engagé literature, some of the finest examples of which are the anticolonial novels of Lidman (*I and My Son*, 1961) and B. Söderbergh (born 1925; *Stirrup*, 1961) and the political novel *Wool* (1973) by L. Gustafsson (born 1936).

Documentary literature reached a high level in the reportage of Lundkvist, the articles about South Africa by P. Wästberg (born 1933), Lidman's articles about Swedish miners and life in Vietnam, and the documentary novels of Enquist and S. Delblanc (born 1931). Works of epic proportions were produced by P. A. Fogelström (born 1917), the author of the novel cycle *City* (1960–68), and by Delblanc, who wrote a series of novels about the province of Södermanland (1970–76). Astrid Lindgren (born 1907) has become internationally famous for her children's books about Karlsson and Pippi Longstocking.

A group of writers, among them Ö. Fahlström (born 1928), emerged in the early 1960's to champion formalist "concrete" poetry. They were opposed by the "new simplicity" school of G. Palm (born 1931), Sonja Åkesson (born 1926), and B. Häkanson (born 1937), which sought to revive realistic poetry. The poets L. Södeberg (born 1931), Häkanson, and G. Sonnevi (born 1939) dealt with current political issues in their lyrics of the late 1960's and early 1970's.

The Swedish Union of Writers, founded in 1893, is the professional organization that protects the economic and intellectual interests of writers.

From the outset Swedish literary criticism has developed under the influence of Western European trends; in the 20th century American criticism has also been closely studied. The foundation of scholarly literary criticism was laid by the Romantics L. Hammarsköld (1785–1827), the author of *Swedish Literature* (1818–19), and Atterbom, both of whom applied aesthetic and psychological criteria in their analysis of literary works. The most influential 20th-century literary scholar was H. Schück, an adherent of the cultural history school whose work was based on a careful study of sources. Schück's method was developed by M. Lamm (1880–1950), F. Böök (1883–1961), and A. Nilsson (1878–1936). The critic V. Svanberg (born 1896) has affirmed the social roots and significance of literary works in his *Poetry and Politics* (1931) and other works. In the 1950's, G. Tideström (born 1906) emerged as the leading exponent of the New Criticism.

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A. A. MATSEVICH

Architecture and art

Among the oldest examples of prehistoric art in Sweden are the Bronze Age rock carvings in Bohuslän showing schematized figures of deities, hunting scenes, battles, and military campaigns. Archaeological excavations have also uncovered Bronze Age ornamented weapons and utensils. Artistic relics dating from the Iron Age (beginning in the sixth century B.C.) and from the first millennium A.D. include stone stelae, metal and wood objects richly decorated with interlace ornamentation in the "animal style," and representations of people and animals. The Vikings (late eighth to mid-11th centuries) left behind the remains of frame buildings and stelae depicting narrative scenes.

In the 11th and 12th centuries massive Romanesque stone churches were built at Sigtuna, Old Uppsala, Lund, and elsewhere. Gothic churches with graceful towers, best exemplified in the Storkyrka (Great Church) in Stockholm and the Cathedral of Uppsala, were constructed over the next three centuries. Renaissance influences were strongest in 16th-century castle architecture (Gripsholm, Vadstena, Kalmar). The Middle Ages saw the rise of towns with a dense network of narrow streets and the development of decorative painting and sculpture and miniature painting.

In the 17th century Swedish noblemen built baroque and classical urban palaces and country residences with parks, designed by the architects J. de la Vallée, N. Tessin the Elder, and N. Tessin the Younger. Native artists, of whom the most famous were J. Sylvius and D. Ehrenstrahl, worked alongside German, French, and Dutch masters. Classical architecture (C. F. Adelcrantz) and sculpture (J. T. Sergel) flourished in the 18th century, as did genre painting, both in the courtly manner of the rococo (N. Lafrensen) and in the bourgeois-didactic style (P. Hilleström). Realistic portraiture reached a high level in the work of A. Roslin, C. G. Pilo, the pastelist G. Lundberg, and the miniaturist P. A. Hall. New city districts were built on a grid pattern.

In 19th-century architecture classicism gave way to a ponderous eclecticism. Romanticism became the prevailing style in the visual arts in the first half of the century. A heightened interest in the country's past, its natural setting, and its people marked the paintings of N. Blommér, E. Lundgren, and M. Larsson and the sculpture of J. P. Molin. The development of realistic painting in the second half of the 19th and the early 20th centuries culminated in the joyous portraits and genre compositions of A. Zorn, the psychological portraits of E. Josephson, the everyday scenes of C. Wilhelmsson and C. Larsson, the landscapes of Prince Eugen, and the animal paintings of B. Liljefors. Official historical paintings were produced by G. Cederström.

In the 20th century a quest for new paths in architecture, stimulated by national romantic aspirations, was initiated by F. Boberg and C. Bergsten. A neoclassical style was evolved by the architects R. Östberg and I. Tengbom, and a school of modern architecture, blending functionalism with features akin to organic architecture, was founded by G. Asplund, S. Markelius,

and S. Backström. Swedish architects have made a major contribution to the development of satellite cities (Vällingby and Farsta near Stockholm, with their extensive system of commercial centers), well-planned, self-sufficient residential districts (microdistricts in Stockholm, Göteborg, and Malmö), and various types of high-rise apartment buildings.

Outstanding examples of 20th-century Swedish sculpture include the monumental-decorative works of C. Milles, B. Hjorth, and B. Marklund, who combined a realistic treatment of national life with romantic symbolism and fantasy. The fine paintings of S. Derkert, E. Jolin, and A. Amelin deal with important social themes. Another group of artists has produced highly colorful, often symbolic canvases: I. Aguéli, I. Grünewald, V. Nilsson, L. Engström, and E. Hallström. Technical excellence and keen observation distinguish the graphic art of P. von Schantz and L. Lindeberg. Swedish artists have also been attracted to various modernist currents, ranging from surrealism and abstract art (E. Nemes and T. Renquist) to pop art, conceptual art, and hyper-realism. The country's extremely rich folk art tradition includes wood architecture (churches, houses, farm buildings), weaving, pottery, the working of metal and leather, and carving on wood and bone.

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Music

Until the 19th century, Swedish music developed within the mainstream of Scandinavian musical culture. Long influenced by German and Norwegian music, it acquired distinctive national traits by the early 20th century. Folk songs and dances—both round dances with singing and couple dances—differ in the various counties. The oldest folk instruments are the *lur* (a shepherd's horn) and bells; later, village ensembles came to include violins, clarinets, flutes, and harps.

The bearers of musical culture down to the 13th century were the skalds; thereafter, until the early 16th century, their role was assumed by itinerant musicians called *lekare*, who played violins, pipes, and drums on city streets and at court. Folk ballads and antifeudal political songs appeared in the 14th and 15th centuries, and evangelical psalms became popular after the Reformation. The development of professional music was influenced by Gregorian chant, which spread to Sweden along with Christianity in the 11th century, and by the Protestant chorale, introduced at the time of the Reformation. The center of secular musical life was the royal court in Stockholm, where a court choir performed from 1526 and where several generations of the German Düben family served as musicians.

In the 18th century the court choir was headed by J. H. Roman (1729–37), one of the first professional Swedish composers (church choral music) and the organizer of the first public concerts in 1731 and by F. Uttini (from 1768), who wrote the first Swedish-language opera, *Thetis and Pelée* (1773), and who formed an opera company that evolved into the Swedish Royal Opera. The opera company performed at the Bollhus Theater from 1773 to 1776 and at the Drottningholm Palace near Stockholm from 1777 to 1782, when it acquired a permanent theater. (A new theater building was constructed in 1898.) The opera theater's early repertoire included works by the Swedish composer J. G. Naumann (*Gustavus Vasa*, 1786). In the early 19th century it presented the operas of F. A. Berwald, the greatest Swedish romantic composer and the first Swedish symphonist, as well as a fine violinist and conductor, and the comic operas of C. Stenborg. In the latter part of the century it gave fine performances of A. Hallén's operas.

Other important composers of the late 18th and early 19th centuries were G. J. Vogler and J. M. Kraus, who produced religious and secular works, and J. F. Palm, who wrote songs. The Royal Academy of Music was founded in Stockholm in 1771, initially as a concert organization. In the late 19th century it was designated a conservatory, and in 1940 it became the Academy of Music, renamed the State Academy of Music in 1971.

Under the influence of romanticism, national folk music drew increasing attention in the early 19th century. Folk songs were collected by E. Drake, J. B. Struve, and R. Dybeck, and the first anthologies were published between 1814 and 1816 by A. Afzelius, E. G. Geijer (also a composer), and A. I. Arwidsson. Several composers of the second half of the 19th century used folk melodies, notably A. F. Lindblad, the Swedish Schubert, who also wrote operas, symphonies, and instrumental chamber works. Folk influences are also apparent in I. Hallström's opera *The Bewitched* (1874) and in A. Hallén's operas, symphonic poems, and choral works. After 1850 musical life developed in Malmö, Norrköping, and Göteborg, where B. Smetana headed the municipal symphony orchestra from 1856 to 1861. Sweden produced a number of internationally known singers, among them Jenny Lind, nicknamed the Swedish Nightingale, C. Nilsson, E. Gulbranson, and J. Björling.

A national school of composition was founded in the first half of the 20th century by W. Peterson-Berger, who wrote Wagnerian music dramas, five symphonies, and vocal and instrumental pieces; W. Stenhammar, known for his instrumental chamber works, operas, and symphonies; H. Alfvén, who produced orchestral compositions (*Swedish Rhapsodies*) and choral works; and D. I. Wirén, noted for his symphonies, concerti, and music for the theater and cinema. The works of these composers have a nordic coloring typical of Scandinavian romanticism. Other distinguished musicians included the violinist, conductor, and composer T. Aulin, who founded a quartet, and the composers E. Sjögren (romances and other works), N. Berg, E. Kallstenius, and T. Rangström.

Several talented composers came to prominence in the 1930's and 1940's: K. M. Atterberg, who wrote operas, ballets, and symphonies; G. Nystroem, a composer of instrumental works who lived in Paris for many years; H. Rosenberg, many of whose works are performed outside of Sweden; and M. Pergament, who employed the serial technique. Another important new composer was K. B. Blomdahl, whose best-known work was the opera *Aniara*, staged in 1959. Among eminent composers of the 1950's were D. I. Wirén, L. E. Larsson, and E. von Koch. They were soon joined by the younger composers I. Lidholm, S. E. Bäck, and H. Eklund. A number of composers of the 1960's and 1970's were strongly influenced by the avant-garde movement. The Society for Contemporary Music (Samtida Musik) was founded in 1960, and electronic music studios were established in Stockholm (1964) and Malmö (1966). Experimental music has been written by A. Mellnäs, K. E. Welin, J. Bark, B. Nilsson, and J. Morthenson.

Sweden has ten professional symphony orchestras, the best known of which are the Swedish Radio Symphony, the Stockholm Philharmonic (directed by G. N. Rozhdestvenskii in 1974–76), and the Göteborg Symphony Orchestra. The leading choral groups are the Swedish Radio Choir and the Stockholm Chamber Choir. There are opera theaters in Stockholm (Swedish Royal Opera), Göteborg, and Malmö; musicals and operettas are performed at Oscar's Theater in Stockholm. The country's vigorous musical life owes much to the activity of the Concert Association in Stockholm (founded 1902), the Orchestra Association in Göteborg (1905), the Society of Swedish Composers (1918), the Choral Union (1925), and various amateur music organizations. Musical training is given at the State Academy of Music in Stockholm, the Conservatory in Malmö (1907), the Institute of Music in Göteborg (1932), and numerous music secondary schools. In 1963 a concert organization was founded to sponsor performances by soloists and chamber ensembles; prior to the 1960's, chamber music concerts were much less popular than performances of symphonic works.

Among the leading performing artists of the 1970's were the conductors S. Ehrling, S. Westerberg, and H. Blomstedt; the pianists H. Leygraf and S. Ericsson; the violinists L. Berlin and E. Wolf; the cellist E. Bløndahl-Bengtsson; and the singers N. Gedda, B. Nilsson, L. Andersson, E. Söderström, K. Meyer, and M. Hallin. The foremost musicologists are L. A. D. Fryklund and I. Bengtsson.

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Ballet

Ballet performances by French artists were regularly staged at the royal court in Stockholm from 1638. The first permanent company, directed by L. Gallodier, was created under the auspices of the Swedish Royal Opera, founded in 1773. Ballets were staged by the Danish ballet masters Antoine Bournonville and L. Delande, who worked in Sweden from 1785 and 1809, respectively. In 1843 the first Swedish ballet master, A. Selinder, acquainted Swedish audiences with F. Taglioni's romantic ballet *La Sylphide*, set to the music of J. Schneitzhöffer. Selinder also introduced Swedish folk dances into operatic productions. The most famous 18th-century ballerinas were G. Bassi and H. Hjortsberg; the mid-19th century produced the outstanding ballerina C. Norberg and the premier danseur C. Johansson, who worked primarily in Russia. Danish ballet greatly influenced the subsequent development of Swedish professional ballet, whose repertoire featured ballets choreographed by August Bournonville. Despite the appearance of such luminaries as the ballet master S. Lund and the ballerina H. Lund in the second half of the 19th century, Swedish ballet stagnated down to the second decade of the 20th century.

The arrival of M. M. Fokine in 1913 gave impetus to a resurgence of the ballet; among Fokine's most popular productions were *Cleopatra*, based on the music of A. S. Arenskii with inserted numbers by other composers, and *Les Sylphides*, based on the music of F. Chopin. The Swedish Ballet, established in the 1920's, gave performances in Paris from 1920 to 1925. Many of its productions were choreographed by J. Börlin, who favored ballets by French composers (D. Milhaud, E. Satie) and stage designs by French artists (F. Léger). Börlin also produced several ballets by Swedish composers, including H. Alfvén's *St. John's Eve*, which incorporates Swedish folklore. The leading dancers of this period were C. Ari and J. Hasselquist. In the 1930's Swedish ballet was strongly influenced by expressionist dance, popularized by J. Algo.

In the 1940's and 1950's the ballet company of the Royal Opera revived a number of classical ballets, among them P. I. Tchaikovsky's *The Sleeping Beauty*, staged by the Finnish choreographer G. Gé (Grönfeldt) during World War II and by the English choreographer M. Skeaping from 1953. At the same time, Swedish choreographers continued to use modern dance extensively, as evidenced by I. Cramér's staging of A. Granström's *The Girl Who Trampled Bread* (1945), S. S. Prokofiev's *The Prodigal Son* (1958), *The Water Sprite*, based on the music of R. Lundsten (1973), and *Peter and the Wolf*, based on the music of Prokofiev (1976). Since 1967, Cramér has headed the Cramér Ballet, whose productions are largely inspired by folklore.

The choreographer B. Cullberg is known for her productions of *Miss Julie* by T. Rangström (1950), *Adam and Eve* by H. Rosenberg (1967), and *Revolt*, based on the music of B. Bartók (1973)—ballets performed at the Swedish Royal Opera, by the Cullberg Ballet (founded 1967), and on television. B. Äkesson has mounted fine productions of *Sisyphus* by K. B. Blomdahl (1957), *Icarus* by S. E. Bäck (1963), and *Nausikaa Alone* by I. Lidholm (1966). The repertoire of the Swedish Royal Opera has also included productions by a number of foreign choreographers who worked there in the 1960's, notably A. Tudor, B. MacDonald, J. Limón, and J. Cranko. There are permanent companies in Göteborg (director, E. M. von Rosen) and Malmö (director, C. Borg).

The leading dancers of the 1940's and 1950's were B. Appelgren, E. Rasch, G. Lindgren, T. Rhodin, J. Mengarelli, and his brother M. Mengarelli; of the 1950's and 1960's, von Rosen, M. Orlando, G. Anderson, C. Selling, and W. Sandberg; and of the 1960's and 1970's, Y. Brosset, M. Lang, K. Lidström, B. Skold, N. Håggbom, V. Klavsen, P. A. Segerström, N. Winqvist, and J. Kåge.

The magazine *Dans* has been published in Stockholm since late 1973. E. IA. SURITS

Theater

School theaters flourished in Sweden in the 15th and 16th centuries, and theatrical performances were given in the royal castles from the late 16th century. The first court theater, which opened in Stockholm in 1649, relied on foreign companies—Italian opera and commedia dell'arte troupes and German and French troupes—down to the early 19th century. The French troupes, in particular, greatly influenced theatrical life in Sweden, molding its taste to conform to the canons of the French classical theater. The first permanent national theater was the Uppsala Student Theater, which existed from 1682 to 1691. The Royal Swedish Theater was founded in 1737 by an amateur company of young noblemen and civil servants; from 1753 the amateur company was largely displaced by French and Italian troupes. The first public theaters were founded under Gustavus III, first in Göteborg in 1779 and then in Stockholm, where the Swedish Royal Dramatic Theater opened in 1788. Down to the 1870's the stage was dominated by French musical comedy and by the pseudohistorical tragedies of A. von Kotzebue and his imitators, acted in a heavy declamatory style.

The social, economic, and cultural upsurge of the 1870's brought the "new drama," including the plays of H. Ibsen and B. Bjørnson, to the stage of private and state theaters. The ascendancy of realism was assured by A. Strindberg, the great playwright and theoretician of the theater. Although many of Strindberg's historical dramas gained a firm place in the repertoire of European theaters, the majority of his boldly innovative works did not achieve recognition on the national stage. In 1907, Strindberg and the director A. Falck opened the Intima Theater in Stockholm, which staged most of his plays before it closed in 1910. The tours of the German Chamber Theater, M. Reinhardt's production of Strindberg's *A Dream Play* (1921) on the stage of the Royal Dramatic Theater, and the tours of the Moscow Art Theater in 1921–22 had a profound impact on Swedish directors and performers. The principles of psychological realism were firmly established on the Swedish stage in the first quarter of the century through the brilliant performances of N. Personne, H. Bosse, T. Teje, V. Sjöström, E. Hillberg, I. Hedqvist, and A. de Wahl. Another master of characterization was J. Ekman. The foremost director of the first half of the 20th century was O. Molander. Two eminent men of the modern Swedish theater, A. Sjöberg and I. Bergman, began their careers in the 1930's and 1940's, respectively.

During World War II, the Royal Dramatic Theater showed a lack of principle in staging predominantly light plays of entertainment. At this time, only the City Theater of Göteborg, under the direction of T. Hammarén, openly opposed Nazism, staging such antiwar plays as Ahlström's *Readiness* (1941), Moberg's *Ride This Night!* (1942), and Munk's *Niels Ebbesen* (1944). One of the most powerful condemnations of fascism was Bergman's production of A. Camus's *Caligula* in 1946. In the 1950's a number of private theaters sought to popularize the "theater of the absurd." But in the state-supported theaters preference was given to the classics and to plays by foreign playwrights, notably J.-P. Sartre, J. Anouilh, A. Miller, T. Williams, and J. Osborne. Swedish theaters gave fine performances of the plays of A. P. Chekhov, L. N. Tolstoy, N. Gogol, M. Gorky, V. V. Mayakovsky, and V. P. Kataev.

A heightened political awareness marked the Swedish theater of the 1960's, when B. Brecht's works were among those most frequently performed. Another new development was the creation of theater groups—communities of actors, directors, and playwrights who staged plays that reflected their common political and artistic views. Such groups generally arose within theaters, for example, in connection with the staging of *They*, a play about the Vietnam war, by the Royal Dramatic Theater in 1967. Some of the groups evolved into "free theaters," which proliferated rapidly in the late 1960's and 1970's. The productions of these theaters tend to be highly political and frequently take the form of revues incorporating music, singing, and pantomime. The entire company participates in writing the script. The best-known group of this kind is the traveling Stockholm Free Professional Theater, which champions the economic and political demands of the working class.

Outstanding performers of the contemporary Swedish theater include I. Tidblad (died 1975), E. Josephson, G. Wållgren, A. Ek, E. Adolphson, E. Dahlbeck, G. Rydeberg, H. Löw-

enadler, T. Pawlo, S. Ruud, U. Palme, K. Kavli, J. Kulle, A. Tretow, S. Fürst, and P. Oscarsson.

In addition to the Royal Dramatic Theater and the City Theater, Stockholm has several private theaters. There are drama theaters in Göteborg, Malmö, and other cities. The state-supported Riksteater was formed to tour the smaller towns; each year it gives as many as 700 performances in more than 100 population centers.

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O. V. GARIBOVA

Circus. Itinerant circuses, such as those directed by Orlando, the Miares brothers, and B. Schreiber, regularly toured Sweden. The founder of a remarkable circus dynasty was G. L. Housske, whose wife, the trick rider Rénee Léonard, headed the Stockholm Circus in the 1860's. Among the larger circuses of the 1920's were the Scott Circus, directed by Kate Bronett, and the Skala Circus, headed by Harry and Helén Johansson. In the 1940's and 1950's the Trolle Rodin Circus combined traditional circus acts with variety shows.
A. IA. SHNEER

Motion pictures

Sweden's first documentary, consisting of short sequences, was made by the German cinematographer M. Skladanowsky. In 1897 several documentary and entertainment shorts were produced by the Swede N. Peterson. Regular film production began in 1907. The classical film school that flourished between 1910 and 1930 substantially influenced world cinematography through such fine films as V. Sjöström's *Strike* (1914), *Terje Vigen* (1916, after H. Ibsen), and *The Sons of Ingmar* (1918, after S. Lagerlöf) and M. Stiller's *When Love Kills* (1913) and *Song of the Scarlet Flower* (1918). In the 1930's the film output was largely restricted to salon melodramas and comedies, best represented by G. Molander's *On the Sunny Side* (1935) and *One Single Night* (1939).

Films denouncing fascism were produced in the 1940's; among the most memorable were Molander's *There Burned a Flame* (1943), H. Ekman's *His Excellency* (1944), and A. Sjöberg's *The Royal Hunt* (1943). The first of H. Faustman's films about the working class, affirming proletarian solidarity, appeared in the late 1940's (*Foreign Harbor*, 1948; *Night Journey*, 1955). Several protest films made by young directors attacked the petit bourgeois ideals that dominated society. Among the best of these films were Sjöberg's *Miss Julie* (1951, after A. Strindberg) and A. Mattsson's *One Summer of Happiness* (1951). The great director I. Bergman won international acclaim for his brilliant portrayal of the tragic contradictions, spiritual emptiness, and inhumanity of capitalist society in such films as *The Naked Night* (1953), *Wild Strawberries* (1957), *The Face* (1958), *The Silence* (1963), *Persona* (1966), *Cries and Whispers* (1972), and *Face to Face* (1976). In 1977 he filmed the anti-Nazi *Serpent's Egg* in Munich.

In the 1960's and 1970's a group of young directors emerged whose films dealt with vital social and economic issues. B. Widerberg dealt with the plight of workers in *Raven's End* (1965), *Ådalen 31* (1969), and *Joe Hill* (1971), and J. Troell showed the fate of the peasantry in *Here Is Your Life* (1967), *The Emigrants* (1970), and *The New Land* (1972), the last two based on novels by V. Moberg. Problems confronting young people are explored in J. Halldoff's *Ola and Julia* (1967) and *A Dream of Freedom* (1969), Widerberg's *Elvira Madigan* (1967), and R. Andersson's *A Love Story* (1970). Swedish children's films have become famous throughout the world; among the finest are O. Hellbom's series of films based on A. Lindgren's books about Pippi (1968–71) and *Karlsson on-the-Roof* (1974). Concurrently, a number of directors have been substituting frankly naturalistic depictions of sexual relations for an exposure of the causes of the spiritual degeneration of Swedish society. This approach is characteristic of V. Sjöman (*I Am Curious*, 1967–8), T. Wickman, B. Forslund, and B. Torn.

The leading film stars are B. Andersson, H. Andersson, I. Thulin, L. Ullmann, M. von Sydow, and G. Björnstrand. A joint Soviet-Swedish film *Man From the Other Side*, was issued in 1971. Although about 15–20 feature films are released each year, film distribution is dominated by American pictures filled with violence and brutality. Attendance at movie theaters has declined sharply, and the number of theaters has dropped accordingly from about 2,500 in the mid-1950's to 1,200 in the second half of the 1970's. The Swedish Film Institute, established in 1963, has operated a film school since 1965. Eminent film critics and theoreticians include B. Idestam-Almquist, R. Waldekrantz, L. Bergström, and H. Schein. The leading film magazines are *Chaplin* (since 1959) and *Film och bio* (since 1967).

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G. S. PAPOVIAN [29–1000–3]

SWEDES, the main inhabitants of Sweden, accounting for about 96 percent of the population and numbering 7.9 million persons in 1975 (estimate). They speak Swedish and profess Lutheranism. More than a million Swedes, descendants of immigrants, live in the USA and Canada, and about 370,000 reside in Finland. Small numbers of Swedes are also found in other countries.

The Swedish nationality evolved during the formation of the early medieval Swedish kingdom between the ninth and 11th centuries—the Viking age—through the unification of the northern Germanic tribes, principally the Svear and Götar, who inhabited Scandinavia in the first millennium A.D. The Finns and Lapps also played a definite role in the ethnogenesis of the Swedes. The struggle of the Swedes against German and Danish domination in the Middle Ages, the wars for supremacy on the Baltic, the rapid growth of the country's economy and trade, and the formation of a national market promoted the emergence of capitalist relations and the amalgamation of the Swedes into a modern nation in the 17th and 18th centuries.

Today, most Swedes are employed in industry; only 6 percent of the population is engaged in agriculture. Traditional occupations are still followed, namely, the production of agricultural equipment and fishing nets, pottery, coopering, and the artistic working of wood, leather, and bone. Popular handicrafts include spinning and weaving, lace-making, and fur dressing. The old dwellings and clothing have been preserved in the folk culture. Swedish folklore includes tales, legends, and ballads.

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M. N. MOROZOVA [29–936–1]

SWEDISH, the language of the Swedes; the official language of Sweden and one of the two official languages of Finland. According to a 1975 estimate, Swedish is spoken in Sweden, Finland, the USA, and Canada by 10 million people. It belongs to the Scandinavian group of the Germanic languages.

Swedish, which emerged as an independent language from the Common Scandinavian parent language between the ninth and 11th centuries, has six dialect groups: the South Swedish dialects of the Skåne region, the Göta dialects of southwestern Sweden, the Svea dialects of central Sweden, the Norrland dialects of northern Sweden, the East Swedish dialects of the eastern coast of the Gulf of Bothnia, and the Gutnish (Gotlandish) dialect of the island of Gotland. The modern literary language evolved in the 16th and 17th centuries as a result of a complex interaction of several dialects (the Svea dialects playing a major role) with the Old Swedish written language, which had developed in the 14th century from the Göta dialects.

In Swedish, sounds are distinguished as short or long; there are no diphthongs. Other phonological features include a musical word accent and a phonemic balance within syllables. Nouns, which are divided into six classes, are marked for gender (common or neuter), number (singular or plural), and case (common or genitive). The definite article may be added, in the form of a suffix, to the noun. Verbs, which are generally not inflected for

person and number, fall into four conjugational paradigms. The verb system includes several forms of the infinitive and an uninflected form—the supine.

The earliest written texts in Swedish are runic inscriptions on stone and date from the ninth to the early 12th century. The oldest surviving manuscripts are a fragment from the legal code known as the *Västgötalagen* (The Law of West Gotland; mid-13th century), a manuscript of the code (1280), and 14th-century legal, religious, and poetic texts. The Swedish writing system uses the Latin alphabet with four additional letters. In Swedish, the spelling of a word is not a precise guide to its pronunciation.

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G. I. ANDREEVA [29–934–1]

SWEDISH-DANISH WAR OF 1813–14, a war waged by Sweden against Denmark to compel it to relinquish Norway, which had been ruled by the Danish monarchy since the late 14th century. By joining the anti-Napoleonic coalition in 1813, Sweden gained the support of Russia, Prussia, and Great Britain. On Nov. 28, 1813, the Swedish Army (60,000 strong including Russian and Prussian units) under G. B. Bernadotte entered Denmark, an ally of Napoleon I, from the south. On December 7, during the battle of Bornhöved, south of Kiel, the Swedish cavalry forced the Danish Army, numbering only 10,000 men, to retreat. Denmark was unable to offer resistance on the sea, which was controlled by the British Navy. After suffering a series of defeats, Denmark signed the Treaty of Kiel with Sweden on Jan. 14, 1814, ceding Norway to the Swedish crown.

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SWEDISH-NORWEGIAN UNION OF 1814–1905, the legal merger of the Swedish and Norwegian states on the basis of an actual union. Sweden imposed the union on Norway by force of arms. The union went into effect on Nov. 4, 1814, with the election of the Swedish king Charles XIII as king of Norway.

The relations between the parties in the union were regulated by the Riksakt (Act of State) adopted by the parliaments of both countries on Aug. 6, 1815. Sweden and Norway had a common foreign office, but each country retained its own laws, administration, courts, and church. The Norwegian Army, all of whose officers were Norwegians, was under the command of the king but could not be used outside Norway without the approval of the Norwegian Storting. A law passed by three convocations of the Storting went into force despite the king's veto. The king appointed the members of the Norwegian government on recommendation from the Storting, which also retained the right to manage the country's finances and to grant Norwegian citizenship.

The Storting became the focal point of Norwegian resistance to the union. Russian and British support for Norway was another factor promoting the annulment of the union. On June 7, 1905, the Storting passed a resolution abolishing the union. In a plebiscite held in Norway on Aug. 13, 1905, about 369,000 persons voted to sever the union and 184 to preserve it. The union was formally dissolved that year by the Karlstad Treaty, concluded between Sweden and Norway.

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SWEDISH-NORWEGIAN WAR OF 1814, a war waged by Sweden against Norway to compel it to acknowledge the Swedish-Danish treaty of Jan. 14, 1814. Naval operations began on July 28, and on July 30 (or July 26, according to some sources) 45,000 Swedish troops under G. B. Bernadotte invaded southeastern Norway. The Norwegian army of 33,000 men retreated fighting beyond the Glomma River. On August 14 an armistice and the Moss Convention were concluded, establishing the conditions for Norwegian recognition of the union with Sweden. Confirmation of the convention by the Norwegian Storting on Oct. 20, 1814, officially ended the war.

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SWEDISH ROYAL DRAMATIC THEATER, opened May 17, 1788, in Stockholm. Until the 1870's the theater cultivated a declamatory acting style and staged chiefly tragedies by A. von Kotzebue, bourgeois plays, and French vaudevilles. In the 1870's the works of B. Bjørnson and H. Ibsen were introduced into the repertoire, but A. Strindberg's plays were initially banned from the state-supported theater. The staging of Strindberg's *Master Olof* in 1908 was followed by the presentation of plays by B. Shaw, P. Lagerkvist, A. Schnitzler, and H. Bergman. From 1933 to 1938 the theater was headed by the director O. Molander, who fostered the intellectual, psychologically subtle style of acting that distinguishes the theater to this day.

In the 1940's and 1950's, under the direction of A. Sjöberg, the theater staged plays by Shakespeare, F. García Lorca, and Strindberg (*Miss Julie*, 1949). Its company has included the distinguished players G. Broström, A. Björk, I. Thulin, M. Krook, U. Palme, and M. von Sydow. From 1963 to 1966 the theater was headed by the director I. Bergman, who mounted fine productions of Albee's *Who's Afraid of Virginia Wolf?* (1963) and Ibsen's *Hedda Gabler* (1964). The actor E. Josephson was appointed principal director and manager in 1966. Outstanding productions of the 1970's include Strindberg's *The Ghost Sonata* (1973) and *To Damascus* (1974), Erdman's *The Mandate* (1974), Chekhov's *Uncle Vanya* (1974), and Sternheim's *The Burgher Schippel* (1976).
O. V. GARIBOVA [29–933–3]

SWEET CHERRY (*Cerasus avium*), a deciduous tree of the family Rosaceae. The crown is ovate with sparse branches. The trunk measures 50–60 cm across and reaches a height of 35 m. The long petioled leaves are ovate, obovate, or elliptical; their margins are deeply double-serrate. The large flowers are initially white but turn pink toward the end of blossoming. The stipules are reddish. The fruit is a dark red drupe.

The sweet cherry is distributed in Central and Southern Europe and in Iran. In the USSR it is found in the Caucasus, the Crimea, the southwestern Ukraine, and Moldavia. The sweet cherry occurs as a solitary tree principally in mixed broad-leaved and coniferous–broad-leaved forests.

The cultivated form of sweet cherry is raised for its drupaceous fruit. The trees are long-lived (100 or more years). They are shade-tolerant but not very winter-hardy. Fruiting begins in the seventh or eighth year. The juicy fruits, which are pink, red, yellow, or almost black, mature from late May to early September. They contain 7–15 percent sugars (glucose, fructose, and sucrose) and 0.36–1.1 percent acids (malic and others); vitamin C is present. The fruits are eaten fresh or processed into compote, jam, candied peel, juice or wine. Freezing is also possible. The kernel of the stone contains as much as 30 percent oil, which is used in perfumery.

The sweet cherry is a nectar-bearer. Its wood is used in carpentry and in the manufacture of musical instruments. The tree is raised in Europe, as well as in Turkey, Iran, Afghanistan, China, and Japan. In the USSR it is most widely cultivated in the Crimea, the Caucasus, the southern Ukraine, and Middle Asia; it is also grown in Latvia and Kaliningrad Oblast. The best varieties are Deiber Black, Drogan Yellow, Gedelfinger, Franz Josef (Francis), Napoleon Pink, and Early Kassena.

The sweet cherry is propagated mainly by grafts on stocks of

wild sweet cherry in the southern zone and Mahaleb cherry in more northerly regions. The feeding area of sweet cherry is 8 × 6 m. The best crown shape for cultivated trees is circled. Care entails loosening the soil, the application of organic and mineral fertilizers, watering, and pruning. The interrow areas are usually kept fallow.

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[29–219–3]

SWISS, a general term designating the principal nationalities of Switzerland, who have merged into a single nation (*natsiia*, nation in the historical sense) as a result of prolonged existence in a unified state, the development of economic, political, and cultural ties, and the widespread practice of bilingualism and trilingualism. [29–995–3]

SWISS ALPS, the ranges and massifs of the Alps that lie within Switzerland. The Swiss Alps include all or part of the Bernese, Glarus, Pennine, Lepontine, and Rhaetian Alps. [29–990–2]

SWISS CAMPAIGN OF SUVOROV (1799), the movement of Russian troops commanded by Field Marshal A. V. Suvorov from Italy across the Alps to Switzerland between Sept. 10 (21) and Sept. 27 (Oct. 8), 1799, during the War of the Second Coalition (Great Britain, Austria, Russia, Turkey, the Kingdom of the Two Sicilies, and others) against France.

Almost all of Italy was liberated from French troops as a result of Suvorov's Italian campaign [*see* ITALIAN CAMPAIGN OF SUVOROV (1799)] and Ushakov's Mediterranean campaign [*see* MEDITERRANEAN CAMPAIGN OF USHAKOV (1798–1800)]. The French Army under General J. V. Moreau, defeated at Novi, retreated toward Genoa. Only the forts of Tortona and Coni remained in French hands in northern Italy. Suvorov laid siege to Tortona. By this time, the Anglo-Austrian leadership of the coalition had developed a new plan for military operations. As early as July 1799, the British cabinet suggested to Emperor Paul I that a joint Anglo-Russian expedition be sent to Holland, thus altering the entire plan of the war. After changes were made by the Austrian command, the following plan was adopted. The Austrian Army under the command of Archduke Charles would march from Switzerland to the Rhine, lay siege to Mainz, occupy Belgium, and establish contact with the Anglo-Russian corps in Holland. At the same time, the Russian forces commanded by Suvorov would march from Italy to Switzerland, where they would meet the Russian corps of General A. M. Rimskii-Korsakov and the corps of *émigré* Frenchmen of Prince L.-J. Condé, after which all these forces, under the command of Suvorov, would invade France through Franche Comté. The Austrian army under Field Marshal M. von Melas was to advance on Savoy from Italy.

The plan adopted served the expansionist interests of Great Britain and Austria. Great Britain sought to gain control of the Dutch fleet and thus gain supremacy at sea; Austria wanted to get Russian troops out of Italian territory and strengthen its own domination in Italy.

Paul I agreed to the plan with the condition that the Austrian forces would clear French troops from Switzerland before the Russian troops arrived. Suvorov received the order from the Austrian emperor Francis to cross into Switzerland on August 16 (27), but he did not hasten to carry it out because he believed it was first necessary to take the French forts in Italy. Meanwhile, despite its promises to Paul I, the Austrian command began withdrawing the army of Archduke Charles from Switzerland, which left the Russian corps of Rimskii-Korsakov, which had arrived in the Zürich area, under attack by the French Army under General A. Masséna. Despite Suvorov's vigorous protests, Archduke Charles agreed to leave only 22,000 men in Switzerland, under the general command of General F. Hötze. On August 31 (September 11) immediately after Tortona's surrender, Suvorov's forces, totaling 21,000, marched north, from Alessandria and Rivalta. Suvorov sent the field artillery and supply trains through Austria, taking with him only 25 mountain guns.

By early September, the forces of the allies were deployed in Switzerland in the following primary groupings: Rimskii-Korsakov's corps (24,000 men) on the Limmat River, near Zürich; Hötze's detachment (10,500) along Lakes Zürich and Wallenstadt and on the Linth River; F. Jelačić's detachment (5,000) near Sargans; Linken's detachment (4,000) near Ilanz; and Auffenberg's detachment (2,500) at Disentis. The Austrian detachments of G. Strauch, W. L. Rogan, and K. Hadik, numbering about 11,500 men, were situated on the southern approaches to Switzerland. General Masséna's main forces, totaling 38,000 men, were deployed opposite Rimskii-Korsakov's corps. N. Soult's division and G. J. Molitor's brigade, numbering 15,000 men, were opposed by Hötze's detachment, C. J. Lecourbe's division, with 11,800 men, was deployed in the Rhine River valley at the St. Gotthard Pass, while L. M. Turreau's detachment, totaling 9,600, stood west of Lake Maggiore, opposite Rogan's detachment. Thus, the French forces outnumbered the coalition forces and occupied advantageous positions.

To join up with Rimskii-Korsakov, Suvorov chose the shortest but also the most difficult route, across the St. Gotthard Pass, which was occupied by the enemy. He set September 8 (19) for the attack on the pass. Simultaneously with the attack on St. Gotthard by Suvorov, the troops of Rimskii-Korsakov and Hötze, supported by the Austrian detachments of Strauch and Auffenberg, were to pass to the offensive on the Limmat and Linth rivers.

Suvorov arrived in Taverne on September 4 (15) but found neither the supplies nor the pack mules that the Austrian commissariat promised to have ready. Five days were lost assembling pack animals and supplies. On September 10 (21), the Russian troops approached St. Gotthard, which was occupied by Lecourbe's French detachment, numbering 8,500 men. Suvorov directed General A. G. Rozenberg's column to circumvent the pass from the right through Disentis to reach the enemy rear at Devil's Bridge, while he himself attacked the pass with the main forces on September 13 (24). Two attacks were driven back, but during the third attack, the detachment led by General P. I. Bagration reached the rear French positions, forcing the enemy to withdraw. On September 14 (25), the French tried to stop the Russian troops at the Urnerloch tunnel and at Devil's Bridge, but they were enveloped from the flanks and withdrew.

Suvorov's troops arrived in Altdorf on September 15 (26), only to learn that there was no road from there to Schwyz (the Austrian command had not informed Suvorov of this) and that the ships needed to cross the Lake of Luzern had been seized by the enemy. Suvorov decided to cross the Rosstock Range and travel down the Muota River valley to Schwyz. The Russian troops completed the difficult 18-km march to the Muota River valley in two days, but there they received the news that Rimskii-Korsakov and Hötze had been defeated on September 15 (26) in the battle of Zürich and on the Linth River. The Austrian detachments of Jelačić and Linken had retreated, and Schwyz had been seized by the French. Suvorov's forces were trapped in the Muota valley without food and with little ammunition.

At a war council held on September 18 (29), it was decided to break through to Glarus. Bagration's advance party drove back Molitor's brigade and opened the way to Glarus. On September 19–20 (September 30–October 1), Rozenberg's rear guard waged a desperate battle against Masséna's detachment, numbering 10,000, and repulsed all attacks, driving the enemy back to Schwyz and taking 1,200 prisoners. On September 23 (October 4), the rear guard joined the main forces in Glarus. However, there were no Austrian troops in Glarus, since Linken's detachment had already left. Auffenberg's detachment also separated from Suvorov and left the area. To save his troops, Suvorov decided to withdraw to Ilanz. After a very difficult passage over the Ringenkopf (Panixer) Range, the Russian forces reached Ilanz on September 26 (October 7), and by September 27 (October 8) they were in the vicinity of Chur. From there they withdrew to winter quarters at Augsburg.

Suvorov's Swiss campaign failed to achieve its objective because of the essentially treacherous actions of the Austrian command, the defeat of Rimskii-Korsakov's troops, the failure of the Anglo-Russian expedition in Holland, and the extreme exhaustion of Suvorov's forces and large losses (more than 4,000 killed

and wounded). Nonetheless, the Russian Army accomplished an extremely difficult, historically unprecedented mountain march, drove back the attacks of superior enemy forces, escaped from encirclement, and even took 1,400 prisoners. The events in Switzerland exposed Austria's two-faced policy with respect to Paul I, and consequently, on October 11 (22), Paul broke off relations with Austria and ordered Suvorov to return to Russia with his army.

Suvorov's Swiss campaign showed the courage, endurance, and heroism of Russian soldiers and Suvorov's skill as a military leader. F. Engels called this march "the most outstanding crossing of the Alps accomplished to that time" (K. Marx and F. Engels, *Soch.*, 2nd ed., vol. 13, p. 243). Suvorov set an example of how to conduct military operations in the mountains under unfavorable conditions and demonstrated procedures for capturing mountain summits and passes by combining frontal attacks with envelopment, thus making a valuable contribution to the theory of the art of war.

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A. N. KOCHETKOV [29–991–2]

SWISS JURA, the part of the Jura Mountains situated in Switzerland. The range extends approximately 200 km, with elevations to 1,679 m (Mont Tendre). [29–990–1]

SWISS LABOR PARTY (SLP; Parti Suisse du Travail; Partei der Arbeit der Schweiz; Partito Svizzero del Lavoro), a political party established by a constituent congress held in Zürich on Oct. 14 and 15, 1944; successor to the Communist Party of Switzerland. The SLP united primarily members of the Communist Party of Switzerland and the Swiss Socialist Federation. The congress declared the thoeretical foundation of the party to be scientific socialism: Marxism-Leninism. The party took its place at the vanguard of the struggle to defend the interests of working people. The Fourth Congress of the SLP in 1949 ratified the first party bylaws.

During the years of the cold war, the SLP was in effect a semilegal organization in several cantons, and party members were prohibited, under an occupational blacklist (*Berufsverbot*), from occupying government posts. Led by such figures as E. Woog and J. Vincent, the party waged a struggle against right and left opportunist deviations in its ranks. In the late 1950's the party overcame its difficulties, and its influence in the working-class movement increased. The National Conference of the SLP in 1971 ratified new bylaws based on the principles of democratic centralism, as well as a program which had been adopted in 1959.

The program declares the party's principal objective to be the construction of a socialist, and eventually communist, society in Switzerland. The transition to socialism in Switzerland can be achieved by peaceful means as a result of a broad national movement, and the working class will be the decisive force in accomplishing this goal. The SLP has called for the united action of "all the forces of peace and labor, which are, in any way, the victims of exploitation and domination by big capital." At the same time the SLP declares the socialism in Switzerland to be "pluralistic."

The Tenth Congress of the SLP (June 1974) and particularly the Eleventh Congress of the SLP (May 1978) have marked a major step in consolidating the Marxist-Leninist international stand of the party. The Eleventh Congress confirmed the party's loyalty to Marxism-Leninism and declared its goal to be large-scale cooperation with all political forces that struggle against the policies of monopolies and the government and for radical transformations in the country's economic and political system. The party's principal aims will be to increase its influence on the broad masses, improve the living conditions of the working people, and protect the democratic rights of the workers. The congress has stressed the necessity for further organizational and ideological consolidation of the party's ranks and deeper fraternal ties with communist and workers' parties.

The practical activity of the party is concentrated on the basic socioeconomic demands of the working people: a better social insurance system, higher wages and salaries, higher pensions at a lower pension age, the construction of housing for working people, legally guaranteed three-week holidays, a reduction in military expenses, and the preservation of democratic rights. Much attention is paid to coordinating the activities of the Swiss working people with the foreign workers, who constitute a considerable part of the country's working force. The SLP is the only party that fights for real rights for foreign workers.

Table 1. Congresses of the Swiss Labor Party

Congress	*Place*	*Date*
Constituent	Zürich	Oct. 14–15, 1944
Second	Geneva	Oct. 6–7, 1945
Third	Zürich	Nov. 30–Dec. 1, 1946
Fourth	Basel	June 4–6, 1949
Fifth	Geneva	May 31–June 2, 1952
Sixth	Geneva	May 28–30, 1955
Seventh	Geneva	May 16–18, 1959
Eighth	Geneva	May 16–18, 1964
Ninth	La Chaux-de-Fonds	Nov. 1–3, 1968
Tenth	Basel	June 1–3, 1974
Eleventh	Geneva	May 13–15, 1978

In foreign policy the SLP concentrated its attention on the struggle for peace, for a genuine Swiss neutrality, and for the development of political, economic, and cultural ties with socialist countries; it also opposed the arms race.

In the 1979 parliamentary elections the party entered candidates in only one-third of the country's cantons; it received 2.1 percent of the vote and gained three seats out of 200 in the National Council. In the 1975 elections the party won four seats.

Delegations of the SLP have taken part in the international conferences of Communist and workers' parties in 1957, 1960, and 1969 in Moscow and the Conference of European Communist and Workers' Parties held in Berlin in 1976. The party approved the documents adopted by these conferences.

In accordance with its bylaws, the SLP is organized on a territorial-production basis. The territorial or production units are united in local sections, which are united in cantonal sections. The highest body is the party congress. Between congresses, the highest body is the Central Committee, which elects the Politburo, Secretariat, and general secretary of the SLP. A. Magnin became general secretary of the party in May 1978. In the same year J. Vincent was named honorary chairman. The party publishes the weeklies *Voix ouvrière*, *Vorwärts*, and *Il lavoratore*. (See Table 1 for Congresses of the SLP.)

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D. Z. IAKUKHIN [29–989–2]

SWISS NATIONAL BANK (Banque Nationale Suisse), Switzerland's central bank and sole bank of issue. Established in Zürich in 1905, the bank is a joint-stock company, with 58 percent of its shares held by the cantons, cantonal banks, and other state institutions and 42 percent by private shareholders.

The Swiss National Bank issues bank notes, regulates the supply of money and credit, and organizes the operations of payment. In the 1970's, when the currency crisis became acute and foreign capital poured into Switzerland, the Federal Council adopted decrees to protect the currency (October 1971 and June 1974) and to regulate domestic credit (December 1972).

In accordance with the two decrees on currency, the Swiss National Bank canceled the payment of interest on foreign deposits in Swiss banks and introduced a system by which interest may be charged, rather than paid, on such deposits; among other mea-

sures, the bank imposed restrictions on the sale of Swiss francs for future delivery. The decree on domestic credit authorized the imposition of mandatory minimum bank reserves in the Swiss National Bank. As of 1954 bank notes were no longer redeemable for gold, although a 40 percent gold cover of bank notes in circulation was maintained; in June 1977 the actual gold cover was 62 percent.

As of June 1977 the Swiss National Bank had total assets of 35 billion Swiss francs, with 19.1 billlion francs' worth of bank notes in circulation. Banks and companies had accounts in the bank totaling 10.8 billion francs, and capital and reserves totaled 70 million francs. The bank held 27.4 billion francs in gold and foreign currency and 4.6 billion francs in foreign treasury notes.

E. D. ZOLOTARENKO [29–991–1]

SWISS PLATEAU (also Mittelland), a plateau in Switzerland, between the Alps and the Jura. The Swiss Plateau extends 240 km, from Lake Geneva to Bodensee (Lake Constance), and is approximately 50 km wide. Elevations decrease from 1,000–1,200 m (maximum elevation, 1,408 m at Mount Napf) in the southeast to 400–500 m in the northwest. The plateau has a hilly relief with numerous lakes. On the Swiss Plateau are fields, orchards, and tracts of oak, ash, and beech forest. [29–995–2]

SWITCHBOARD INSTRUMENT, a measuring instrument that is designed to be mounted on, for example, a traffic-control panel, a control console, a control switchboard, or a cabinet of an

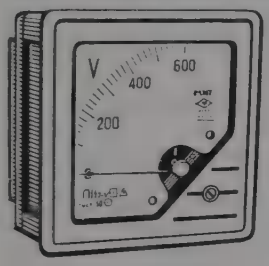

Figure 1. A switchboard voltmeter

electrical installation. A switchboard instrument may be an indicating instrument or a recording instrument. As a rule, switchboard instruments have a low class of precision, usually 1.0–5. [29–1612–3]

SWITZERLAND, Swiss Confederation (German, Schweizerische Eidgenossenschaft; French, Confédération Suisse; Italian, Confederazione Svizzera).

GENERAL INFORMATION
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General information

Switzerland is a Central European state located in the Alps and bordered by France, the Federal Republic of Germany, Austria, Liechtenstein, and Italy. Area, 41,300 sq km. Population, 6.3 million (1977). The capital is the city of Bern. The Swiss Confederation comprises 23 cantons (as of Jan. 1, 1979), three of which are divided into demicantons (see Table 1).

Constitution and government

Switzerland is a federal republic. The present constitution was adopted in 1848 and revised in 1874. The federal government has jurisdiction over such matters as war and peace, foreign relations, the army, railroads, communications, the minting of coins, and approval of the federal budget.

The head of state is the president, elected from among the members of the Federal Council for a one-year term by the Federal Assembly. Legislative power is vested in the bicameral Federal Assembly, which comprises a lower house—the National Council—and an upper house—the Council of States. The National Council is made up of 200 deputies popularly elected by a system of proportional representation for four-year terms. The Council of States is made up of 46 deputies, two from each canton and one from each demicanton, popularly elected for four-year terms (three-year terms in certain cantons). All citizens who have reached the age of 20 are eligible to vote.

Executive power resides in the Federal Council, comprising seven members, each of whom heads a department. The members of the Federal Council are elected at a joint session of the legislature; all the members of the council take turns occupying the posts of president and vice-president.

Each canton and demicanton has its own constitution; legislative and executive authority are exercised by a great council (*Landrat*) and a cantonal council, which are popularly elected for terms ranging from one to five years. The districts, which are headed by a prefect appointed by the cantonal council, and the communes have two forms of self-government: in the German cantons, citizens gather together and vote in a general assembly known as the *Landsgemeinde*; in the French cantons, the body of local government is the commune council. The executive bodies in the communes are the lesser councils, headed by mayors or syndics.

Table 1. Administrative-territorial divisions of Switzerland (1976)

Cantons and demicantons[1]	*Area (sq km)*	*Population*	*Capital*
Zürich	1,700	1,120,000	Zürich
Bern[2]	6,900	991,100	Bern
Luzern	1,500	292,800	Luzern
Uri	1,100	34,200	Altdorf
Schwyz	900	92,800	Schwyz
Unterwalden			
Obwalden[3]	500	25,300	Sarnen
Nidwalden[3]	300	26,500	Stans
Glarus	700	36,000	Glarus
Zug	200	73,600	Zug
Fribourg	1,700	181,900	Fribourg
Solothurn	800	224,100	Solothurn
Basel			
Basel-Stadt[3]	40	213,700	Basel
Basel-Land[3]	400	220,400	Liestal
Schaffhausen	300	70,200	Schaffhausen
Appenzell			
Appenzell-Ausserhoden[3]	200	47,200	Herisau
Appenzell-Innerrhoden[3]	200	13,400	Appenzell
St. Gallen	2,000	385,400	St. Gallen
Graubünden	7,100	164,800	Chur
Aargau	1,400	443,600	Aarau
Thurgau	1,000	184,500	Frauenfeld
Ticino	2,800	264,700	Bellinzona
Vaud	3,200	523,900	Lausanne
Valais	5,200	213,700	Sion
Neuchâtel	800	164,600	Neuchâtel
Genève	300	337,900	Geneva

[1]Cantons are given in the official order, which in most cases corresponds to the entry of the canton into the Confederation [2]In 1979 the demicanton of Jura, which had been formed from the canton of Bern, was made a canton [3]Demicanton

Switzerland's judicial system includes federal and cantonal courts. The supreme judicial body is the Federal Tribunal, its members are elected by the Federal Assembly for six-year terms, and it comprises ten sections. Justice is administered in the cantons through a three-level court system made up of local, district, and cantonal courts.

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Natural features

Terrain. Most of Switzerland is occupied by the Alps. In the south lie the Pennine Alps, which rise to an elevation of 4,634 m at Dufourspitze, the highest point in Switzerland; also in the south are the Lepontine Alps and the Rhaetian Alps, which include the Bernina Massif. Deep longitudinal valleys of the upper Rhône and middle Rhine separate the Pennine and Lepontine Alps from the Bernese Alps (highest point, the Finsteraarhorn, approximately 4,274 m) and the Glarus Alps, which form a system of mountain ranges that runs southwest to northeast through the entire country. Ranges of peaked mountains, formed primarily of crystalline rocks and deeply eroded, predominate; there are numerous glaciers and glacial landforms. The principal passes—the Great St. Bernard, Simplon, St. Gotthard, and Bernina—are at elevations above 2,000 m.

In the north and the northwest, where the Alps decrease in elevation, gentler landforms prevail; glaciers are encountered in the area, and karst has developed.

Approximately one-third of Switzerland, the area northwest of the Alps, is occupied by the Swiss Plateau, which gradually descends from 1,000–1,200 m to 400 m in the Rhine and Aar valleys. The plateau is characterized by piedmont shingle plains, outwash plains, basket-of-eggs topography, terminal moraines, and deep lake basins. In the northwestern part of the country are the folded Jura Mountains, which rise to an elevation within Switzerland of 1,679 m at Mont Tendre; the Jura give way in the west to tableland karst plateaus of the same name.

Climate. Switzerland's proximity to the Atlantic Ocean and its complex orographic structure account for its predominantly wet, temperate climate and clearly demarcated altitudinal zones. In the plateau regions the average January temperature is approximately 0°C in Geneva, −1.5°C in Zürich, −7°C at elevations of about 1,500 m (Davos), and −14°C at elevations of 2,500 m (the foot of Mount Jungfrau). The average July temperature is 19°C in Geneva, 17°C in Zürich, 12°C in Davos, and 0°C at the foot of Mount Jungfrau.

Annual precipitation is 800–1,200 mm in the Swiss Plateau, 2,500 mm on the windward slopes of the Alps (3,000 mm on certain summits), and 1,000–1,500 mm on the leeward slopes and in the deep valleys of southern Switzerland (500–600 mm in certain areas of the upper Rhône valley). At lower elevations the snow cover is not permanent: snow covers the ground for about 3 months at 700 m, 4.5 months at 1,000 m, 8 months at 1,880 m, and 10.5 months at 2,500 m. The snow line is at an elevation of 2,800–3,300 m. The characteristic mountain and valley winds and foehns cause sharp drops in temperature and avalanches.

The total area covered by glaciers is approximately 2,000 sq km; there are about 140 large valley glaciers, notably the Aletsch Glacier, as well as numerous cirque and hanging glaciers.

Rivers and lakes. Switzerland has a dense network of deep rivers that includes the Rhine, which flows for 375 km within the country's borders, and its tributary the Aare, as well as the upper courses of the Rhône, Inn, and Ticino rivers; all rise in the Alps and are fed by melting snow and rain. High water is in spring. Intensive glacial melting causes summer freshets, and flooding occurs during winter thaws. The rivers descend abruptly, forming numerous waterfalls. Extensive use is made of the country's considerable hydroelectric potential: many rivers have hydroelectric power systems.

The largest of Switzerland's many lakes are Lakes Geneva, Constance (Bodensee), and Maggiore (part of which lies in Italy), as well as the western part of the Lake of Neuchâtel. The lakes, most of which lie in depressions scoured by ancient glaciers, are elongated and quite deep. At high elevations in the Alps are numerous cirque lakes. The Rhine and Aare rivers and the large lakes are used for navigation.

Soil and flora. Switzerland has a predominance of mountain brown forest and mountain-meadow soils, often coarsely textured; rendzinas are encountered in the Jura Mountains and in those areas of the Alps where flysch prevails. Forests cover more than one-fourth of the country. On the Swiss Plateau, where up to an elevation of 800 m cultivated vegetation predominates, modest tracts of broad-leaved forests—oak, beech, ash, elm, maple, and linden—have been preserved on brown forest soils.

At elevations ranging from 500–600 m to 1,000 m, the most common tree is the beech; in some areas, notably in the Jura, beech trees are found at 1,500 m. At 1,000–1,500 m mixed forests of beech, spruce, fir, and pine predominate; at higher elevations (1,800–2,400 m) there are coniferous forests of spruce, fir, pine, and larch. The valleys have thickets of alder. At still higher elevations (up to 2,800 m), there are found subalpine and alpine meadows, along with thickets of rhododendron, azalea, and juniper.

Fauna. Mammals encountered in the mountains include the chamois, marten, blue hare, alpine marmot, ibex, and fox. Birds include the golden eagle, capercaillie, thrush (*Turdus*), creeper, red-billed chough, snowy reel, and swift; gulls are found along the riverbanks and lakeshores. The rivers and lakes are inhabited by such fish as trout, whitefish, grayling, and char.

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Population

Switzerland's indigenous population is made up of four ethnic groups: the German Swiss, French Swiss, Italian Swiss, and Rhaeto-Roman Swiss (Rhaeto-Romance–speaking peoples).

The German Swiss, who number 4.3 million (figures here and below are 1975 estimates), inhabit the central and eastern cantons; they speak Upper German dialects, and their literary language is German. The majority are Protestants, though some are Roman Catholics.

The French Swiss, who number 1.3 million, live in the western cantons; they inhabit the canton of Bern together with the German Swiss. They speak southern French (Provençal) dialects, and their literary language is French. They are Protestants (Calvinists) and Roman Catholics.

The Italian Swiss, who number 200,000, live in the southern cantons of Ticino and Graubünden; they inhabit certain regions together with the German Swiss. They speak Italian and profess Roman Catholicism.

The Rhaeto-Roman Swiss, who number 50,000, comprise the Ladins and the Romansh-speaking peoples; they inhabit the high-mountain regions of Graubünden Canton. They speak their own languages, as well as German and Italian. They are Protestants and Roman Catholics.

Approximately 1 million foreigners live in Switzerland, including Italians, Spaniards, Germans and Frenchmen. The official languages are German, French, and Italian. The Gregorian calendar is used.

Until 1975, increases in population resulted from natural growth (about 0.5 percent annually) and immigration, primarily the influx of foreign workers. In response to the economic crisis, the number of foreign workers has been reduced, from 676,000 in 1965 to 425,000 in 1975. The proportion of the population under 15 years of age is 23.4 percent; 15.1 percent are over 60.

The average population density is about 152 persons per sq km. Four-fifths of the population live on the Swiss Plateau, where nearly all the major cities are located. The population of the Alpine mountain regions is decreasing. According to the 1970 census, the economically active population numbers 2,995,800, including 2,683,100 wage earners (89.6 percent), of whom approximately one-fourth are foreign. In 1975, 2.7 million persons were employed, 15 percent of whom were foreign.

The breakdown of employment according to sectors of the economy in 1975, with the figures for 1965 given in parentheses, is as follows: industry, construction, and handicrafts employed 44.4 percent (51.2 percent); agriculture, 6.2 percent (9 percent); transportation, 5.7 percent; commerce, banking, and insurance, 16.2 percent, and the hotel industry, 4.5 percent. Overall, 49.4 percent (39.8 percent) of the economically active population is employed in the service sector.

In 1970 approximately 77.7 percent of the population was urban, a city being defined as a community of more than 2,000 inhabitants. The principal cities are Zürich, Basel, Geneva, Bern, and Lausanne.

Historical survey

Numerous habitation sites of the earliest settlers in Switzerland have been preserved, including the Paleolithic caves of Drachen-

loch and Birseck, Mesolithic sites, and pile dwellings. The first written references to the inhabitants of Switzerland date from the second century B.C., when most of Switzerland was inhabited by a Celtic tribe, the Helvetians; the eastern part of the country was inhabited by the Rhaetians. The Helvetians, who had been defeated by Julius Caesar at Bibracte, became *foederati* in 58 B.C. and were eventually completely subjugated by Rome; the Rhaetians were conquered in 15 B.C. Switzerland then entered a period in which it underwent considerable romanization.

Feudal period (fifth century to the end of the 18th century). In the fifth century most of Switzerland was conquered by the Alamanni (406–407); western Switzerland was conquered by the Burgundians circa 450, and southeastern Switzerland by the Ostrogoths in 493. In the part of the country seized by the Alamanni, the language and social system that had existed among the Germans became established. The southeastern and the western parts of the country remained Roman in language and culture.

In 496 the Alamanni were conquered by the Franks, who defeated the Burgundian kingdom in 534 and the Rhaetian kingdom in 536; thus, nearly all Switzerland became part of the Frankish state. During the late sixth and seventh centuries the population was converted to Christianity. Under the Treaty of Verdun of 843, the southern and western parts of the country were given to the emperor Lothair, and the eastern part to Louis the German. Eastern Switzerland became part of the duchy of Alamannia (Swabia), formed in the tenth century within the Kingdom of Germany; both the duchy and the Kingdom of Germany became part of the Holy Roman Empire in 962. Between 1032 and 1034 western Switzerland was annexed by the empire as part of the Burgundian kingdom.

Feudal relations developed in Switzerland. The country was divided into numerous counties, seignories, ecclesiastical principalities, rural communities (*Länder* and cantons), and urban republics. The most important feudal lords were the dukes of Zähringen, who ruled at the end of the 11th and the beginning of the 12th centuries, and the counts of Kyburg, Savoy, and Hapsburg. The Hapsburgs, after inheriting the lands of the extinct Kyburg family in 1264, became the most important rulers in Switzerland.

The Hapsburgs sought to gain complete control of the forest cantons (Schwyz, Uri, and Unterwalden), which controlled the Alpine mountain passes connecting Central Europe with Italy. During the struggle against the Hapsburgs that developed in the mid-13th century, the forest cantons in August 1291 formed a perpetual alliance, which laid the foundation of the Swiss Confederation as a de facto independent state within the Holy Roman Empire; on August 1, Independence Day, the Swiss celebrate the founding of the confederation. The Holy Roman emperors kept the cantons within the empire but freed them from the control of the Hapsburgs through charters granted in 1291, 1297, and 1309. The Hapsburgs' attempts to subjugate the forest cantons ended in the utter defeat of an army of Austrian knights at Morgarten in 1315, after which the forest cantons reaffirmed their alliance in a new treaty signed at Brunnen.

In the 14th and 15th centuries the Swiss Confederation increased its territory and developed as a military and political power. Luzern, which had been ruled by the Hapsburgs, joined the confederation in 1332; Zürich in 1351; Glarus and Zug, which had been wrested from the Hapsburgs, in 1352; and Bern in 1353. The confederation waged continual war with the Hapsburgs, who renewed their efforts to exert control over the liberated lands. The Hapsburgs, defeated by the confederation at Sempach in 1386 and at Näfels in 1388, were compelled to recognize the independence of the eight confederated cantons in 1389.

As allies of the French king Louis XI, the Swiss took part in the Burgundian Wars of 1474–77, in which their victory over the duke of Burgundy, Charles the Bold, enhanced the military reputation of the Swiss infantry. In 1481 the confederation was joined by Fribourg and Solothurn. The Swabian War of 1499 ended in the establishment of Switzerland's de facto independence from the Holy Roman Empire. In 1501, Basel and Schaffhausen were admitted into the confederation and accorded the rights of cantons. In 1513, Appenzell joined, thereby creating the Federal Union of the Thirteen Cantons, which existed until 1798.

In addition to the cantons, which exercised complete independence in domestic matters and in foreign policy, the confederation included allied districts, such as St. Gallen, Graubünden, and Geneva, whose autonomy was restricted, particularly in the area of foreign policy. The confederation also included subject districts, such as Aargau, Thurgau, and Vaud, which had no rights. Until 1798, Switzerland had no permanent central government: confederation-wide diets, known as *Tagsatzungen*, were convened periodically; only the cantons enjoying full rights were allowed to vote. There was no confederation-wide administrative body, army, or financial system.

Switzerland has undergone a unique socioeconomic development. Throughout the Middle Ages, large areas of the cantons did not experience the development of feudal relations; communes, or marks, were preserved for a long period, as was a peasantry that was free in terms of both personal bonds and ties to the land. The economy was agricultural and patriarchal. Many cantons, especially the backward cantons with a relative surplus rural population, developed mercenary armies as part of the economy.

In the urban cantons of Zürich, Basel, and Bern, and in such allied districts as St. Gallen and Geneva, the economy was based on handicrafts and trade. The cities of Bern, Geneva, Basel, and Zürich were important centers of handicraft production and banking, and the fairs at Basel and Geneva were known throughout Europe. In certain instances, land cultivation in the rural areas of the urban cantons assumed highly developed commodity forms. Serf and semiserf relations were steadfastly maintained in the subject districts.

Beginning in the late 15th and early 16th centuries, feudal relations disintegrated, primarily in the most developed urban cantons and in certain allied territories. Capitalist manufacture developed in textile production, book printing, and papermaking in Basel, Geneva, Bern, and Zürich. Wine growing was organized in several areas as a commodity enterprise. Dairyfarming was organized on a commercial basis. The development of new socioeconomic relations was hindered, however, by Switzerland's division into numerous political units, by the lack of protection for industry from the patricians and the guild leaders in the cities, by the mercenary system, which diverted the population from productive labor, and by the existence of feudal landholding.

In the cities, a struggle was waged between the urban landowners and patricians on the one hand and the craft guilds and the rising bourgeoisie on the other. The peasantry opposed not only the feudal lords, but also the cities, which exploited the rural areas. The social struggle, exacerbated in the early 16th century, set the stage for the Reformation, which in Zürich was initiated by H. Zwingli. Between 1523 and 1525, Zwingli instituted a series of religious reforms: clerical property was secularized, the monasteries were closed down, and images and pictures were removed from the churches. At the same time, usury was outlawed, as was the mercenary system. The patricians and gentry were almost completely forced out of municipal government, and the newly created church organization was made subordinate to the municipal magistrates.

The Reformation, which spread to St. Gallen, Basel, Schaffhausen, Solothurn, and Bern, was accompanied by antifeudal peasant uprisings in 1524 and 1525, notably in the areas of Zürich, Bern, and Basel and in Schaffhausen, St. Gallen, Solothurn, Thurgau, and Aargau. Nearly everywhere the peasant revolts were supported by the urban lower classes, which were often led by the Anabaptists. The defeat of the peasants in the Peasant War in Germany made it easier for the Swiss authorities to subdue the peasantry and urban lower classes, which they were able to crush almost completely by 1526.

Zwinglianism continued to spread and became established in Bern, St. Gallen, Schaffhausen, Glaurus, Biel, and Basel at the end of the 1520's and in Geneva between 1532 and 1535. The Protestant cantons formed an alliance, and Zwingli evolved a plan to propagate the Reformation throughout Switzerland, which was to be united under Zürich's leadership. Zwingli was opposed by the economically backward cantons, which had remained Roman Catholic, and by Bern, which itself laid claim to hegemony in Switzerland. The Wars of Kappel, waged between the Protestant and Catholic cantons in 1529 and 1531, ended in the defeat of the Protestants and Zwingli's death.

In the mid-1530's the center of the Reformation shifted to Geneva, where J. Calvin became active in 1536; he took up permanent residence in the city in 1541. At the beginning of the 1540's, Calvinism was introduced into Geneva, which became the center of the Calvinist Reformation in Europe. During the second half of the 16th century, Calvinism supplanted Zwinglianism in the other Protestant cantons.

During the second half of the 16th and in the 17th century, the Protestant cantons experienced an economic upsurge, which encouraged an influx of Protestant emigrants from Catholic countries, especially France, into Switzerland. This wave of immigration led to the development of new branches of industry, notably the production of clocks and watches, and lay behind Switzerland's refusal to take part in the ruinous Thirty Years' War of 1618–48. Under the Treaty of Westphalia of 1648, the Swiss Confederation was formally recognized as an independent state by the rest of Europe.

The country was torn by internal religious and political differences. In 1586 the Catholic cantons of Schwyz, Uri, Unterwalden, Luzern, Freibourg, Zug, and Solothurn formed an alliance for the protection of Catholicism, thereby essentially dividing the country into Catholic and Protestant blocs. The conflicts between the two blocs reflected in religious form the efforts of the bourgeois elements in the economically developed cantons to change Switzerland's outmoded governmental system, which ensured that the backward Catholic cantons would remain dominant. Rivalry soon took the form of open warfare, notably in the First and Second Villmergen wars in 1656 and 1712.

Oligarchies of patricians and guild leaders had seized power in many urban magistracies and sought to maintain the backward sociopolitical system. They were opposed by the exploited peasants of the urban districts, notably in the Peasant War of 1653, who were supported by the urban lower classes and the bourgeois townspeople. The struggle against the urban oligarchic regimes became particularly intense in the 18th century, which witnessed such manifestations of unrest as the uprising of 1707 in Geneva, led by P. Fatio, and the Henzi conspiracy of 1749 in Bern.

Late 18th century and early 19th century; the rise and establishment of capitalism and the creation of a centralized bourgeois state. By the end of the 18th century, industry—the production of cotton in Zürich, silk in Basel, and clocks and watches in western Switzerland—had undergone considerable development in Switzerland, as had trade. The French Revolution encouraged the bourgeoisie in Switzerland to put an end to feudal relations and oligarchic government. The revolutionary struggle was given further impetus by the Club of Swiss Patriots, formed in Paris in 1790 (*see* HELVETIAN CLUB).

In 1792 revolutionary disturbances took place in Geneva, Valais, and Vaud; in Basel the Rauracian Republic was formed, only to be annexed by France in May 1793. The French Army entered Switzerland in spring 1798 and captured Bern on March 5; the Federal Confederation of the Thirteen Cantons collapsed. With the support of France, the Helvetian Republic was proclaimed on April 12 in Aargau; it included, in addition to the 13 cantons, Valais, Léman, Aargau, Bellinzona, Lugano, Rhaetia, Sargans, Thurgau, and St. Gallen. A constitution modeled after the French Constitution of 1795 was introduced, and Switzerland became a centralized, unitary state.

A defensive and offensive alliance concluded with France in August 1798 involved Switzerland in a war against the Second Coalition, during which Switzerland became a battlefield (*see* SWISS CAMPAIGN OF SUVOROV). A struggle developed in Switzerland between the Unionists, who emphasized the indivisibility of the republic, and the Federalists, who favored local self-government. In February 1802 the Constitution of Malmaison was adopted. The new constitution, named after the city of Malmaison, where negotiations between the Unionists and Federalists had taken place, granted self-rule to the cantons. On Feb. 19, 1803, Napoleon I issued the Act of Mediation, which restored (with certain changes) the governmental structure of Switzerland as it had existed before 1798. Six new cantons were added to the former 13: Graubünden, Aargau, Thurgau, St. Gallen, Vaud, and Ticino.

After the defeat of the Napoleonic empire, the Confederation of Switzerland abrogated the Act of Mediation and proclaimed on Dec. 29, 1813, that Switzerland intended to observe strict neutrality. The new constitution, drafted in September 1814 and ratified by the Diet in August 1815, was approved by the Congress of Vienna (1814–15), which also recognized in a special declaration on Mar. 20, 1815, Switzerland's eternal neutrality. To Switzerland was joined, in addition to Valais and Geneva, Neuchâtel, which until 1857 formally had been a personal possession of the king of Prussia; all became cantons. Switzerland was now an association of 22 independent, loosely interconnected cantons; supreme authority was vested in the Diet.

At the turn of the 1830's a movement headed by liberal bourgeois groups developed that sought to completely eliminate feudal relations, democratize the political system, and centralize the country. The revolutionary events of 1830 in France led to increased demands in Switzerland for a review of the Federal Pact of 1815, and in March 1832 seven cantons in which the liberal bourgeoisie was in power formed the Concordat of Seven. In response, six cantons in which the clerical faction was dominant created the League of Sarnen in November 1832. A plan for a new federal treaty was worked out by the Diet in 1832 but was rejected by a majority of the economically backward cantons. Between 1843 and 1845 seven Catholic cantons established a reactionary bloc, the Sonderbund.

In the civil war provoked by the leaders of the Sonderbund in 1847, the federal army was victorious. The military and political victory of the bourgeoisie was affirmed in the Constitution of 1848. A unified, federal state was established, with a central legislative body, the Federal Assembly, consisting of two houses: the National Council and the Council of States. Executive power was vested in the Federal Council, which was empowered to represent Switzerland in dealings with foreign states, to mint coins, and to collect customs duties. The post office and the customs office were combined, and systems of measures, weights, and money were standardized. Bern was named the national capital.

The constitution adopted on May 29, 1874, which remains in effect today, extended the jurisdiction of the central government to such areas as the armed forces, established the principle of the referendum, placed limitations on the church's activities, and created a federal court in Lausanne.

Once accomplished, centralization facilitated the country's economic development and the establishment of capitalism. An important prerequisite of industrialization was the accumulation of capital, which was made possible by Switzerland's role as a middleman in international trade and by the development of the resort and hotel industry, which became a separate sector of the economy in the 19th century. Light industry underwent substantial development in the 1840's and 1850's, and agricultural production became more specialized: Swiss butter and cheeses became important export products. Between 1825 and 1874 the length of the railroad system increased from 25 km to 1,500 km; the opening of the St. Gotthard Tunnel in 1882 led to an increase in freight and passenger traffic through Switzerland. At the end of the 1890's many branches of the manufacturing industry were established; in 1898 a law was passed under which the railroads were bought up by the state from private companies.

In the course of industrialization, an industrial bourgeoisie and a factory proletariat were formed. During the 1860's and 1870's the Geneva section and other sections of the First International were created. As early as 1858, craft organizations were founded, and in 1880 the Federation of Swiss Trade Unions was created. In 1888 the Social Democratic Party of Switzerland (SDPS) was founded. Political émigrés from the Russian Empire, Italy, France, and other countries found refuge in Switzerland, where the Russian Section of the First International was created in 1870 and the Liberation of Labor group in 1883.

The period of monopoly capital. END OF THE 19TH CENTURY TO 1918. At the end of the 19th century various new industries underwent development in Switzerland, including machine building and the chemical and electrical-engineering industries. Industry became oriented toward machine-tool building and the production of pharmaceuticals, watches, dyes, and toxic chemicals. Between 1888 and 1910 the number of persons employed in industry rose from 543,000 to 811,000; the influx of foreign manpower increased substantially, from 100,000–150,000 persons in the 1890's to 300,000–500,000 in the period 1910–14.

By the beginning of the 20th century banking capital had become highly concentrated, and the Swiss National Bank was founded in 1905. Switzerland became a major exporter of capital in the world market: at the beginning of the 20th century the annual export of capital from Switzerland was more than 3 billion francs, and by 1914, Swiss assets abroad amounted to 7.5 billion francs. By the beginning of the 20th century, monopoly capitalism had become firmly entrenched in Switzerland.

The first mass expressions of working-class discontent occurred in Switzerland, the largest being the general political strike in Zürich in 1912. Under pressure from the working-class movement, the country's first law insuring workers against work-related diseases and accidents was adopted in 1911. The SDPS divided into a right wing and a revolutionary wing, led by F. Platten.

On Aug. 3, 1914, at the beginning of World War I, Switzerland declared its neutrality. The monopolistic Swiss bourgeoisie took advantage of the war to reap profits by providing war matériel to both sides. A decline in the workers' standard of living (real wages fell by almost 30 percent during the war years) led to an increase in strikes during the summer and autumn of 1917 in such cities as Bern, Zürich, and Geneva. International socialist conferences were held on Swiss territory in Zimmerwald in 1915 and Kiental in 1916. The revolutionary wing of the SDPS took part in the Zimmerwald Left, which was directed by V. I. Lenin, who lived in Switzerland off and on for a total of about seven years.

FROM 1918 TO 1939. The strike movement grew in Switzerland under the influence of the October Socialist Revolution in Russia. From Nov. 12 to 14, 1918, a general political strike took place; involving about 400,000 persons, it was suppressed by the army, which was called in by the government. The government, however, met some of the workers' demands: proportional representation in the assembly and a 48-hour workweek were introduced. In March 1921 the revolutionary wing, which had left the SDPS, merged with communist groups that had been founded in Switzerland in 1917 and 1918 to form the Communist Party of Switzerland (CPS).

In March 1918 the government of Switzerland established diplomatic relations with Soviet Russia, and in June a Soviet diplomatic mission headed by Ia. A. Berzin arrived in Bern. On Nov. 12, 1918, however, the mission was expelled from Switzerland on the false charge that it had taken part in demonstrations by Swiss working people; the Swiss government then broke off diplomatic relations with Soviet Russia. On May 10, 1923, White Guards assassinated V. V. Vorovskii, the general secretary of the Soviet delegation to the Lausanne Conference; owing to the anti-Soviet policy of the country's ruling circles, Switzerland did not resume relations with the USSR until 1946.

In 1920, Switzerland joined the League of Nations, having stipulated that it would take part only in the economic and financial sanctions outlined in the league's Covenant. In 1923 it signed an agreement creating a customs union with Liechtenstein, which Switzerland has represented in dealings with foreign states ever since.

In 1931 the Swiss economy was gripped by the world economic crisis of 1929–33. In 1932 about 2,500 bankruptcies were recorded in Switzerland, and there were 124,000 unemployed. The class struggle became exacerbated, with strikes in such cities as Basel, Zürich, and Geneva. On Nov. 9, 1932, troops put down a demonstration in Geneva in which 13 workers were killed and 39 wounded. There followed a wave of arrests of Communists and left-wing Socialists; the task of combatting "subversive" activity was entrusted to the federal police, established in 1935. Fascist groups became active in the 1930's, the largest of which, the National Front, had some 10,000 members. Membership in the Swiss branches of German and Italian fascist organizations, which operated legally among the Germans and Italians living temporarily in Switzerland, numbered in the tens of thousands. The CPS helped the left-wing forces set up antifascist committees, which resisted the attempts of the National Front to hold marches in Zürich and Basel in 1938.

The Swiss economy experienced an upsurge between 1936 and 1939, brought on, for the most part, by prewar world market conditions. Swiss industry filled the orders of the fascist German and Italian war machines. Swiss trusts and concerns established branches abroad: in 1937 the Nestlé trust had 86 branches. The trade unions, influenced by the SDPS, cooperated with the bourgeoisie. In 1937 the entrepreneurs and the trade unions in the metalworking industry signed an agreement calling for an industrial peace under which, among other provisions, the workers agreed not to strike and arbitration was recognized as the sole means for resolving labor conflicts; similar agreements were soon signed in other industries. In 1938 the government proclaimed the doctrine of "integral neutrality," which in fact signaled Switzerland's refusal to take part in economic and financial sanctions against fascist Germany and Italy.

FROM 1939 TO 1945. On Aug. 31, 1939, Switzerland reaffirmed its neutrality. Measures were nevertheless taken to strengthen the country's defenses: a system of fortifications was built along the borders and, especially, in the heartland, the National Redoubt. In 1939 rationing of food and industrial raw materials was introduced, and emergency laws were passed: freedom of assembly was abolished, censorship was established, and the right of political asylum for foreigners was restricted.

On June 25, 1940, a policy was announced by which Switzerland would adapt to the "new order" in Europe. The government banned the CPS in 1940 and the organization of the left-wing socialists—the Swiss Socialist Federation—in 1941. Meanwhile, fascist groups continued to operate legally; the National Front, which had disbanded in March 1940, was revived in June as the Rassemblement Federal and remained in existence until the second half of 1943.

Switzerland supplied fascist Germany with strategic raw materials, equipment, weapons, war matériel, and electric power; German and Italian military freight was transported on the country's railroads. Fascist Germany and Italy, as well as the USA and Great Britain, set up intelligence services on Swiss territory, notably the American espionage center headed by A. Dulles.

When fascist Germany was on the brink of defeat, profascist groups were disbanded in Switzerland, and the CPS was legalized in 1944. On Oct. 14 and 15, 1944, the Constituent Congress of the Swiss Labor Party (SLP), which included members of the CPS and the Swiss Socialist Federation, was held in Zürich. In February 1945, Switzerland cut off supplies to fascist Germany and ceased providing transit for German and Italian war matériel; it also froze German assets in Swiss banks, although not the private accounts of the fascist leaders.

SINCE 1945. During World War II, Switzerland's industrial capacity increased, and gold reserves in the Swiss National Bank rose from 2.2 billion francs in 1940 to 4.8 billion francs in 1945. Increases were registered in capital investment, construction, production, level of employment, commodity turnover, and credit operations; capital became further concentrated. To a considerable extent, the growth of Swiss industrial production has been achieved by exploiting the workers, notwithstanding the reduction of the workweek from 47.5 hours in 1950 to 43.2 hours in 1975. This is especially true with regard to foreign workers, who numbered 215,000 in 1950, 435,000 in 1960, 659,000 in 1970, and 342,000 in 1976.

Exploitation and the drop in the standard of living, which declined during the war years by 10–13 percent, led to renewed strikes in 1946 and 1947. Under pressure from the workers, Switzerland enacted in 1947 its first law providing for old-age and disability pensions. Government pensions represented approximately 20 percent of wages, and although a small increase was passed in 1972, the Swiss pension system remains one of the least generous in the capitalist world.

In the atmosphere of the cold war a campaign was launched to harass activist members of the working-class movement and the Swiss Labor Party; it reached its peak in 1956 and 1957, when the occupational blacklist (*Berufsverbot*) was introduced. In order to ensure domestic political stability, Switzerland's bourgeois parties sought to broaden their cooperation with the reformist leadership of the SDPS. As of 1959, pursuant to an agreement reached by the various Swiss political parties, the Federal Council was to comprise two representatives from the Radical Democratic Party of Switzerland, which had sat on the council since 1848; two from the Christian Democratic Party, which had sat on the council since 1891; two from the SDPS, which had sat on the council from 1943 to 1953; and one from the Party of Peasants,

Artisans, and Burghers, which had sat on the council since 1929 (in 1971 it was renamed the Swiss People's Party). This coalition was supported by approximately 80 percent of the deputies in the Federal Assembly.

In the mid-1960's the nationalist groups renewed their activities; organizations such as the Republican Movement, led by J. Schwarzenbach, and the National Campaign for People and Homeland staged demonstrations in 1970 and 1974 demanding restrictions on the number of foreigners living in Switzerland. At the end of the 1960's the labor peace that had been concluded between the trade unions and the entrepreneurs was renewed. The working-class movement experienced an upsurge in 1971 (there had been a rash of strikes in 1952 and 1953 and in 1963) and gathered momentum in 1973 and 1974.

In the 1970's *Berufsverbot* was, in effect, lifted, and political restrictions on foreign workers were removed. In 1971 women were granted equal civil rights with men, including the right to vote and to be elected to the Federal Assembly; women continued to receive lower wages than men, however. From 1974 to 1976 the Swiss economy suffered a severe crisis. In 1977 about 25,000 persons were registered as unemployed (between 1945 and 1973 there had been virtually no unemployment), and 136,000 persons were underemployed. From 1974 to 1976 more than 200,000 foreign workers who had lost their jobs left the country. In 1974 the Swiss Labor Party proposed the imposition of controls on prices and capital investment and urged the adoption of various measures, including a proposal to limit the unrestricted power of the monopolies. In 1975 approximately 100,000 signatures were gathered in support of the Labor Party's program.

In foreign policy, in 1945 the Swiss Political Department proclaimed the principle of "active," or "solidary," neutrality; this meant that Switzerland would not formally join the military and political blocs of the imperialist states but would express solidarity with their policies. On Mar. 18, 1946, diplomatic relations with the USSR were resumed. The first Soviet-Swiss trade agreement was concluded on Mar. 17, 1948, but Soviet-Swiss relations developed little until the end of the 1960's.

Since the late 1960's the principle of universal neutrality has been central to Swiss foreign policy; although it considers its political and economic relations with the leading capitalist states to be of primary importance, Switzerland has, at the same time, actively pursued relations with the socialist and developing countries. Since the late 1960's Soviet-Swiss trade has increased, government officials of both countries have exchanged visits, and scientific, technical, and cultural cooperation has developed. In 1974 a consulate general of the USSR was opened in Geneva. As of 1976, Switzerland maintained diplomatic relations with all the socialist countries.

Switzerland joined the Organization for European Economic Cooperation (since 1961, the Organization for Economic Cooperation and Development) in 1948, the European Free Trade Association in 1959, and the European Council in 1963. In 1972, Switzerland signed an agreement with the European Economic Community (EEC) concerning the reciprocal elimination of tariffs on industrial goods by 1977 but refused to join the EEC on the grounds that participation in the EEC would compromise its neutrality.

Switzerland has not joined the United Nations, stating that its neutral status is incompatible with articles in the UN Charter that oblige member states to join forces to repel aggression and, in some instances, to apply economic sanctions. At the same time, Switzerland is a member of almost all the specialized organizations of the UN, and various international organizations are located on Swiss territory; many international conferences are held in Switzerland. Switzerland signed the Nuclear Test-Ban Treaty in 1963 and the Nuclear Nonproliferation Treaty in 1969 (ratified 1977). In 1972 it signed a convention banning the development, production, and stockpiling of bacteriological (biological) and toxic weapons and calling for their destruction. Switzerland took part in the Conference on Security and Cooperation in Europe, whose Final Act it signed on Aug. 1, 1975. As of 1981, Switzerland maintained diplomatic relations with almost 140 states.

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Political parties, trade unions, and other public organizations

Political parties. The Radical Democratic Party of Switzerland (Radikal-Demokratische Partei der Schweiz; Parti Radical Démocratique Suisse), founded in 1848, had about 120,000 members in 1976. The party represents the interests of the big bourgeoisie.

The Christian Democratic People's Party of Switzerland (Christlich-demokratische Volkspartei der Schweiz; Parti Démocrate-Chrétien Suisse) was founded in 1881 and until 1970 was called the Conservative Christian Social Party; it had about 60,000 members in 1976. It represents the interests of the big and middle bourgeoisie, as well as clerical groups.

The Social Democratic Party of Switzerland (Sozialdemokratische Partei der Schweiz [SPS]; Parti Socialiste Suisse), founded in 1888, had about 60,000 members in 1976. It includes workers, white-collar employees, and part of the petite and middle bourgeoisie; it is a member of the Socialist International.

The Swiss People's Party (Schweizerische Volkspartei; Parti Suisse de l'Union Démocratique du Centre), founded in 1971 as a result of the merger of the Party of Peasants, Artisans, and Burghers (founded 1919) and the Democratic Party of Switzerland (founded 1941), had approximately 50,000 members in 1976. It includes peasants, artisans, and part of the petite and middle bourgeoisie.

The Independent Party (Landesring der Unabhängigen; Alliance des Indépendants), founded in 1935, had about 10,000 members in 1974. It is a right-wing, petit bourgeois party. The Liberal Democratic Union of Switzerland (Liberalne Partei der Schweiz; Parti Libéral Suisse), founded in 1913, had about 10,000 members in 1976: it is a bourgeois party.

The Swiss Labor Party (Partei der Arbeit der Schweiz; Parti Suisse du Travail), founded in 1944, is the successor to the Communist Party of Switzerland.

In addition to the groups mentioned above, Switzerland has numerous small parties and political factions.

Trade unions and other public organizations. The Swiss Federation of Trade Unions, founded in 1880, comprises 19 affiliated

trade unions and has 455,000 members; if the membership of seven unions that belong to both the SFTU and the Federal Union of Employees of State Institutions and Enterprises is counted, the organization has 562,000 members (1974). It is influenced by the SDPS and is a member of the International Confederation of Free Trade Unions. The Federal Union of Employees of State Institutions and Enterprises includes ten affiliated unions, seven of which also belong to the SFTU; it had 122,000 members in 1974. It is influenced by the SDPS.

The Federation of the Swiss Unions of Salaried Employees includes 12 affiliated unions that represent white-collar workers and technical personnel employed in the private sector; it had 128,000 members in 1974. It is influenced by the SDPS.

The Federation of Christian Trade Unions includes 11 affiliated unions and had 99,800 members in 1974; it is influenced by the Christian Democratic People's Party. In addition to the groups listed above, there are numerous national independent professional organizations.

The Swiss Communist Youth League operates under the auspices of the Swiss Labor Party. The Swiss Young Socialist Association operates under the auspices of the SPS. The Swiss Peace Movement is part of the World Peace Council. The Swiss Council of Peace Associations unites 15 pacifist organizations. The Swiss Women's Federation for Peace and Progress belongs to the Women's International Democratic Federation. The Association for the Development of Cultural Ties between Switzerland and the USSR (the Switzerland-USSR Society) was founded in 1945.

Economic geography

General state of the economy. Switzerland, a developed capitalist country, is highly industrialized and has an intensive agriculture. Trade, finance, and tourism play an important role in the economy.

In 1976, Switzerland accounted for about 1 percent of the capitalist world's industrial production and 1.7 percent of its exports. The country occupies a leading position in the world in terms of foreign trade generated per capita ($4,628 in 1976) and per capita gross national product. In 1976 the gross national product was $148 billion, with exports accounting for about 25 percent of the total.

Switzerland has long made use of its traditional neutral status; it has assumed the role of a middleman in international trade, a role for which it is suited by virtue of its location in central Europe. Other sources of Switzerland's considerable capital include a constant influx of foreign capital, foreign tourism, and the health-resort industry. The guaranteed secrecy of Swiss bank accounts and the country's neutral status have attracted capital from many foreign countries to Swiss banks; foreign depositors often circumvent the laws of their own countries.

In 1976, Switzerland had direct investments abroad of an estimated 45.5 billion Swiss francs and was among the world's leaders both on a per capita basis and in absolute volume. Two-thirds of the direct investments abroad are controlled by seven large concerns. The country exports most of its capital in the form of loans, 80–85 percent of which go to the developed capitalist countries, primarily the USA, Canada, and the countries of Western Europe (especially the Federal Republic of Germany).

Although the Swiss economy is notable for the extent to which capital is centralized, production is relatively little concentrated. In a number of industries, such as the textile, clock and watch, and clothing industries, there is a numerical predominance of medium-sized and small enterprises. In 1975 the country had 9,989 industrial enterprises, with a total of 715,000 employees; enterprises with fewer than 100 employees, or 85 percent of all enterprises, employed about 35 percent of the labor force, and enterprises with 1,000 or more employees, or 0.6 percent of all enterprises, employed 20 percent of the labor force. Most small enterprises are controlled by large concerns.

In 1976 more than half the joint-stock capital of 32,005,600,000 Swiss francs was controlled by 699 joint-stock companies, each of which owned capital of 10 million Swiss francs or more; these companies constituted 0.7 percent of all joint-stock companies. Concerns are the principal form of monopolistic association, many of which have become multinational firms with numerous enterprises outside Switzerland. Leading concerns are Nestlé Alimentana, a food-processing concern with 127,800 employees; Brown Boveri, an electrical equipment concern with 95,500 employees; and the Ciba-Geigy and Hoffmann-La Roche, chemical and pharmaceutical concerns with 73,300 and 35,000 employees, respectively.

Switzerland's numerous banking monopolies include the Swiss Bank Corporation (Schweizerischer Bankverein), the Union de Banques Suisses (Schweizerische Bankgesellschaft), and the Schweizerische Kreditanstalt (Crédit Suisse); leading insurance monopolies are the Zürich Versicherungs-Gesellschaft and the Schweizerische Rückversicherungs-Gesellschaft.

In the mid-1970's, Switzerland's economic situation deteriorated, and industrial production declined. The crisis of 1974–75, the gravest since 1949, led to a decrease in the total number employed in the manufacturing industry from 879,900 in 1970 to 714,900 in 1975; industrial production fell by 13 percent in 1975. In 1976 there was a slowdown in industrial production.

Industry. Swiss industry specializes in the manufacture of high-quality products, often of unique type. The leading branches of industry are machine building and the chemical industry; however, basic branches have been insufficiently developed (see Table 2).

Table 2. Percentages, for each industry, of those employed in manufacturing, excluding handicrafts

Industry	*1966*	*1970*	*1976*
Food processing (including tobacco products)	6.7	7.0	7.7
Textiles	7.8	6.8	6.0
Clothing, footwear, and leather goods	8.7	7.6	6.4
Wood products	5.0	4.8	4.2
Toys, sports equipment, and musical instruments	0.2	0.2	0.2
Paper	2.5	2.3	2.5
Printing	5.6	6.0	6.1
Chemical (including the production of rubber, the processing of synthetic materials, and petroleum refining	7.6	9.0	11.2
Building materials	3.4	3.2	2.7
Metallurgy and metalworking	13.8	13.8	13.5
Machine building	30.0	30.4	32.1
Clocks and watches	8.2	8.3	7.0
Jewelry	0.5	0.5	0.4

Almost all raw materials and mineral fuels, especially petroleum, are imported. The leading branches of industry produce primarily for export.

A steady decline in the proportion of the labor force employed in the textile, clothing, footwear, wood-products, and building-materials industries and an increase in the proportion in the machine-building, chemical, and pharmaceuticals industries reflect structural changes in Swiss industry brought about by the scientific and technological revolution. The reduction of the proportion of employees in the clock and watch industry has been caused primarily by stiffer competition on the world capitalist clock and watch market.

MINING AND POWER ENGINEERING. Switzerland's industrially useful minerals are rock salt, of which 311,600 tons were extracted in 1976 in the Basel area, and building materials. Switzerland produces substantial electric power, primarily hydroelectric power. Less than one-fifth of the country's energy needs are met by domestic sources; the remainder is met through imported fuel, chiefly petroleum (4 million tons in 1976), petroleum products (8 million tons), coal, and natural gas. Nuclear fuel is taking on increasing importance. Petroleum refineries in Aigle and Cressier, with a total installed capacity of about 8.5 million tons, are supplied by international pipelines from the ports of Genoa (Italy) and Marseilles (France). Natural gas is transported via gas pipeline from the Netherlands through Basel.

In 1976, Switzerland had 435 hydroelectric power plants in operation with a total installed capacity of 10.5 million kW. The share of electricity produced by the hydroelectric plants has declined from 98 percent of the total in 1965 to 74 percent in 1975–76. Atomic power plants and fossil-fuel-fired steam power

plants produce about 26 percent of the total electricity. The most important atomic plants are in Mühlenberg (effective capacity of more than 300,000 kilowatts [kW]) and Beznau (effective capacities of 300,000 kW and 1.2 million kW, respectively). In 1975, Switzerland imported 7.4 billion kilowatt-hours (kW-hr) of electricity and exported 9.6 billion kW-hr.

MANUFACTURING. Switzerland does not have a large iron and steel industry. The aluminum industry, with plants in the Rhône valley and in Steg and Chippis, uses imported bauxites. Ferrous and nonferrous metals, with the exception of aluminum, are for all practical purposes totally imported.

Machine building specializes in the production of precision metalworking machine tools and forging and pressing equipment (Switzerland ranks third among the capitalist world in exports in this area, behind the Federal Republic of Germany and the USA), electrical equipment, textile machinery, printing machinery, equipment for the chemical industry, internal-combustion engines, transportation equipment, and measuring instruments. The major centers of the machine-building industry are the cities of Zürich, Winterthur, Baden, Geneva, Basel, and Schaffhausen.

Switzerland is known throughout the world for its watches and clocks, produced primarily in western Switzerland—in the cities of Biel, La Chaux-de-Fonds, Le Locle, Grenchen, and Geneva and in several small towns. Watches and clocks are produced, for the most part, at medium-sized enterprises that are controlled by the monopolistic groups ASUAG, or Allgemeine Schweizerische Uhren (General Society of the Swiss Watch Industry), and SSIH, or Société Suisse Pour l'Industrie Horlogère (Association of the Swiss Watch Industry); the latter group includes the firms Omega and Tissot. About 95 percent of the clock and watch industry's output—clocks, watches, and parts—is exported. Switzerland accounts for more than one-fifth of the world clock and watch production.

The chemical industry uses domestic rock salt and imported organic intermediates. Development has been concentrated on the pharmaceutical industry and the production of dyes, synthetic fibers, and plastics. The principal centers of the chemical industry are the cities of Basel and Visp.

Light industry is represented by various branches. The textile industry produces fine cottons, silk fabrics and ribbons, various types of knitwear, and embroidery. Among other light industries are the clothing industry and the footwear industry, which includes the Bally concern. The main center of the cotton industry is the city of St. Gallen; silk production is concentrated, for the most part, in the cities of Zürich and Basel.

The food-processing industry is heavily dependent on imported raw materials. Swiss cheeses, chocolate, and food concentrates are known throughout the world. Other well-developed branches of Swiss industry are the wood-products, paper and printing, and building-materials industries.

Figures on the output of principal industrial products are given in Table 3.

Table 3. Output of principal industrial products

	1955	1965	1975
Electric power (billion kW-hr)	15.6	25.3	43
Steel (thousand tons)	—	347	420
Primary aluminum (thousand tons)	—	67.2	79
Metal-cutting and press-forge equipment (million dollars)	—	132	494
Textile equipment (million dollars)	—	200	660
Wrist and pocket watches, including mechanisms (million units)	34.4	54.7	65.8
Dyes and paints (million francs)	—	—	1,193
Organic chemical products (million francs)	—	—	2,818
Pharmaceuticals (million francs)	—	—	1,655
Paper and paper-board (thousand tons)	345	610	600
Cotton fabrics (million meters)	151	146	115
Woolen and mixed fabrics (million tons)	31.5	5.9	5.8[1]
Cement (million tons)	2.2	4.0	3.9
Footwear (million pairs)	11.1	15.4	8.1
Chocolate (thousand tons)	31.1	58.0	58.5
Sugar (thousand tons)	301.2	409.9	594.4

[1]1974

Agriculture. Agricultural holdings have gradually become concentrated in large capitalist farms, each with an area of more than 20 hectares (ha). Between 1955 and 1975 the number of farms declined from 206,000 to 133,000, primarily at the expense of small farms of less than 5 ha. The country is nearly self-sufficient in livestock production, but it produces only one-third of the required breadgrains. More than 50 percent of the land is used for agriculture: 9 percent, or 366,000 ha, is plowland; 41 percent, or 1,630,000 ha is meadows and pastures; and about 0.5 percent, or 18,000 ha, is set aside for perennial plantings.

Livestock raising, the principal branch of agriculture, accounts for 80 percent of the value of agricultural output; crop cultivation accounts for 20 percent. Agriculture is highly intensive; in 1975, Swiss farms had 83,900 tractors, 122,000 electric motors, and 5,000 combines. In 1977 there were 2,004,800 head of cattle (including about 900,000 dairy cows), 2,065,000 swine, 368,400 sheep, and more than 6 million chickens. The cattle are mainly of the Simmental and Schwyz breeds; the average annual milk yield per cow is 3,890 kg. Milk production accounts for about 40 percent of the output produced by livestock raising (3.5 million tons of milk, 35,000 tons of butter, and 111,000 tons of cheese in 1976), beef for 27 percent, swine raising for 24 percent, and poultry farming more than 5 percent.

Grain farming accounts for about 30 percent of the value of the total crop (half the grain produced is for fodder), fruit growing for 25 percent, viticulture for about 20 percent, and vegetable growing for about 16 percent, 10 percent of which is accounted for by the potato crop (see Table 4 for the principal crops).

Table 4. Area and yield of major crops

	Area (thousand hectares)		Yield (thousand tons)	
	1961–65[1]	1975	1961–65[1]	1975
Grains	178	182	583	842
wheat	109	82	355	320
barley	31	48	102	180
Potatoes	46	21	1,145	907
Sugar beets	7	11	270	480
Grapes	12	13	122	109[2]

[1]Annual average [2]Wine production totaled 77,200 tons

Transportation. Switzerland's complex road system, a necessary consequence of the mountainous terrain, includes numerous tunnels, bridges, and viaducts. The railroad system, which has a total track length of about 5,000 km, is entirely electrified. Mountain aerial cableways total 617 km in length, funiculars 55 km, and cog railways 97 km. Switzerland has 18,500 km of highways. As of 1976 there were 1,864,000 passenger cars, 43,000 trucks, and 4,338 buses.

There is navigation on the Rhine (from Basel) and on the lakes. The country's river fleet has a cargo capacity of 558,000 tons. More than one-fifth of Switzerland's foreign cargo passes through the major river port of Basel, which handled 8.2 million tons of cargo in 1975. In 1976 the merchant fleet had a total tonnage of 243.4 gross registered tons (Swiss ships are registered in the ports of other countries). Swissair provides service primarily on international routes; the principal airport is at Zürich. About one-fourth of the freight transported consists of transit goods. Switzerland has approximately 240 km of pipelines.

Foreign trade. In 1976 imports amounted to 36.2 billion Swiss francs, and exports totaled 36.4 billion francs; for the first time since 1953 the country enjoyed a favorable balance of trade. Deficits are covered by income from the export of capital, the import of foreign capital, revenues from foreign tourism, customs duties, and services provided to foreigners working in international organizations.

In 1976 raw materials and semifinished products, including foodstuffs requiring further processing, made up 41.5 percent of imports and 41.3 percent of exports; energy sources accounted for 10.3 percent and 0.1 percent respectively; machinery, equipment, and vehicles were responsible for 14.9 percent and 34.6 percent; consumer goods, including food commodities, beverages, and tobacco, accounted for 33.3 percent and 24.0 percent.

In 1976 trade with Europe accounted for 79.7 percent of imports and 67.2 percent of exports; trade with the member nations of the European Economic Community made up 66.5 percent and 45.1 percent, respectively. The socialist countries accounted for 3.7 percent of imports and 6.7 percent of exports, Asia for 7.9 percent and 14.3 percent, Africa for 2.3 percent and 4.7 percent, and North America for 7.8 percent and 8.5 percent. Switzerland's principal trading partners are the Federal Republic of Germany (FRG), France, Italy, the USA, Great Britain, and Austria. Trade with the USSR has increased: imports from the USSR rose from 24.6 million rubles in 1970 to 108 million rubles in 1976; in the same period exports to the USSR rose from 70.5 million rubles to 263 million rubles.

The monetary unit of Switzerland is the Swiss franc. According to the rate of exchange set by the State Bank of the USSR in March 1978, 100 Swiss francs equal 35.53 rubles.

Foreign tourism. The provision of services to tourists, sportsmen, and patients at health resorts constitutes a special branch of the economy: the tourist industry. Switzerland has more than 8,000 hotels and numerous pensions, sanatoriums, automobile service stations, and camping sites. As a source of foreign currency, tourism ranks third, after the export of machine-building products and of chemicals and pharmaceuticals. In 1976, Switzerland provided services to 5.9 million foreign tourists and earned 5.5 billion Swiss francs. The climatic health resorts in the mountains are renowned throughout the world.

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A. I. MUKHIN

Armed forces

The armed forces consist of an army and an air force, which includes an antiaircraft force. The post of commander in chief is held by the president. The head of the Military Department, the chief of the General Staff (who is also the commander of the army), and the commander of the air force and antiaircraft force are in direct command. In 1977 the armed forces numbered about 46,500 men, who are called up under the law on compulsory military service in accordance with the territorial-militia system. Conscripts undergo basic training for a four-month period, after which they are transferred to the reserves. Reservists are called up for annual three-week repetition courses over the next eight years, two-week courses for the following three years, and one-week courses for the following two years.

The army of about 37,500 men includes an alpine corps, comprising three mountain infantry divisions, and three army corps, each consisting of two infantry divisions and one tank division. In addition, the army is made up of 23 detached frontier brigades, a detached armored regiment, three detached heavy-artillery regiments, two detached engineer regiments, two communications regiments, and other units and subunits concerned with combat security and services.

The air force of about 9,000 men comprises 24 squadrons, with a total of 345 combat aircraft; two helicopter squadrons; an antiaircraft missile regiment, consisting of two antiaircraft missile battalions, with a total of 64 launching installations for Bloodhound surface-to-air missiles; and seven antiaircraft artillery regiments.

Health and social welfare

Medicine and public health. In 1976, Switzerland had a birth rate of 11.7 per 1,000 inhabitants and a death rate of 9 per 1,000 inhabitants; the infant death rate was 11 per 1,000 live births. For the period 1968–73 the average life expectancy was 70.3 years for men and 76.2 years for women. Among the principal causes of death are cardiovascular diseases, malignant tumors, accidents, and diseases of the respiratory organs. The most common infectious diseases are influenza, children's infectious diseases, tuberculosis, and infectious hepatitis.

The administration of health care is decentralized: the federal government, through the Federal Office of Public Health (Bundesamt für Gesundheitswesen) of the Interior Department, merely monitors morbidity (for example, the incidence of infectious diseases and rheumatism), the training of physicians, and environmental protection; it also directs the campaign against alcoholism and the narcotics trade. The cantonal health care agencies are directly responsible for such areas as the management of hospitals, the organization of nonhospital care, and the administration of health services in the schools. Switzerland's social insurance system covers 90 percent of the population.

In 1975 there were 474 hospitals, with a total of 72,400 beds (11 beds per 1,000 inhabitants), of which more than 43,000 beds were in state medical institutions. Nonhospital care is provided, for the most part, by private physicians working with the social insurance agencies, as well as by the polyclinic divisions of certain hospitals. In 1976 there were 10,400 physicians (one physician per 680 inhabitants), 2,600 dentists, and about 17,000 secondary medical personnel. Doctors are trained at the medical schools of five universities; secondary medical personnel receive their training at 80 schools.

Switzerland has climatic health resorts in the mountain cities of St. Moritz, Davos, Leysin, and Vevey, balneological health resorts at Aigle, Weggis, Bad Ragaz, and Baden, and peloid health resorts at such cities as Acquarossa and Lavey-les-Bains.

In 1976, expenditures on health care made up 10 percent of the state budget.

O. A. ALEKSANDROV

Veterinary services. In 1976 there were two new cases of anthrax, 1,761 of rabies, two of Newcastle disease, three of cattle brucellosis, 18 of bovine and sheep tuberculosis, 159 of acariasis of bees, and 21 of blackleg. Cases of enterotoxemia and braxy of sheep, infectious agalactia of sheep and goats, malignant catarrhal fever of cattle, and myxsomtosis have also been reported. Veterinary services are directed by the Veterinary Administration, subordinate to the Federal Council. The network of veterinary services encompasses all cantons; the country has a unified code of veterinary laws. In 1976, Switzerland had 1,100 veterinarians, who trained at the veterinary schools of the universities of Zürich and Bern. Research in veterinary medicine is carried on at the two schools and at other veterinary institutions.

M. G. TARSHIS

Education and cultural affairs

Switzerland has no standardized system of public education. Each canton has its own educational legislation and administration. In all cantons education is compulsory for children from 6–7 to 15–16 years of age. There are kindergartens for children from 3–4 to 6–7 years of age. The primary school offers a period of instruction that ranges from seven to nine years and comprises two levels; depending on the canton, primary education lasts four years plus three years, four years plus four years, or four years plus five years. At the first level of instruction all pupils receive the same general-education training. In the senior grades of the primary school, the pupils are given, in addition to a general education, specialized vocational training for entry into vocational-technical schools or trade schools and for work in agriculture. In the 1972–73 academic year, primary schools had an enrollment of more than 526,100 pupils: the various vocational-technical schools had more than 165,200 pupils.

Switzerland's secondary schools vary widely in type and curriculum. They may be divided, nevertheless, into two basic categories: general-educational and specialized. The secondary schools, like the primary schools, have two levels: junior and intermediate. The junior level is a four-year *pregymnasium*, which accepts pupils who have completed four grades of primary school and have passed entrance exams in their native language (German, French, or Italian) and mathematics. The senior level is a four- or five-year *Gymnasium*, which has three divisions: classical lan-

guages, modern languages, and natural sciences and mathematics; upon graduation, the student may enter a technical higher educational institution or the law school or school of economics at a university, provided that the student has passed an additional exam in Latin. The junior level of a specialized secondary school, which has a two-year course of study, prepares students to work in various branches of the economy. In the 1972–73 academic year, 344,000 students were enrolled in secondary schools of all types, including 300,700 at the junior level and 43,300 at the senior level.

Higher educational institutions offer courses of instruction that range in length from three to five years (in some departments, six years). The system of higher education includes the universities of Basel (founded 1460), Lausanne (founded 1537), Geneva (founded 1559), Zürich (founded 1833), Bern (founded 1834), Neuchâtel (founded 1909), and Fribourg (founded 1889), as well as such institutions as the federal institutes of technology in Zürich and Lausanne and the Hochschule for Economics, Business, and Public Administration in St. Gallen. In the 1974–75 academic year, approximately 45,000 students were enrolled in higher educational institutions.

The largest of Switzerland's 33 libraries and archives are the Public Library of the University of Basel (more than 2 million volumes in 1977) and the Swiss National Library in Bern (1.5 million volumes). Museums include the Historical Museum, the Museum of Art, and the Museum of Natural History in Bern; the Public Art Collection, the Museum of Ethnography, and the Historical Museum in Basel; the Museum of Art and History in Geneva; the Cantonal Museum of Fine Art in Lausanne; and the Museum of Art and History in Fribourg. Z. K. NAVOKINA

Science and scientific institutions

Natural and technical sciences. NATURAL SCIENCES PRIOR TO THE 1840's. From the ninth through 11th centuries, the center for the study of natural sciences was the Abbey of St. Gallen, which was the most important cultural center in Switzerland during the Middle Ages. In 1465 the first printing press in the country began operating in the city of Muri. The first universities appeared during the 15th and 16th centuries—in Basel, Lausanne, and Geneva.

Paracelsus and M. Servetus influenced the development of biology and medicine in Switzerland during the Renaissance, and K. von Gesner wrote *A History of Animals* (vols. 1–5, 1551–87). The development of mathematics and mechanics was largely due to the Huguenots, who emigrated to Switzerland at the end of the 16th century; the Huguenots also fostered the local manufacture of watches and precision instruments. At the beginning of the 17th century, the Swiss mathematician J. Burgi invented logarithms independently of J. Napier. Another Swiss mathematician, P. Guldin, is credited with developing theorems on the volumes and surface areas of bodies of revolution. In botany, J. Bauhin is important for his work (published 1650–61) describing 5,000 plants. His brother G. Bauhin was one of the first to apply binary nomenclature in the systematic classification of plants. The anatomical works of T. Bonet and J. Wepfer were noteworthy contributions to 17th-century medicine.

During the first half of the 18th century, international recognition was accorded to the works of Swiss mathematicians. The brothers Jakob and Johann Bernoulli laid the foundations for the calculus of variations. Jakob Bernoulli was also one of the founders of the theory of probability, and he discovered the simplest form of the law of large numbers. Johann Bernoulli, who was made a foreign honorary member of the St. Petersburg Academy of Sciences in 1725, created the first systematic textbook of differential and integral calculus. In algebra, G. Cramer laid the foundations of the theory of determinants.

The work of Swiss mathematicians in other countries, including Russia, facilitated recognition of Swiss mathematical achievements. In 1725, J. Hermann (Ia. German) became the first professor of the St. Petersburg Academy of Sciences. In the same year, Johann Bernoulli's sons Daniel and Nikolaus also became professors at the academy, as did Daniel's nephew Jakob in 1787. Daniel became a foreign honorary member of the academy in 1733. Another Swiss mathematician, L. Euler, gained worldwide recognition through his work at the St. Petersburg Academy; named an adjunct in 1726, he was appointed a professor in 1731 and 1766 and was a foreign honorary member of the academy from 1742 to 1766. Also elected as foreign honorary members of the St. Petersburg Academy of Sciences were J. Gessner (1764), E. Develey (1808), and S. A. l'Huilier (1782).

J. Mallet-Favre founded the department of astronomy at the University of Geneva and established an observatory there. He carried out a number of projects in Russia and in 1776 became a foreign honorary member of the St. Petersburg Academy of Sciences. On I. F. Kruzenshtern's round-the-world expedition from 1803 to 1806, meteorological studies were conducted by J. K. Horner, who became a foreign corresponding member of the St. Petersburg Academy of Sciences in 1808. G. L. le Sage the Younger, P. Prévost, and A. de la Rive contributed to the development of physics.

The study of the Alps gave rise to a number of branches of science in Switzerland. As a result of travel and exploration in the mountains, J. J. Scheuchzer was able to publish descriptions of many types of fossil animals and plants between 1731 and 1735. M. Kappeler was the author of several works on general crystallography. H. B. de Saussure was the first to study the geologic structure of the Alps; he laid the foundations of descriptive geology and of glaciology. The foundations of the study of glacial epochs were laid by J. L. R. Agassiz' works on glaciology (published 1840–47). Agassiz moved to the USA in 1846. In 1835, J. Thurmann identified the Neocomian stage in the Cretaceous system. Between 1786 and 1802, J. R. Meyer compiled the first geographic atlas of Switzerland.

Biology in the 18th century developed under the influence of the doctrine of preformation. A. Haller, one of the founders of experimental physiology, was the first to devote detailed research to the phenomena of excitability and sensitivity; Haller became a foreign honorary member of the St. Petersburg Academy of Sciences in 1776. The science of entomology was furthered by C. Bonnet, who became a foreign honorary member of the St. Petersburg Academy of Sciences in 1764. F. Huber's studies contributed to the formation of a scientific approach to beekeeping. The works of A. Trembley aided the acceptance of the experimental method in biology. Discoveries made by J. Senebier and N. T. de Saussure led to the beginning of the study of plant physiology in the 19th century and to an understanding of photosynthesis. A. P. de Candolle, who became a foreign honorary member of the St. Petersburg Academy of Sciences in 1835, was the founder of comparative plant morphology. In 1804, J. P. E. Vaucher became the first to study algae through a microscope.

Contributions to medicine were made in the 18th century by T. Tronchin in therapy and J. G. Zimmermann in medical diagnosis; in the first half of the 19th century, F. K. Stadlin's work on physiology and surgery was important. The research of C. Schönbein at the University of Basel beginning in 1828 aided the development of modern chemistry in Switzerland.

FROM THE LATE 1840's TO THE FIRST HALF OF THE 20TH CENTURY. After Switzerland adopted a federal constitution in 1848, a number of educational institutions were opened, including federal institutes of technology in Lausanne and Zürich (1853 and 1855, respectively), universities in Fribourg and Neuchâtel (1889 and 1909, respectively), and a college in St. Gallen (1898). The Geneva National Institute was founded in 1853.

The works of J. Tralles on mathematics and its applications to astronomy gained widespread recognition; A. Speiser made important contributions to group theory, and L. Schläfli founded multidimensional geometry. The research of J. J. Balmer on atomic spectroscopy and the experiments of R. P. Pictet, who obtained liquid oxygen in 1877, made a great contribution to physics in the second half of the 19th century. Also of importance were C. E. Guillaume's inventions and theoretical works on metrology; Guillaume received a Nobel Prize in 1920 and became a foreign corresponding member of the Academy of Sciences of the USSR in 1924.

An enormous influence was exerted on modern science by A. Einstein, who was a professor at the University of Zürich from 1909 to 1911 and from 1912 to 1914. Einstein formulated the special theory of relativity, the quantum theory of light, and the theory of Brownian movement. Beginning in the late 1920's the development of physics in Switzerland was associated with the re-

search of W. Pauli, who helped develop quantum mechanics and the relativistic quantum field theory; Pauli received a Nobel Prize in 1945. R. Wolf established a connection between solar activity and variations in the Earth's magnetic field.

In chemistry, A. Werner received a Nobel Prize in 1913 for his investigation of inorganic-complex coordinated compounds. C. E. Guye and his brother P. A. Guye, who became a foreign corresponding member of the St. Petersburg Academy of Sciences in 1913, laid the foundations of electrochemical research in Switzerland. An important contribution to organic chemistry was made by A. Pictet, who carried out research on heterocyclical compounds. In 1934 and 1935, L. Ružička synthesized androsterone and testosterone; he received a Nobel Prize in 1939 and became a foreign member of the Academy of Sciences of the USSR in 1958. H. Staudinger, one of the founders of macromolecular chemistry, was a professor in Zürich from 1912 to 1926. The fundamentals of the stereochemistry of crystalline compounds and a genetic classification for magmatogenic ores were worked out by P. Niggli, who became a foreign corresponding member of the Academy of Sciences of the USSR in 1924. A major school of chemistry was founded by P. Karrer; in 1937, Karrer shared a Nobel Prize with W. Haworth for his studies on carotinids, flavins, and certain vitamins. Biochemical research advanced under the direction of E. Abderhalden, who became a foreign corresponding member of the Academy of Sciences of the USSR in 1925. P. H. Müller studied the insecticidal properties of DDT and received a Nobel Prize in 1948.

Niggli, F. de Quervain, and R. Winterhalter compiled a survey, published in 1930, of the chemical compositions of the rocks found in Switzerland. Important figures in minerology were U. Grubenmann, L. Duparc, and G. A. Kenngott; Kenngott became a foreign corresponding member of the St. Petersburg Academy of Sciences in 1884, and Duparc, in 1912. In the mid-19th century, A. Gressly set forth the principles of facies analysis, and at the end of the 19th century, F. A. Forel laid the foundations of limnology. A. Heim, who was a foreign honorary member of the Academy of Sciences of the USSR from 1925, studied the tectonic structure and glacial history of the Alps. C. W. M. Dorno conducted the first research in Switzerland in bioclimatology and radiation climatology. In 1931 and 1932, A. Piccard carried out flights for scientific purposes in a stratosphere balloon of his own design.

During the second half of the 19th century, the traditions of excellence in Swiss botany were continued by P. E. Boisier and A. de Candolle, who became a foreign corresponding member of the St. Petersburg Academy of Sciences in 1858. Noted botanists in the early 20th century included J. Briquet, C. de Candolle, E. Cramer, and R. Chodat, who became a foreign corresponding member of the Academy of Sciences of the USSR in 1924. *Fossil Flora of the Arctic* (1868–83) by O. Heer laid the foundations for the systematic study of the extinct vegetation of the arctic regions; Heer became a foreign corresponding member of the St. Petersburg Academy of Sciences in 1876. One of the first palcontologists to adopt the Darwinian point of view was L. Rütimeyer, who became a foreign corresponding member of the St. Petersburg Academy of Sciences in 1882.

A milestone in biology was F. Miescher's discovery of nucleic acids in 1868, and a considerable influence on biology and medicine in Switzerland was exerted by A. H. Forel, who wrote works on psychotherapy, sexology, entomology, and the anatomy and physiology of the nervous system. An important role in Swiss medicine was also played by M. Schiff, who became a foreign corresponding member of the St. Petersburg Academy of Sciences in 1895, and by H. Sahli; both Schiff and Sahli studied clinical physiology and diagnosis. F. de Quervain and C. Roux made notable contributions to surgery, and E. Bleuler, to psychiatry. Widespread recognition was gained by T. Kocher's achievements in the study and treatment of diseases of the thyroid gland; Kocher received a Nobel Prize in 1909. In the late 19th and early 20th centuries, health resort science, balneology, and physiotherapy began developing, and during the first half of the 20th century, a Swiss school of ecology took shape; the foremost scientists of the school were J. Braun-Blanquet, E. Rübel, and E. Schmid.

Progress in the technical sciences in Switzerland was fostered by widespread transportation construction and industrialization. In 1852, J. D. Colladon proposed a design for a pneumatic drill, and in 1862, J. Lechaux invented the diamond drill bit. To help with the driving of tunnels, such engineers as A. Heim, K. Brandau, and R. Meyer studied problems of the strength of various types of tunnels. Geodetic surveys were conducted under the direction of C. Guillaume, and outstanding works on the technology of tunnel construction were contributed by L. Favre, C. Baeschlin, and C. Koppe. The St. Gotthard Tunnel was opened in 1882, and the Simplon Tunnel, the longest in the world, was opened in 1906; a second tunnel, parallel to the first was completed in 1922.

Such Swiss engineers as R. Abt and N. Riggenbach occupied a prominent place in the design and construction of cog railways; Swiss engineers also made important contributions to the design and construction of mountain cableways. J. Ackeret built one of the first supersonic wind tunnels. T. Turrettini, E. Bürgin, and V. Boveri formed a Swiss school of electrical engineering.

SECOND HALF OF THE 20TH CENTURY. In 1944 a governmental commission was organized in Bern to encourage scientific research and coordinate research in the applied sciences. In 1952, the Swiss National Science Foundation was established, and during the 1960's the National Research Council was founded under its auspices. In 1969 a science division was organized in the Interior Department.

In basic research in Switzerland, mathematics occupies a prominent place, with recognition being accorded to J. Burckhardt, E. Trost, and G. de Rham, as well as to R. Wavre and his school. Research in physics has been continued by W. Pauli and his school; in 1955, Pauli formulated the *CPT* theorem. Major studies on antibiotics and other physiologically active compounds have been carried out by V. Prelog, who became a foreign member of the Academy of Sciences of the USSR in 1966. A broad program of scientific research is being conducted in the interests of the chemical and pharmaceutical monopolies.

In geology and geography, an important role has been played by the deep-sea studies begun in the 1940's by A. Piccard and continued since 1966 by his son J. Piccard; the Piccards designed new bathyscaphes. Research is also being carried on in volcanology, alpine geology, tectonics, geodesy, geophysics, and meteorology; A. Rittmann has performed especially valuable investigations in volcanology, R. Staub in alpine geology, and E. Begman in tectonics.

In biology, great achievements have been made by W. R. Hess in the physiology of the nervous system, by T. Reichstein in endocrinology, and by G. Aebi in biochemistry; Hess and Reichstein both received ■ Nobel Prize—in 1949 and 1950, respectively. G. Zop, E. Müller, and C. Baehni have made important contributions to botanical taxonomy, and the works of A. Frey-Wyssling on plant physiology have gained recognition. Experimental embryology has been developed by E. Hadorn and his school. Important medical research is being conducted in neurophysiology by K. Akert, and in neuropathology and psychiatry by scientists at the C. G. Jung Institute in Zürich. In the agricultural sciences, outstanding works have been contributed by the Lausanne school of agronomy, especially R. Halle and F. Ober.

Research and development technology have mainly been connected with the manufacture of precision instruments, machine tools, and turbines. Important studies have been carried out by such engineers as R. Braun in an attempt to develop safeguards against landslides and avalanches. Among Switzerland's major achievements in engineering are the Mauvoisin Dam (237 m; constructed 1950's), the Great St. Bernard Tunnel (opened 1967), and a system of freight-bearing cableways (some of them up to 200 km long).

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B. A. STAROSTIN

Social sciences. TO THE MID-18TH CENTURY. In the ninth and tenth centuries *The Encyclopedia of Literary Sciences*, the anony-

mous *Life of Charlemagne*, and the *Chronicle of the Abbey of St. Gallen* by Ratpert and Ekkehard were compiled at the Abbey of St. Gallen, where the scholar-monks Notker Balbulus ("the Stammerer") and Notker Labeo ("the Thick-lipped") were active. A prominent representative of the ecclesiastical and monastic culture of a later period was the mystic nun Elizabeth Stagel (14th century), a disciple of H. Suso's.

The principal achievements of medieval Swiss social science came with the development of an urban culture in the 14th and 15th centuries. Numerous urban chronicles were written, chiefly in Bern, where the Bern chronicles of K. Justinger and D. Schilling were compiled in the 15th century. The development of the social sciences and the dissemination of knowledge was facilitated by the establishment of printing houses and universities. At the University of Basel jurisprudence underwent considerable development as early as the second half of the 15th century; a leading figure in this field was P. von Andlau.

In the 16th century numerous scholars and thinkers were associated with the Swiss universities, notably Erasmus of Rotterdam, who from 1521 to 1528 lived in Basel, where many of his works were published by J. Froben. Other important figures included J. Sichardt, the founder of the Basel school of historical textual criticism, and K. von Gesner, the author of the *Universal Library* (1545–55). The Swiss humanists continued the tradition of compiling local chronicles; noteworthy examples are the *Bern Chronicle* of Valerius Anselmus and the *Geneva Chronicles* of F. Bonivard. The first attempts to write a systematic history of Switzerland were made by J. Stumpf and A. Tschudi.

During the 16th century Switzerland became a leading center of Protestant theology, primarily through the work of H. Zwingli and his followers Vadianus (J. von Watt), J. Oecolampadius, and H. Bullinger, as well as J. Calvin and his successor T. Bèze. The Reformation sparked an awakening of interest in the historical and legal questions of the confederative state structure, which were dealt with by J. Simmler in the second half of the 16th century.

Many French Protestant scholars and journalists who had fled religious persecution were active in Switzerland, notably M. Cordier, S. Castalion, and F. Hotman. In the first half of the 18th century the ideas of natural law as advanced by H. Grotius and S. von Pufendorf were disseminated by J. Barbeyrac, J.-J. Burlamaqui, and E. Vattel. Philosophical problems of scientific cognition were dealt with by G.-L. Lesage, who was influenced by B. Pascal, and by J.-P. Crousaz, who subscribed to a late Cartesianism. The work of J.-J. Rousseau, a native of Geneva who lived in Switzerland until 1741 and during the 1760's, and later of Voltaire, who lived in Switzerland from 1754 to 1758, played a major role in spreading the ideas of the Enlightenment in Switzerland.

SINCE THE MID-18TH CENTURY. *Philosophy, pedagogy, and law.* Swiss social thought, whose development has been closely connected with the philosophy and culture of neighboring countries, chiefly Germany and France, is characterized by a particular interest in problems of education and of social and legal systems. In the mid-18th century attempts were made to put pedagogy and Enlightenment aesthetics, as seen from a Wolffian standpoint, on a rationalist basis; prominent in these efforts were J. G. Sulzer, as well as J. J. Bodmer and J. Breitinger, the teachers and predecessors of J. H. Pestalozzi. The democratic theory and practice of education developed by Pestalozzi, which was based on visual instruction, gained international recognition. K. von Bonstetten, who was active in the late 18th and early 19th centuries, studied the role that differences in geographic environment and in systems of public education play in the formation of individual and national character.

After Switzerland's neutral status was formally recognized in 1815, there was an increased interest in philosophical and legal questions, reflected in the works of K. L. von Haller, I. Troxler, O. Huber, and J. K. Bluntschli, a theorist of the organic school of law. Such figures as C. Secrétan, J.-E. Naville, and K. Hebler discussed the issues of liberal reform, the democratization of the electoral system, and the emancipation of women. Several social and ethical problems pertaining to relations among states were posed by J. H. Dunant, who was the founder of the International Red Cross, E. Ducommun, and A. Gobat. In the 20th century the theory of the state and the law has been studied by C. Borgeaud, K. Dürr, U. Lampert, and E. Ruck.

In the first half of the 19th century, Swiss philosophy was dominated by German idealism. Secrétan and Troxler further developed Schelling's philosophy of nature and put forward a spiritualistic concept of freedom. The end of the 19th century was marked by the influence of positivism, particularly in the works of H. Naville, and neo-Kantianism.

In the early 20th century the neo-Fichtean philosophy of activism, as elaborated by R. Eucken, gained popularity; it was applied to ethics and aesthetics by E. Grisebach and P. Häberlin and to pedagogy by A. Ferrière and Grisebach. E. Jaques-Delacroze developed a pedagogic system based on a wide-ranging interpretation of rhythm as an educative principle that permeated all areas of life and art.

From 1910 through the 1930's religious and mystical trends became increasingly influential, notably in the anthroposophy of R. Steiner, which was applied to various disciplines, including pedagogy, and in the dialectical theology of K. Barth. Neo-Thomism, represented by J. Bochénski and the Fribourg group, which was associated with the journal *Divus Thomas* (1923–53), gained a certain influence, as did the existentialism of H. Barth.

An important school developed in the philosophic analysis of works of literature and art; its representatives—J. Gebser, E. R. Curtius, W. Muschg, K. Schmid, and E. Staiger, the principal exponent of the "school of interpretation"—were influenced primarily by phenomenology and, to a degree, by German existentialism.

Of some importance in the history of psychology in the second half of the 18th century were J. Zimmermann and J. Lavater; the latter attempted to revive the science of physiognomy. In the 19th century valuable work was done by P. Scheitlin in animal psychology, A. Forel in hypnotism, and E. Bleuler in psychiatry. H. Rorschach's test for use in the study of personality, first presented in 1921, gained widespread acceptance. From the 1920's to 1940's work in military psychology was done by E. Bircher and U. Wille. K. G. Jung, the founder of the trend in depth psychology known as analytic psychology, developed a classification of psychological types and a methodology for the associative experiment. Another school of depth psychology is the existential analysis of L. Binswanger, F. Kaune, and W. Keller.

Important work in experimental psychology was carried out by E. Claparède, who wrote on child psychology and occupational psychology; his version of functional psychology greatly influenced J. Piaget's genetic epistemology and operational conception of the intellect.

Marxist philosophy gained currency in Switzerland in the second half of the 19th and the early 20th centuries, particularly after the founding of the Social Democratic Party of Switzerland in 1888 and the Communist Party of Switzerland in 1921; of major importance were the contacts of the Swiss socialists with V. I. Lenin and G. V. Plekhanov when the two lived in Switzerland. The works of Swiss Marxists of the 1920's to 1940's, notably S. Bamatter, J. Mimiola, F. Platten, and W. Trostel, expressed the ideas of internationalism and dialectical and historical materialism. After the founding of the Swiss Labor Party in 1944, its leaders, who included E. Woog, J. Vincent, and K. Farner, actively disseminated the teachings of Marxism-Leninism.

In Switzerland, research in philosophy, psychology, pedagogy, and law has traditionally been carried out at the universities.

Swiss philosophical journals include *Freidenker* (since 1918), *Studia philosophica* (since 1941), *Dialectica* (since 1947), and *Freiburger Zeitschrift für Philosophie und Theologie* (since 1954). The major psychological journals are *Archives de psychologie* (since 1902), *Action et pensée* (since 1925), *Schweizerische Zeitschrift für Psychologie und ihre Anwendungen* (since 1942), and *Der Psychologe* (since 1949).

Historical scholarship. The development of Swiss historical scholarship in the second half of the 18th century is closely linked with the ideas of the Enlightenment. The members of the Helvetian Club (founded 1761), notably I. Iselin and F. Balthasar, developed the notion of bourgeois civilization as the summit of human progress. J. von Müller's *A History of the Swiss Confederation*, which was influenced by Enlightenment ideas, provided a heroic view of the history of the Swiss people and long remained

the principal textbook on medieval Swiss history; it was continued by various historians, including R. Glutz-Blotzheim and L. Vuillemin, who imparted a romantic coloring to the work.

In the first half of the 19th century the ideas of German romanticism were reflected in historical works that supported the Restoration, notably those of F. D'Ivernois and H. Zschokke, and in a new interest in local history. The first historical societies were established at this time. In the 1830's, J. Kopp became the first to critically study the chronicles and other Swiss historical sources; he showed that much of their information was based on legends.

The development of European history of culture was considerably influenced by J. Burckhardt, who specialized in the culture of ancient Greece and the Renaissance and founded the cultural-historical school, and later by H. Wölfflin. A major figure in the development of cultural anthropology was J. J. Bachofen, whose works initiated the study of the matriarchal system and the evolution of the family. In the mid-19th century F. Keller was the first to study systematically Swiss pile dwellings.

The information accumulated throughout the 19th century on all periods of Swiss history made it possible to write, at the end of the 19th and the beginning of the 20th centuries, large, comprehensive works covering the entire course of Swiss history (K. Dändliker, J. Dierauer, T. van Muyden, and E. Gagliardi), as well as survey works dealing with Swiss military history and with the study of sources (W. Oechsli). Notable studies on the medieval period were written during this period by R. Wackernagel and by G. Caro, who conducted a polemic with the adherents of the patrimonial estate theory. The works of E. Fueter constitute an important contribution to European historiography.

The history of the working-class movement and socialist ideas in Switzerland was dealt with by R. Grimm, the leader of the Social Democratic Party of Switzerland. Important works in the fields of ethnography and archaeology, both those limited to Switzerland and those of a broader purview, were written by such scholars as E. Pittard, H. Bechtold, E. Baechler, and O. Tschumi.

Dominant among the trends in Swiss historiography is the liberal school, which indiscriminately applies the historical methodologies of such trends as neopositivism, phenomenology, and the historiography of A. Toynbee to issues in Swiss and world history; representatives of this school include P. Bessire, P. Dürrenmatt, V. Martin, E. Müller-Büchi, L. Binz, E. Gruner, and W. Hofer. The most important studies on Swiss history are those of H. Nabholz, who wrote on the medieval and modern periods, and K. Meyer, who revealed the historical basis of a number of legends pertaining to the formation of the Swiss Confederation whose authenticity had been cast into doubt by 19th-century historians.

Several historians, notably H. Weilemann, E. Bonjour, and R. Feller, subscribe to the notion of Helvetianism; they have attempted to put forward the social and political structure of the Swiss Confederation as the ideal organization of the state. A sociological school has been developed that relies primarily on the comparative historical method, as in the works of S. Stelling-Michaud, in *An Economic and Social History of Switzerland* (1961), and in studies on patterns of migration carried out in the late 1960's by H. Hoffmann-Nowotny; in a number of instances the works of this school lean toward an approach in which ethnology plays an important role.

The materialist interpretation of history is represented by a relatively small number of works of a Marxist tendency, such as those by M. Bodenmann, M. Pianzola, K. Farner, and H. Egger, which study specific and general phenomena in the historical development of Switzerland, as well as the history of the class struggle and working-class movement. The works of the progressive Swiss scholar A. Bonnard on the history of Greek civilization have gained widespread recognition.

The departments of philosophy and history, as well as the departments of political and social sciences, at various universities, including those at Basel, Bern, Geneva, Lausanne, and Zürich, are the principal centers of historical scholarship. Historical studies are published in the proceedings of historical societies; these organizations exist in all cantons and belong to the Swiss Historical Society (founded 1841), which publishes the *Schweizerische Zeitschrift für Geschichte*. Problems of domestic history are treated in such journals as *Beitrage zur Heimatkunde* (since 1927), *Blätter zur Heimatgeschichte* (since 1963), and *Bollettino storico della Svizzera italiana* (since 1879). The leading journal dealing with problems of world history is *Schweizer Beitrage zur allgemeinen Geschichte* (since 1943).

ECONOMICS. Economics emerged as an independent discipline in Switzerland in the second half of the 18th century, when the Swiss economist J. Waser set forth his theory of prices and price formation. A prominent representative of Swiss economics of the first half of the 19th century was J. C. L. S. de Sismondi, a seminal figure in petit-bourgeois political economy.

In the first half and beginning of the second half of the 19th century, W. Schulz-Bodner studied the role of the labor force in an economy based on free competition. In the same period, A. E. Cherbuliez subjected capitalism to a petit bourgeois critique similar to that of Sismondi's: he proposed that the state abolish private ownership of the land and appropriate rent, which would be used to replace taxes. Despite these radical demands, Cherbuliez was a fierce opponent of socialism. In the second half of the 19th century, L. Walras founded the mathematical school of political economy, which saw in mathematics the basic means of comprehending economic phenomena.

At the beginning of the 20th century Swiss economists attached great importance to the study of trade, money circulation, and the banking system. A prominent Swiss economist of the 20th century, W. Röpke, studied problems of international commercial and currency-credit relations, economic crises, market conditions, and inflation. Röpke, who helped create the theory of the social market economy, was an advocate of neoliberalism.

Most modern Swiss economists are Keynesians and concentrate in their works on questions of economic statistics and the construction of economic models. Since the late 1950's econometrics has undergone considerable development in Swiss economic scholarship. Many Swiss economists work on a continuing basis with the international organizations located in Switzerland and take part in the research sponsored by these organizations.

The chief centers of economic science in Switzerland are the universities of Geneva, Bern, Zürich, and Fribourg and their affiliated scientific research institutes.

The principal Swiss economics journals are *Wirtschaft und Verwaltung* (since 1942), *Revue économique et sociale* (since 1943), *Gewerbliche Rundschau* (since 1956), *Archiv für schweizerische Wirtschaft und Wirtschaftspolitik* (since 1960), *Aussenwirtschaft* (since 1946), and *Schweizerische Zeitschrift für Volkswirtschaft und Statistik* (since 1865).

LINGUISTICS. Beginning in the 19th century, linguistic science developed in three areas: Indo-European linguistics, general linguistics, and linguistic geography. Indo-European studies have been represented by works on general problems, Celtic linguistics (A. Piktet), Indic linguistics (J. Wackernagel and A. Debrunner), Baltic linguistics (M. Niedermann), and classical languages (Debrunner and Niedermann). Piktet wrote on problems of linguistic paleontology.

The contributions to general linguistics by the Geneva school, primarily F. de Saussure, and by C. Bally and A. Séchehaye greatly influenced the development of linguistics in many countries throughout the world. The ideas of the Geneva school were further developed by S. O. Kartsevskii, O. Frei, and R. Godel. The study and publications of Saussure's manuscripts is proceeding under the direction of Godel and R. Engler. In 1941 the Geneva Linguistic Society initiated the occasional publication *Cahiers F. de Saussure*, of which 30 volumes had appeared as of 1976.

The foundations of linguistic geography were laid at the end of the 19th century. J. Gilliéron, K. Jaberg, and J. Jud, all of whom took a historical approach to the study of linguistic geography, compiled *A Dialect Atlas of Italy and Southern Switzerland* (1928–40). In 1932, Jud founded the journal *Vox romanica*, an organ of the Society of Romance Languages in Basel. W. von Wartburg also dealt with problems of linguistic geography.

Dialectology has undergone development by H. Morf and L. Gauchet; the latter published *A Dictionary of the Dialects of French Switzerland* (1924–25). Dictionaries of German dialects have appeared since 1873 and of Rhaeto-Romance dialects since

1904. H. Baumgartner and R. Hotzenköcherle initiated the publication of *An Atlas of the German Dialects of Switzerland* in 1962. Applied linguistics has undergone development in Basel, Zürich, and Neuchâtel.

The principal linguistic societies are the Geneva Linguistic Society (1940–57), the Swiss Linguistic Society (Basel, founded 1947), the Society for the Study of German Language and Literature (Zürich, founded 1894), and the Rhaeto-Romance Society (Chur, Graubünden Canton; founded 1870).

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B. A. STAROSTIN, I. A. BOECHIN (economics), and N. A. SLIUSAREVA (linguistics)

Scientific institutions. The Geneva National Institute (founded 1853) coordinates scientific research in Switzerland. An important role in organizing scientific research is played by the Swiss National Science Foundation (1952), which includes the National Research Council, an organization made up of scientists. Most scientific work is carried out at the universities and polytechnic institutes. A number of research programs are sponsored by various governmental institutions, such as the Science Division (1969) of the Interior Department and the Study Commission for Atomic Energy (1945). The state finances the work of the Swiss Federal Institute for Snow and Avalanches Research (1942), certain observatories, scientific stations, and some scientific research institutes under the jurisdiction of the Federal Institute of Technology in Zürich, including the Swiss Reactor Center (1955) in Würenlingen.

Private research institutes and planning and design organizations are generally run by the large monopolies in such branches of industry as machine building (Brown Boveri and others) and the pharmaceutical industry (Ciba-Geigy, Hoffman–La Roche, and Sandoz). Research in the humanities is conducted, for the most part, at the universities.

In the mid-1970's about 22,000 persons, including approximately 16,000 scientists and engineers, were employed in research and development. Expenditures on science totaled some 3 million Swiss francs (about 2.5 percent of the gross national product), of which one-fifth comes from the state budget.

B. A. STAROSTIN

Press, radio, and television

As of 1980, 115 newspapers, with a total circulation of approximately 2.5 million, were being published in Switzerland. The most important German-language newspapers are *Blick* (published since 1959 in Zürich; circulation in 1980, 272,000), *Tages Anzeiger* (since 1893 in Zürich; circulation 261,000), *Neue Zürcher Zeitung* (since 1780 in Zürich; circulation 115,000), *Berner Zeitung* (since 1979 in Bern, the result of a merger of *Berner Nachrichten* and *Berner Tagblatt*; circulation 120,000), *Basler Zeitung* (since 1977 in Basel, the result of a merger of Basler Nachrichten, since 1845, and *National Zeitung* since 1842, circulation 110,000), *Vaterland* (since 1833 in Luzern; circulation 68,000), and the weekly *Die Weltwoche* (since 1933 in Zürich; circulation 127,000).

The most important French-language newspapers are *Journal de Genève* (published since 1826 in Geneva; circulation 18,700), *La Suisse* (since 1898 in Geneva; circulation 64,500), the evening newspaper *La Tribune de Genève* (since 1879 in Geneva, circulation 70,700), and *La Tribune–le matin* (since 1862 in Lausanne; circulation 49,700).

The most important Italian-language newspapers are *Corriere del Ticino* (published since 1890 in Lugano; circulation more than 27,000) and *Giornale del popolo* (since 1926 in Lugano; circulation 18,000).

The organs of the Swiss Labor Party are the daily French-language newspaper *Voix ouvrière* (published since 1944 in Geneva; circulation 8,000), the weekly German-language newspaper *Vorwärts* (since 1920 in Basel; circulation 12,000), and the weekly Italian-language newspaper *Il lavoratore* (Lugano; circulation 1,000).

The Swiss Telegraph Agency is a joint-stock company, founded in Bern in 1894. The Swiss Society for Radio and Television Broadcasting, which is also based in Bern, is a commercial organization, but it is controlled to a considerable extent by the government. Radio broadcasting was begun in Switzerland in 1923; as of 1980, programs were being broadcast in nine languages. There have been regular television broadcasts since 1958.

I. N. LOBASHEVA

Literature

The literature of the Swiss people has developed in the German, French, Italian and Rhaeto-Romance languages. The literature of each linguistic region of Switzerland, except the Rhaeto-Romance–speaking area, is linked with that of the neighboring country of the same language.

German. A literature that was distinctly Swiss began emerging at the end of the 13th century, when the forest cantons of Schwyz, Uri, and Unterwalden concluded a perpetual alliance. This literature, which featured historical chronicles and folk songs glorifying the struggle for independence, made use of legends about William Tell and Arnold von Winkelried (14th century). The minnesingers B. Steinmar (13th century) and J. Hadlaub (died c. 1340) combined traditional motifs of courtly love with realism. From the 14th through 16th centuries, poetry that was both satirical and didactic enjoyed popularity, most commonly taking the form of a fable. A unique encyclopedia of medieval life is H. von Wittenweiler's comic narrative poem *The Ring* (c. 1410), which makes use of elements of the grotesque.

By the end of the Middle Ages, Switzerland had made its final political break with the Holy Roman Empire, but intellectual ties with Germany remained the most important influence in the literary life of the German-speaking cantons. During the Reformation, religious drama was the most popular literary genre, and the works of N. Manuel (1484–1530) and P. Gengenbach (1480–c. 1525) were especially important.

The first Swiss Enlightenment figure was the patrician B. L. de Muralt (1665–1749), who lived in Bern; his *Letters About the English and the French* (in French; written 1698, published 1725) had an influence on A. von Haller and J.-J. Rousseau. An important place in the Swiss Enlightenment is also occupied by the literary critics J. J. Bodmer (1698–1783) and J. J. Breitinger (1701–76), who together founded one of the first German-language Enlightenment weeklies, *Die Diskurse der Mahlern*, in 1721. The ideas of the scholar and poet A. von Haller evolved from an enlightened opposition to the oligarchic regime (*Swiss Poems*, 1732) to a defense of orthodox religiosity and a social structure that had outlived its time (the historical novels *Usong* [1771] and *Fabius and Cato* [1774]). Sentimentality and moderate conservatism marked *The Idylls* by S. Gessner (1730–1788).

The interests of the democratic strata were expressed by the outstanding pedagogue J. H. Pestalozzi (1746–1827), the author of the novel *Leonard and Gertrude* (1780–87). *The Life and Adventures of a Poor Man in Tockenburg*, the autobiography of U. Bräker (1735–98), shows that the ideas of the Enlightenment penetrated the consciousness of the peasantry; the book is permeated with hatred for the feudal order and capitalist exploitation.

Neither romanticism nor classicism took root among the Swiss petite bourgeoisie. Although not distinguished by depth or originality, the works of G. G. de Salis-Seewis (1762–1834), M. Usteri (1763–1827), H. Zschokke (1771–1848), and J. Stutz (1801–77) laid the foundations for the realism of J. Gotthelf (1797–1854), G. Keller (1819–90), and C. F. Meyer (1825–98). These three Swiss writers were the first to be widely read outside of Switzer-

land; their works were a realistic embodiment of the growing conflict between a rejection of capitalist development and the faith of the humanist writers in the limitless potential of the people. Particularly noteworthy are Keller's novel *Martin Salander* (1886) and Gotthelf's novel *Uli the Tenant Farmer* (1849). The poems of H. Leuthold (1827–79) and F. Dranmor (real name, L. F. Schmid, 1823–88) were also marked by pessimism and a lack of faith in the bourgeois path of development. In his epic narrative poems *Prometheus and Epimetheus* (1880–81) and *Olympian Spring* (1900–07), C. Spitteler (1845–1924) attempted to create a type of modernized, humanist myth, in which ancient mythology was interwoven with modern cosmic images.

At the beginning of the 20th century, the idyllic works of J. V. Widmann (1842–1911), the Alpine romanticist E. Zahn (1867–1952), J. Heer (1859–1925), and H. Federer (1866–1928) were popular. A form of *pochvennichestvo* (a "grass-roots" literary and social movement in Russia) also appeared in Swiss literature; it is exemplified by M. Lienert and R. von Tavel, both of whom made use of local dialects. The "intellectual defense of the fatherland," which was essentially a reaction against the expansionism of fascist Germany in the sphere of culture, aided the growth of regional literature.

The rejection of Swiss reality was continued by R. Walser (1878–1956), A. Zollinger (1895–1941), and J. Schaffner (1875–1944), all three of whom revealed the contradictions within society and its lack of historical perspectives. Especially important are Walser's novels *The Assistant* (1907) and *Jakob von Gunten* (1908) and Zollinger's *Half a Man* (1929) and *Great Unrest* (1939). J. Bührer (1882–1975) was associated with the socialist movement; in his novels *Kilian* (1922) and *It Is Impossible* (1932) and his drama *Galileo Galilei* (1933), he asserted the need for a radical restructuring of the unjust social system.

After World War II, M. Frisch (born 1911) and F. Dürrenmatt (born 1921) created in their dramas and comedies readily understandable "models of the world," thus leading Swiss literature out of the dead end of regionalism and isolationism. Their best works are marked by a strong interest in sociopolitical problems, social criticism, and an unceasing quest for the human in men. Most noteworthy are Frisch's novels *Stiller* (1959) and *Homo Faber* (1957) and Dürrenmatt's dramas *The Visit* (1956) and *The Meteor* (1965).

During the 1950's and 1960's, Swiss literature witnessed an increase in social criticism, political themes, and stated rejections of petit bourgeois society. In such novels as *The Interrogation of Harry Wind* (1964) by W. M. Diggelmann (born 1927), *The Weaver of Wreaths* (1964) by H. Loetscher (born 1929), *The Mute* (1959) and *Herr Tourel* (1962) by O. F. Walter (born 1928), and *Antidotes to Enchantment* (1967) by A. Muschg (born 1934), the traditions of realism are combined with a use of modern descriptive techniques. The short stories of such authors as P. Bichsel, (born 1935), F. Federspiel (born 1931), U. Eggli, and F. Hohler show that these writers have studied motives of social behavior in a changing world; through the use of irony, skepticism, and elements of the irrational and fantastic, they undermine faith in the stability of the existing system. The novels *The Discovery Place* (1974) by W. Schmidli (born 1939) and *The Nightmare* by W. Kauer (born 1935) testify to a revival of interest in the life and struggle of the Swiss working class.

French. The beginnings of the intellectual and literary life of the French-speaking cantons—Genève, Neuchâtel, Vaud, and Valais—coincide with the Reformation. The most prominent writer in French during the 16th century was F. Bonivard (1493–1570), who is known for his *Geneva Chronicles*. Ties with the progressive wing of the Huguenots had a favorable effect on T. de Beze (1519–1605), who wrote the tragedy *Abraham's Sacrifice* (1550). During the 17th century, Swiss literature written in French, or *romande* literature, was entangled in religious controversies and was propagandistic in nature. *Les Tragiques* (parts 1–7; 1616) by T. A. d'Aubigné (1552–1630), who had come from France, reflected the age of Calvinism.

From the Protestant camp came the first signs of the intellectual awakening that weakened the hold of Calvinist dogma and paved the way for the Enlightenment. A bourgeois-democratic patriotic movement arose; the belief in a vital link between the German and French cantons of Switzerland was affirmed in the activities of the Helvetian societies. Nevertheless, the humanist traditions that were espoused by J.-J. Rousseau (1712–78) and B. Constant (1767–1830) and that grew out of ties with French culture did not find the necessary ground for development. Moral-philosophical literature of a religious nature prevailed. Of the 19th-century writers, only R. Töpffer (1799–1846) was a literary artist in the proper sense of the term; Töpffer was known for such works as *Geneva Short Stories* (1841).

In the 20th century, such writers as P. Budry (1883–1948), C. A. Cingria (1883–1954), R. de Traz (1884–1951), and A. Spiess (1876–1940) continued the process of liberating literature from religious moralizing. The most talented writer of this group was the novelist, poet, and essayist C. F. Ramuz (1878–1947), whose influence is still seen in such contemporary writers as G. Haldas, M. Dentan, J. Chessex, and M. Chappaz. Because of close contacts between literary developments in France and French-speaking Switzerland, *romande* literature was influenced by the Resistance. Thus, such Swiss poets as G. Trollier, P. L. Matthey, and J. Cuttat exhibited social concerns and enriched Swiss literature with civic motifs.

Since the early 1950's, active humanism has again given way to traditional, abstract humanism, as seen in G. Roud and M. Raymond and later in P. Jacotte and V. Godel. The change is also clearly noticeable in the novel *I* (1959) by Y. Veland (born 1925), the collection of poems *Freedom at Dawn* (1967) by A. Voisard (born 1930), the drama *Captain Karagheuz* (1967) by L. Gaulis (born 1932), and the play *Sun and Death* (1966) by B. Liegme (born 1927).

Italian. Swiss literature in the Italian language has developed in the canton of Ticino. Beginning in 1803, when Ticino joined the Swiss Confederation with the rights of an independent canton, the themes of national uniqueness and Swiss patriotism appear in its literature; the leading writers using these themes include G. Zoppi (1869–1952), V. Abbondio (1891–1958), and G. Motta (1871–1940). The literary tastes of several generations in Ticino have been molded by F. Chiesa (1871–1973), who wrote the collection of poems *Calliope* (1907), the collection *Children's Stories* (1920), and the novel *March Weather* (1925).

Fidelity to the realistic traditions of Italian-language literature has been preserved by P. Bianconi (born 1899), P. Scanziani (born 1908), and A. Jenni (born 1911); the influence of modernism is seen in such works as the novels *Evening Spider* (1950) by F. Filippini (born 1917) and *The Hostages* (1954) by G. Bonalumi (born 1920). Noteworthy poets include F. Menghini (born 1909), G. Orelli (born 1909), A. Nessi, R. Fasani, and G. Mascioni.

Romansh. Rhaeto-Romance languages are spoken in less than one-third of the canton of Graubünden; the principal Rhaeto-Romance language is Romansh. The first works of literature in the language date from the 16th century and include *The Song of the Battle of Müs Castle* (1527) by J. Travers. During the 17th and 18th centuries, didactic works of a religious and political nature appeared.

The pride of Romansh literature is its folkloric works—folk songs, folktales, legends, proverbs, and sayings that have been collected and reworked by the canton's professional writers. Calls for the preservation of the individuality of the Romansh language and literature were made by such poets as G. C. Muoth (1844–1906). Of the writers and poets from the turn of the 20th century, P. Lansel (1863–1943) is particularly noteworthy. Since 1938, Romansh has been Switzerland's fourth official language.

Enjoying renown among contemporary writers are the prose writers T. Halter (born 1914) and C. Biert (born 1920), the dramatist T. Murk (born 1915), the poet A. Peer (born 1921), and the author of children's stories S. Chönz (born 1911). Romansh is gradually being supplanted by German.

The Society of Swiss Writers, which was founded in 1912, includes representatives from all the linguistic regions. In 1969, 22 writers, including Frisch and Dürrenmatt, left the organization in a protest against its lack of political activity; they subsequently formed the Olten Group, which exists alongside the reformed Society of Swiss Writers.

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Literary theory and criticism. The most important Swiss literary critics of the 18th century were J. J. Breitinger and J. J. Bodmer, who argued against the normative poetics of classicism. Breitinger was the author of *A Critical Examination of the Miraculous in Poetry* (1740; preface by Bodmer). In the mid-19th century, such critics as J. K. Mörikofer and J. Bächdold began showing an interest in Swiss literature. A prominent representative of the intellectual-historical school was E. Ermatinger (1873–1953), who wrote *Poetry and the Intellectual Life of German Switzerland* (1933). In the 20th century, Switzerland has had many comparative philologists, including F. Ernst (1889–1958), who distinguished Helvetian studies from the general field of Romance and Germanic philology; Ernst saw Swiss culture essentially as an intermediary between the German, French, and Italian cultures.

By the early 1940's, the Zürich school (also known as the school of interpretation) had been formed, including such scholars as E. Staiger (born 1908), who wrote *The Art of Interpretation* (1955), M. Wehrli (born 1909), who wrote *General Literary Theory and Criticism* (1951), and W. Kaiser. Members of the Zürich school analyze literary works outside the social and historical contexts in which the works were written. In his *Tragic History of Literature*, W. Muschg contrasted a romantic longing for the "old" Europe to his view of the disintegration of contemporary bourgeois culture.

V. D. SEDEL'NIK

Architecture and art

The art of Switzerland, although it has developed in close connection with that of France, Germany, and Italy, has nevertheless retained a distinctive national style. The earliest works of art found on the territory of Switzerland date to the period of the La Tène culture and to Roman times. The oldest monuments of Switzerland's architecture are linked with the art of the Merovingians, for example, the baptistery at Riva San Vitale (fifth–sixth centuries). Structures of the Carolingian Renaissance, including the Abbey of St. Gallen (founded seventh century, retains the plan of the ninth century), are impressive in size and tend toward a complex reworking of architectural forms.

In the monumental art of the Carolingian period, artists revived certain devices of visual illusion from classical painting, for example, the frescoes from the Church of St. Johann in Münster (ninth century). Structures in the Romanesque style include the Grossmünster in Zürich; the transitional Romano-Gothic style is represented by the cathedrals in Basel (mainly 1185–1200), and in Chur (1171–1282). These buildings closely resemble the architecture of France and Germany. Gothic structures from the 13th through the 15th centuries are marked by weak articulation of mass and restraint in the use of sculptural decoration, for example, the cathedral in Lausanne (1175–1275). From the late 13th through 15th centuries, Gothic sculpture and painting developed. Important examples are the fresco cycle of the church in Winterthur (c. 1336), book miniatures executed at the school of St. Gallen, and stained-glass windows, including those of the church in Königsfelden (1325–30). Easel painting was represented by the works of K. Witz.

In the 16th century, the Renaissance style reached Switzerland, as seen in the arcaded street in Lugano (16th century) and the city hall in Basel (1504–14). Decorative painted facades were typical of urban architecture during the 16th and 17th centuries, for example, the paintings on the Knights' House in Schaffhausen by T. Stimmer (1557). The traditions of the Renaissance were maintained in 17th-century architecture, notably in the town hall in Zürich (1694–98).

Painting and the graphic arts reflected the everyday life of the Swiss, especially the works of U. Graf and N. Manuel Deutsch. H. Holbein the Younger, who worked in Basel, had a considerable influence on 17th-century Swiss portrait painting. The baroque style predominated in the religious architecture of the 17th and 18th centuries, one good example being a church in St. Gallen (begun 1755).

Of special interest in 18th-century art are the pastels of J.-E. Liotard, the landscapes and engravings of S. Gessner, and the portraits of A. Graff and I. G. Füssli, which combine classicist austerity with romantic fantasy. The Swiss minor masters, who produced genre scenes, landscapes, and historical paintings, included I. L. Aberli and S. Freidenberger. Classicism prevailed in Swiss architecture at the end of the 18th century. The facades of public and residential buildings were modeled on the classical structures of France. Typical examples are the town hall in Neuchâtel (1782–90, architect P. A. Paris) and the railroad station in Zürich (1847). Eclecticism took root in the mid-19th century, and *art nouveau* became popular toward the end of the century. Neither classicism nor romanticism attained any significant development in the representational art of the early 19th century. Working in the mainstream of German romanticism were G. L. Vogel and H. Hess, as well as the graphic artists R. Töpffer and M. Disteli. The painter L. Rober belonged to the romantic school, while C. Gleyre belonged to the academic trend; both worked in France.

In the mid-19th century, Switzerland's artists turned to subjects from the life of the people and strove to convey the beauty of the Swiss countryside. Realistic landscapes were painted by A. Calame, and genre scenes by F. Buchser, A. Anker, and B. Vautier, the last of whom worked in Germany. At the turn of the 20th century, Swiss painting was strongly influenced by the works of A. Boecklin. F. Hodler depicted scenes from Swiss history in the style of national romanticism. Beginning in the late 19th century, impressionism, postimpressionism, and symbolism developed in Swiss painting. Outstanding painters included F. Vallotton, T. Steinlen (both of whom worked in France), C. Amiet, R. Auberjonois, and A. Giacometti.

At the beginning of the 20th century, Swiss architects employed new materials while retaining traditional architectural forms, for example, in the University of Zürich (1911–14, architect K. Moser). In the mid-1920's a renewed interest in folk architecture was reflected in urban and suburban buildings modeled after the traditional chalet. During the 1920's, the devices and methods of functionalism were introduced in the designs of O. Salvisberg and A. Meili, and in the 1930's elements of rationalism took hold. Le Corbusier was a native of Switzerland.

Residential districts of the major Swiss cities, built during the 1950's, 1960's, and 1970's, were situated among greenery, far from main roads and industrial enterprises. Such settlements include Letzigraben, near Zürich (1952–55, architects A. H. Steiner and others), and Halen, near Bern (1959–61, architects S. Gerber and others). The growth of industrial centers in various regions of Switzerland created a need for satellite cities, such as Le Ligon, near Geneva (1962–70, architects H. Ammann, P. Ammann, and others). In Switzerland's mountain regions, terrace apartments have been built on the sunny slopes of the mountains, for example, the cities of Klingnau and Brugg.

During World War I (1914–18), dadaism arose in Switzerland, and expressionism was represented in the works of P. Klee. In monumental painting, prominence was gained by a group of masters of religious church paintings, headed by H. Altherr and A. Cingria. The monumentalist A. Blansch turned to subjects drawn from the labor and life of the Swiss people. Abstractionism was the predominant trend in Swiss painting from the 1930's to the 1950's, particularly in the sculptures of Taeuber-Arp and the paintings of J. Arp and R. P. Lohse. Swiss pictorial art of the 1960's and 1970's has reflected the basic trends and schools of European art. Of special note is the painter and graphic artist H. Erni, a representative of the progressive wing of Swiss art. In 20th-century sculpture, O. C. Bänninger and J. Probst have created psychologically complex works, while H. Haller is known for his impressionistic pieces.

Swiss folk art is renowned for its carved wooden articles, often decorated with ornamental or narrative paintings. Ceramics, woven goods, and leather and metal articles are also of high quality.

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Music

The music of Switzerland is based on various national traditions. Both folk and written music manifest, in addition to traits that are common to other national traditions, characteristics that are distinctive of Swiss music as a whole. Important folk-song genres include the songs that developed in various regions of the country between the 13th and 16th centuries, which were patriotic, primarily antifeudal, in nature, and a genre peculiar to the Alpine mountaineers—the yodel. Related to the folk song are the calls performed by herdsmen on alpenhorns. Swiss folk dances include the *Vögelschottisch* and round dances.

The musical art that emerged in the medieval monasteries was connected with liturgical music. The monk Notker Balbulus ("the Stammerer"), who wrote on music theory, introduced sequences in the tenth century; Tuotilo introduced tropes. Glareanus (16th century), in his treatise *Dodecachordon*, classified the 12 basic church modes. Secular music was represented by the minnesingers U. von Singenberg and B. Steinmar in the 13th century and by J. Hadlaub in the beginning of the 14th century.

Notable figures of the 16th century included the masters of choral polyphonic church music L. Senfle, who lived for a time in Munich, L. Bourgeois of Geneva, J. Wannemacher of Bern, and G. Meyer of Basel. In addition to J. U. Sulzberger, important composers of the 17th century included V. Molitor, who also wrote secular music. In the 17th century a type of musical association known as the *collegium musicum* was established in the cities.

In the 18th century a variety of genres underwent development. Instrumental music and music for the theater were represented by the Singspiels of J. Meyer von Schauensee, which were staged in Luzern. Overtures and trio sonatas were written by H. Albicastro (H. Weissenberg), and piano compositions by J. K. Bachofen and J. H. Egli.

The first operas—German and Italian—were staged in Zürich in 1788. Operas by such Swiss composers as F. Schnyder von Wartensee and H. Götz were staged periodically in the 1820's in Zürich and on a regular basis beginning in 1834. Beginning in the mid-19th century the operas of R. Wagner dominated the stage. In the late 19th century the operas of H. Huber (five operas) and O. Schoeck were staged; both composers also wrote symphonies and other works.

In the 19th century a music education movement, inspired by the educational theories of J. G. Pestalozzi (late 18th to early 19th centuries), became widespread; several choral societies and music educational institutions were established. Prominent Swiss composers of this period were also teachers or served as the directors of choral societies or schools; in addition to F. Hegar, they included E. Jaques-Delacroze, who devised an educational system based on rhythm.

The leading Swiss musical figures of the early 20th century were G. Doret, V. Andreae, E. Bloch (later a resident of the USA), H. Gagnebin, H. Suter, and E. Ansermet, who in 1918 founded and became director of the Orchestre de la Suisse Romande. The music of this period combined the traditions of the late German romantics, notably R. Wagner and R. Strauss, with the musical devices of C. Debussy and M. Ravel; this synthesis is especially evident in F. Martin's work, in a variety of genres, in the 1920's and 1930's. A. Honneger, also active in this period, was of Swiss origin. Musicologists included M. Lussy, K. Nef, A. Moser, and J. Handschin.

Prominent composers of the mid-1930's were W. Burkhard, P. Müller, C. Beck, and A.-F. Marescotti. In the 1940's, W. Vogel became the first Swiss composer to use serial technique; he was followed by various composers, including R. Liebermann, in such works as the opera *Leonora 40/45* and the *Concerto for Jazz Band and Orchestra*, and H. Sutermeister, in the operas *The Enchanted Isle* and *Raskolnikoff* and in instrumental and choral works. Musicologists of this period included W. Schuh and A.-E. Cherbuliez.

The most widely known musical figures since the 1950's have been A. Schibler, J. Wildberger, K. Huber, and R. Kelterborn. The latest experimental music has been written by such composers as H. Holliger, J. Wittenbach, U. P. Schneider, and R. Moser. Certain types of jazz have made inroads in Switzerland, and folk-influenced light music is performed, notably by the singer and yodeler F. Liechti.

The musical life of Switzerland's cities has been shaped, since the first decade of the 20th century, by the presence of some of Europe's greatest musical figures, notably F. Busoni, S. V. Rachmaninoff, I. V. Stravinsky, R. Strauss, P. Hindemith, B. Martinů, and E. Petri. Major international music organizations are located in Switzerland, which is the site of music festivals, symposia, and competitions, including the international Concours d'Exécution Musicale.

In the 1970's, Switzerland, in addition to more than ten symphony orchestras, had chamber orchestras and ensembles (notably Basel's chamber orchestra and string quartet), opera companies, and choral societies. Prominent Swiss performers include the conductors E. Appia and N. Aeschbacher, the pianists E. Fischer and N. Magaloff, the violinists A. Pochon and F. Hird, the singers E. Haefliger, H. J. Rehfuss, L. Della Casa-Debeljevic, and E. Mathis, and the church organists K. W. Senn, E. Kaufmann, and H. Funk.

Learned societies and educational institutions include the Association of Swiss Musicians and Composers, the Union of Swiss Musicians, the Basel Academy of Music, the Conservatory and Higher School for Music in Zürich, and conservatories in Geneva and Lausanne. The universities, as well as many municipal and church schools, have music departments. The major Swiss music publications are the *Schweizerische Musikzeitung* and *Acta musicologica*, an international scholarly journal.

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DZH. K. MIKHAILOV

Theater

The theater in Switzerland developed simultaneously in French, German, and Italian. The traditions of folk amateur productions are still drawn upon and stem from the mystery plays, Shrovetide plays, and other dramatic forms of the Middle Ages; in the 16th century, folk drama became the leading genre, and from the time of the Reformation it gave voice to popular movements. Owing to persecution by the church in the 17th century for its use of political satire and for the secular themes and farcical nature of its productions, the theater lost ties with reality.

The first professional troupes in Switzerland appeared at the turn of the 19th century—in St. Gallen and later in such cities as Lausanne and Geneva. They staged primarily plays by German and French authors. Until the late 1930's, the abundance of foreign touring companies retarded the development of Switzerland's own companies. In the 1940's, however, the Swiss theater, which for the most part used the German language, experienced a rebirth, largely as a result of an influx of actors from Nazi Germany and countries occupied by the Nazis. After World War II, the works of the playwrights M. Frisch and F. Dürrenmatt brought new life to the Swiss theater.

Among individual theaters, one of the most important was the Schauspielhaus in Zürich (founded 1908). Another Zürich theater, the Theater am Neumarkt, was noted for dealing with the political problems of the day and for experimenting with new forms of communication with the audience. Under the direction of W. Duggelin, the theater in Basel became a bastion of progressive ideas during the 1960's. In addition to works by such established authors as B. Brecht, J. Anouilh, and Dürrenmatt, it staged plays by the younger generation of Swiss playwrights; the theater also arranged discussion sessions dealing with political topics, such as the general strike of 1918.

Other cities with professional troupes include St. Gallen, Luzern, Chur, Biel, and Solothurn. Many of the medium-sized amateur theaters stage productions that are notable for their innovations and originality. In the French-speaking cantons, there are five major theaters—the drama center in Lausanne, the theater in Carouge, the folk theater in La Chaud-de-fonds, La Comédie in Geneva, and the Nouveau Theatre de Poche in Geneva. Many professional troupes originated as amateur groups.

International theater festivals are held in June in Lausanne.

V. D. SEDEL'NIK

Circus. For generations, tightrope walkers have performed at fairs in Switzerland, and there have been traveling troupes of various kinds. The brothers Friedrich, Rolf, Karl, and Eugen Knie, who were members of the oldest family of tightrope walkers in Switzerland, opened a big top circus in Bern in 1919. The Knie Brothers' Swiss National Circus is a traveling circus, and for part of the year it appears in countries other than Switzerland; foreign performers also appear with the company. The Knie Circus is noted for its exotic animal acts and for the quality of its equestrian acts.

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A. IA. SHNEER

Motion pictures

The first full-length dramatic film made in Switzerland was *The Origins of the Confederation* (1924), directed by E. Harder. Until the 1960's, Swiss motion pictures were primarily in German. In addition to drawing-room comedies, melodramas, short scenic films, and advertising pictures, Switzerland produced films of greater merit, such as the works of the progressive documentary film-makers L. Wechsler and E. Leiser, as well as the patriotic dramatic films *The Archer Wipf* (1938) and *The Last Chance* (1945) by L. Lindtberg. Among the best-known French-speaking film-makers are the documentary directors C. Duvanel and H. Brandt, who began directing political documentaries in the 1950's.

In 1967 the young directors C. Champion, F. Reusser, J. Sandoz, and Y. Yersin created the film *Four Women*, which comprised four stories describing the destinies of four simple women of various ages. In 1968 the directors A. Tanner, C. Coretta, J. L. Roys, M. Soutter, and J. J. Lagrange (later replaced by Yersin) formed the Group of Five, which opposed the aestheticizing of reality practiced by many directors. Tanner depicted ordinary people and the difficulties of real life in films such as *Salamander* (1971), *Return From Africa* (1973), and *The Middle of the World* (1975), as did Goretta in *The Invitation* (1972) and *Not as Wicked as That* (1976). Among the noteworthy German-speaking directors of the 1970's were R. Lyssy, who directed *The Confrontation* (1975), T. Koerfer, and D. Schmid.

Between 16 and 18 dramatic films are produced annually in Switzerland. The Swiss cinema centers in Zürich and Lausanne are popular, and there is a motion-picture department in the Schauspiel Academy. Since 1946, international film festivals have been held in Locarno.

M. G. MARETSKAIA [29–942–2]

SZAFER, WŁADYSŁAW. Born July 23, 1886, in Sosnowiec; died Nov. 16, 1970, in Kraków. Polish botanist and public figure. Member of the Polish Academy of Learning in Kraków from 1920 and of the Polish Academy of Sciences from 1952 (vice-president from 1957 to 1961).

Szafer studied at the universities of Vienna and Lwów (L'vov). He was a professor at the University of Kraków and became director of the Botanical Garden in 1917. During the fascist occupation he was the rector of an underground university. Szafer was the organizer and first director of the Institute of Botany of the Polish Academy of Sciences (1951–63) and of the academy's Institute of Nature Conservation (1951–60). He was chairman of the State Council on Nature Conservation from 1919 to 1949.

Szafer's main works were on the systematics and ecology of vascular plants, botanical geography, geobotany, paleobotany, and conservation. He was the organizer and editor of *Flora of Poland* (vols. 1–9, 1919–60), *Vegetation of Poland* (vols. 1–2, 1959), and *Nature and Resource Conservation* (vols. 1–2, 1965). He was the author of *Memoirs of a Naturalist* (1973).

Szafer received the State Prize of the Polish People's Republic in 1949. He was a member of many foreign academies of sciences.

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D. V. LEBEDEV [29–887–2]

SZAJNOCHA, KAROL. Born Nov. 20, 1818, in Komarno, near Sambor; died Jan. 10, 1868, in L'vov. Polish historian, publicist, and writer.

In the 1830's, Szajnocha took part in the activities of clandestine patriotic organizations in Galicia. He was the author of works on the history of Poland from ancient times to the 17th century. Szajnocha's glorification of the national past and his skillful exposition ensured the popularity of his historical works.

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Dzieła, vols. 1–10. Warsaw, 1876–78.

In Russian translation:

Iadviga i Iagailo, vols. 1–2. St. Petersburg, 1880–82. [29–811–1]

SZCZECIN, a city and port in Poland. Situated on the lower course of the Odra River, 65 km from the Baltic Sea. Administrative center of Szczecin Województwo. Population, 376,000 (1976). Szczecin is the "gate to the sea" of the Upper Silesian coal field, with which the city is connected by an electrified railroad and by river. Coal, general cargo, and imported iron ore and grains are transshipped at the port. Szczecin is Poland's principal port for international transit; its freight turnover in 1975 amounted to 16 million tons. More than one-half of the country's merchant marine and a considerable portion of its fishing fleet are registered in the city.

Szczecin is a center for shipbuilding, metallurgy, and the production of construction cranes, cable, and automotive parts. It also produces viscose fiber, superphosphate, paper, and cement. Other branches of industry are food processing, woodworking, the manufacture of clothing, and ferrous metallurgy. The city has polytechnical, medical, and agricultural institutes, as well as a higher maritime school.

Szczecin, which was mentioned for the first time in the ninth century, was once a settlement of the Pomeranians and had a temple to the Slavic god Triglav. In the late tenth century it became part of the old Polish state, and later it was the administrative and trade center of the principality of Western Pomerania. In 1121 it was again united with the Old Polish lands. In the late 12th century it became part of the Holy Roman Empire. By the late 13th century the city was known under its German name, Stettin, and had become a member of the Hanseatic League. In 1648 it was taken by Sweden, and in 1720, by Prussia. Despite prolonged germanization, Szczecin developed as a Polish city. After its liberation by Soviet troops on Apr. 26, 1945, it again became part of Poland.

Modernized in the late 19th century, Szczecin is now a system of star-shaped public squares connected by streets and boulevards. Remains of the city fortifications (13th–14th centuries) have been preserved, as well as a baroque gate (18th century). Other structures of interest include the Gothic city hall (13th century), the Church of St. Peter and St. Paul (second half of the 15th century), and the Renaissance castle (begun 14th century, rebuilt 15th–early 17th centuries), as well as numerous houses and palaces in the Gothic, baroque, and classical styles.

[29–1602–4]

SZCZECINEK, a city in northwestern Poland, in Koszalin Województwo. Population, 34,000 (1976). Szczecinek is a railroad junction. It manufactures metal fittings, fiberboard panels, furniture, chemicals, food products, and linen. [29–1603–1]

SZCZECIN WOJEWÓDZTWO, an administrative and territorial unit in northwestern Poland, located near the Baltic Sea. Area, 10,000 sq km. Population, 854,000 (1976), including more than 70 percent urban dwellers.

Szczecin Województwo, the administrative center of which is the city of Szczecin, is an industrial and port region with a heavy agricultural sector. Approximately 100,000 persons are employed in industry (1974), three-fifths of whom are concentrated in Szczecin, the *województwo's* chief industrial center and port. The region produces ships, locomotives, various machines, cast-iron goods, and chemicals, mainly phosphate and other fertilizers and sulfuric acid. Food-processing enterprises produce sugar and fish, and wood products are manufactured. Industrial centers in addition to Szczecin include the cities of Police, Świnoujście Międzyzdroje, and Stargard.

More than one-fourth of the region's territory is covered with forest, predominantly pine and beech; 40 percent of the land is cultivated, and an additional 10 percent is used for growing hay. Crops include wheat, sugar beets, barley, rye, potatoes, and rape. Meat and dairy cattle are raised, as well as swine. Fishing is also important.

In 1976 the freight turnover of the seaports, Szczecin and Świnoujście Międzyzdroje, was 24.3 million tons. Coal is exported, while iron ore, phosphates, and grain are imported. Shipping is important along the Odra River and on the Stettin Lagoon, an inlet of the Baltic Sea. [29–1603–3]

SZCZEPAŃSKI, JAN. Born Sept. 14, 1913, in Ustroń. Polish sociologist. Member of the Polish Academy of Sciences (1964).

Szczepański became a professor at the University of Łodź in 1951. He was director of the Institute of Philosophy and Sociology from 1968 to 1975, and he became vice-president of the Polish Academy of Sciences in 1972. He was president of the International Sociological Association from 1966 to 1970.

Szczepański's principal works deal with the history and theory of sociology, the social structure of Polish society, and the sociology of higher education. Beginning in 1958 he directed the publication of *A Study of the Position of the Working Class and the Intelligentsia* (vols. 1–28, 1959–67). Szczepański received the State Prize of the Polish People's Republic First Class in 1974.

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SZENWALD, LUCJAN. Born Mar. 13, 1909, in Warsaw; died Aug. 22, 1944, near Garwolin. Polish poet. Joined the Communist Party of Poland in 1932.

Szenwald studied at Warsaw University. He was first published in 1925. In 1926 he joined Kwadryga, a literary group whose poetic practice was characterized by social awareness, a tendency toward reflectiveness, and fidelity to the traditions of C. Norwid. In his works, which include poems, the narrative poem *Scene By a Brook* (1936), and radio dramas, Szenwald dealt with the social and political problems of his day. His literary manner reflected the traditions of the classics. Szenwald translated works by Shakespeare, P. B. Shelley, M. Gorky, and V. V. Mayakovsky.

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A. V. LIPATOV [29–1126–1]

SZERMENTOWSKI, JÓZEF. Born Feb. 16, 1833, in Bodzentyn, near Kielce; died Sept. 6, 1876, in Paris. Polish painter; representative of democratic realism.

Szermentowski studied in Warsaw with F. Kostrzewski in 1851 and 1852, at the School of Fine Arts from 1852 to 1857, and at J. Kossak's studio. He moved to Paris in 1860. Szermentowski painted melancholy, softly colored landscapes and genre landscape compositions marked by the influence of the Barbizon school; of particular interest are *Polish Village* (c. 1868, National Museum, Kraków) and *Village Church* (1870, National Museum, Poznań).

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Jakimowicz, I. *J. Szermentowski*. Wrocław, 1950. [29–1142–2]

SZLACHTA, in several Central European countries, especially Poland and Lithuania, the principal segment of the ruling class in the feudal period. Originally the *szlachta* was a knighthood that constituted the lowest group of secular feudal lords. As it became consolidated into an estate between the 14th and 16th centuries, the lowest stratum of secular feudal lords, or nonheraldic *szlachta* (the *włodycy* in Poland and the *pantsirnye boiare*, or armored boyars, in the Grand Duchy of Lithuania), was excluded from it (*see* KOSZYCE PRIVILEGE OF 1374, NIESZAWA STATUTES OF 1454, RADOM CONSTITUTION OF 1505, and LITHUANIAN STATUTES).

As the *szlachta* gained political strength, the highest group of secular feudal lords, the magnates, was legally incorporated into it. Between the 16th and 18th centuries the state structure of the Polish-Lithuanian Commonwealth became that of a *szlachta* republic. The Polish *szlachta*, which included the categories of "land-starved" and "landless" *szlachta*, was relatively large in size: in the 16th century it made up 8 percent of the population as a whole and more than 20 percent of the population in Mazovia and Podlasie. The estate enjoyed a privileged and dominant status and was by tradition forbidden to engage in certain occupations, such as handicrafts and trade.

After the partitions of the Polish-Lithuanian Commonwealth in the 18th century, the *szlachta* was, as a rule, granted equal status with the nobility of Russia, Austria, and Prussia. Among the measures implemented by the tsarist government after the suppression of the Polish Uprising of 1830–31 was the "sorting out" of the *szlachta*, by which the members of the petty *szlachta* became *odnodvortsy* (single-homesteaders). The term *szlachta* (*šlechta*) is sometimes applied in historical literature to an estate of feudal lords in the Czech lands, in which the highest level was made up of the *páne* and the lowest consisted of the *zemane*.

I. S. MILLER [29–1308–4]

SZUBRAWCY (the Rogues), the humorous self-appellation of a literary and social circle of the Polish intelligentsia in Vilnius from 1816 to 1822.

The Szubrawcy published the satirical weekly *Wiadomości Brukowe* (Street News), in which, in the spirit of liberal enlightenment, they criticized obscurantism, the arrogance of the Polish gentry, and the blind imitation of foreign fashion. The circle adopted a ritual that parodied the rites of the Masons. The Szubrawcy maintained ties with the Philarets and Philomats, which were patriotic youth groups. The Szubrawcy disbanded after the authorities closed down their journal and as a result of persecution by the Masons and other organizations. [29–1519–1]

SZUJSKI, JÓZEF. Born June 16, 1835, in Tarnów; died Feb. 7, 1883, in Kraków. Polish political figure and historian.

Szujski was a member of an insurgent organization in Galicia in 1863; after the defeat of the Polish Uprising of 1863–64, he condemned the national liberation movement. One of the ideologists and leaders of the conservative party known as the Stańczyks, he became a deputy to the Galician *sejm* in 1867 and a member of the House of Lords of the Viennese Reichsrat in 1879.

Szujski became a professor of Polish history at the Jagiellonian University in 1869. In 1872 he was made secretary of the Academy of Sciences in Kraków. In his historical works Szujski was an apologist for strong monarchical authority and for the Catholic

Church; he glorified the expansionist policy of the feudal Polish-Lithuanian Commonwealth.

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Dzieła, vols. 1–20. Kraków, 1885–96. [29–1523–2]

SZUMKA (also *shumka*), a merry folk song and dance popular in Poland and in the western Ukraine. The *szumka* is performed in 2/4 time, in a tempo close to that of the *kolomyika*. It is also played as an instrumental piece, for instance, M. Zawadzki's piano arrangements. [29–1542–3]

SZWARCE, BRONISŁAW ANTONI. Born Oct. 7, 1834, on the estate of Lôchrist, near Dinan, France; died Feb. 18, 1904, in L'vov. Figure in the Polish and Russian revolutionary movements; journalist.

Szwarce, the son of an émigré who fought in the Polish Uprising of 1830–31, graduated from the Ecole Centrale des Arts et Manufactures in Paris in 1855; in 1860 he began working on the construction of the St. Petersburg-Warsaw railroad. In the summer of 1862 he embarked on a course of illegal activity. He became a member of the Central National Committee, the organization of the Reds, in which he sided with the left revolutionary-democratic wing as an advocate of radical agrarian reform and the establishment of an alliance with Russian revolutionaries.

On Dec. 11 (23), 1862, in Warsaw, Szwarce was placed under arrest, after having offered armed resistance. On May 19, 1863, he was condemned to death, a sentence that was commuted to life at hard labor. He spent about 30 years in prisons and in exile; until 1870 he was incarcerated at the Shlissel'burg Fortress. In 1881 he took part in the work of the Red Cross of the People's Will in Tomsk. In 1892, Szwarce went to Galicia, where he contributed to the democratic press and carried on a polemic with proponents of a conservative historical interpretation of the Polish Uprising of 1863–64.

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SZYFMAN, ARNOLD STANISŁAW. Born Nov. 23, 1882, in Ulanów; died Jan. 11, 1967, in Warsaw. Polish stage director and theatrical figure.

Szyfman organized and headed the first literary cabaret in Warsaw, the Momus, in 1908. In 1913 he founded the Teatr Polski, serving as administrative director during the years 1915–18, 1939–45, and 1949–55 and as honorary director from 1957. He simultaneously headed Warsaw's Teatr Mały from 1918 to 1939 and directed the restoration of the Teatr Wielki from 1950 to 1965. His productions included Krasiński's *Iridion* (1913) and *The Undivine Comedy* (1920), Shaw's *Pygmalion* (1914), Shakespeare's *Hamlet* (1922, 1947), and Aeschylus' *Oresteia* (1947).

Szyfman staged scrupulously faithful versions of the classics, creating an artistic whole by harmoniously integrating all the expressive elements of a play. Szyfman brought together the best Polish actors in the companies he directed. He was the author of scholarly works and reminiscences about the theater.

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SZYMANOWSKA, MARIA (née Wołowska). Born Dec. 14, 1789, in Warsaw; died July 25, 1831, in St. Petersburg. Polish pianist and composer.

Szymanowska studied piano under A. Lissowski and G. Gremm, and possibly composition under F. Lessel, in Warsaw. In the second decade of the 19th century she began giving concerts and composing. Beginning in 1815 she toured numerous Western European cities and Russia, where in St. Petersburg she received the title of court pianist in 1822; she subsequently appeared in Kiev, Moscow, L'vov, and Kremenets. In 1828 she took up residence in St. Petersburg, where she taught, composed music, and gave concerts; among those who visited her home were A. S. Pushkin and A. Mickiewicz, who was later to marry her daughter. Goethe, L. Cherubini, J. N. Hummel, and J. Field dedicated works to her.

A precursor of F. Chopin, Szymanowska contributed to the formation of a Polish national style. In her compositions, she made use of the musical idiom and rhythms associated with folk dances, and she created works in a variety of miniature piano genres: preludes, nocturnes, études, and dances. In her songs set to the lyrics of Polish and French poets, Szymanowska combined features characteristic of Polish music with the Western European lyric song, whose traditions she transformed to suit her purposes.

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O. V. LEVTONOVA [29–1198–5]

SZYMANOWSKI, KAROL. Born Oct. 6, 1882, in Timoshovka (Tymoszowka), in the Ukraine; died Mar. 29, 1937, in Lausanne. Polish composer, pianist, teacher, music critic, and figure in the music world.

Until 1900, Szymanowski studied at the school of his uncle G. V. Neigauz (Gustaw Neuhaus) in Elizavetgrad (now Kirovgrad). From 1901 to 1905 he studied music theory under M. Zawirski and composition under Z. Noskowski in Warsaw. In 1905 he became a member of the Publishing Society of Young Polish Composers, which was shortly thereafter renamed Young Poland in Music.

Szymanowski's oeuvre is divided by convention into periods that coincide roughly with World War I and with the establishment of the Polish state. His work was influenced not only by the musical cultures of Poland and Russia, particularly by F. Chopin, A. K. Liadov, and A. N. Scriabin, but by his encounters at various periods of his career with the music of R. Wagner, R. Strauss, C. Debussy, G. Mahler, and I. F. Stravinsky and with the culture of the Near East during trips to Algeria and Tunisia in 1914. In the first two decades of the century he gave concerts abroad, performing his own works for piano in composer's recitals; many of these piano pieces gained renown, notably the three poems for piano entitled *Métopes* (1905) and the Sonata No. 2 for Piano, both of which were also performed by G. G. Neigauz (Harry Neuhaus).

Other important works from Szymanowski's first, longest, and stylistically most diverse creative period are the *Concert Overture* (1905; revised version, 1912), the Symphony No. 2 (1910), several compositions for violin and piano, and songs set to the words of German and Polish poets and ancient poets of the Near East. He lived in Vienna from 1911 to 1914, when he undertook a journey through Italy and Sicily.

During his "war period," Szymanowski lived mainly in Timoshovka, which he left occasionally to give concerts in Kiev, Moscow, and Petrograd. The works from these years reflect his interest in Near Eastern poetry and philosophy. Using the coloristic discoveries of the French impressionist composers, he created a personal style that combined a rich tonal color and sumptuous orchestration with an ecstatic emotional expressiveness that recalls the music of Scriabin; these qualities are most evident in the Symphony No. 3 (*Song of the Night*; 1916), scored for solo voice, chorus, and orchestra and set to the words of the medieval Persian poet Rumi; *Mythes* (1915); *Masques* (1916), for violin and piano; the Sonata No. 3 for Piano (1916–17); the Concerto No. 1 for Violin (1916); the String Quartet No. 1 (1917); and the opera *King Roger* (1918–24; staged 1926 in Warsaw). In 1917 and 1918 he took part in concerts for workers and soldiers in Elizavetgrad.

In late 1919, Szymanowski took up residence in Warsaw, where he wrote a series of articles on the role of aesthetics and music criticism and on such composers as Chopin, Scriabin, Stravinsky, and M. Ravel. In 1920 and 1921 he toured the USA (including Florida) and Cuba with the violinist P. Kochański. In 1922 he took up residence in Zakopane, where he lived off and on for many years and where he studied the local musical folklore of the Podhale region.

In his last creative period, the "folkloric period" (1920–37),

Szymanowski made extensive use of national, primarily Góral, folk music, notably in the symphonic poem with singing and dancing *Harnasie* (1923–31; staged 1934 in Prague), which is based on the music of the Górals, and in the 20 mazurkas written between 1924 and 1926. From 1927 to 1929 and from 1930 to 1933 he taught; as rector of the Warsaw Conservatory he carried out a reform of music education. From 1933 to 1936 he toured Scandinavia and Europe and appeared in Moscow and Leningrad. From 1928 to 1930 and in 1936 and 1937 he underwent medical treatment in Austria and Switzerland.

Szymanowski's late works exhibit a marked tendency toward greater melodic and harmonic clarity, simplicity of style, and transparency of orchestration; at the same time the composer achieved original harmonic and tonal effects by combining modern compositional techniques with elements of national folk music. Works of this final period include the *Stabat Mater* (1926), the Concerto No. 2 for Violin (1933), *Six Kurpian Songs* (1929 and 1932), and the *Symphonie Concertante for Piano* (1932).

Szymanowski, the greatest Polish composer of the 20th century, laid the foundations of the modern Polish school of composition.

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O. V. LEVTONOVA [29–1199–1]

SZYMONOWICZ, SZYMON (also Szymonowic; in Latin, Simonedes). Born Oct. 24, 1558, in Lwów; died May 5, 1629, in Czarnięcin, near Zamość. Polish poet.

Szymonowicz studied at the Kraków Academy (the University of Kraków). His works, which are in Polish and Latin, include panegyrics, dramas, odes, hymns, and epithalamiums. His cycle *Eclogues* (*Sielanki*; 1614, reprinted 1626, written in the form of a dialogue), imitated classical models to a certain extent; however, they are filled with references to everyday Polish life and reveal the influence of local oral folk poetry. In the idyll *The Reapers*, which A. Mickiewicz considered typically Polish and highly truthful, Szymonowicz portrayed the burden of forced peasant labor.

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[29–1203–1]

SZYSZKOWSKI, BOGDAN. Born June 20, 1873, in Tribukhi, in what is now the Ukrainian SSR; died Aug. 13, 1931, in Myślenice. Polish physical chemist. Member of the Polish Academy of Sciences (1929).

Szyszkowski graduated from the University of Kiev in 1896 and joined the staff of the university in 1907. In 1920 he became a professor at the Jagiellonian University in Kraków. Szyszkowski's principal works deal with colloidal chemistry and the theory of solutions. In 1908 he experimentally established the connection between surface tension and the concentration of aqueous surfactants. This relationship is expressed by the Szyszkowski equation.

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[29–1249–4]

TAMPING MACHINE, a track machine for tamping the ballast layer of a track superstructure. There are both cyclic and continuous-action types. Cyclic tampers, mounted on railroad car frames, pack the ballast layer separately beneath each tie. They operate by means of 16 or 32 vertical tamping arms that oscillate simultaneously through the action of an eccentric shaft and that close and open by pairs through the action of a squeezing mechanism (see Figure 1). An internal-combustion engine with a hydraulic drive is used to turn the eccentric shaft and squeezing mechanism. The oscillating arms of the machine dig into the ballast layer beneath the tie being tamped and close, thus pressing the ballast underneath; they then draw apart and lift up, and the machine moves on to the next tie. The tamping cycle takes 6–8 seconds. Such machines can tamp up to 700 ties per hr. Cyclic tamping machines that tamp two ties simultaneously have also been developed. They can handle up to 2,000 ties per hr.

Modern tamping machines are equipped with automatic aligning systems. The system consists of a spotlight or laser and a photodetector. The spotlight or laser is mounted on a cart up to 150 m in front of the tamping machine and directs a beam of light toward the machine; the photodetector is connected to the track being aligned. The rails and ties are raised until the beam strikes the photodetector.

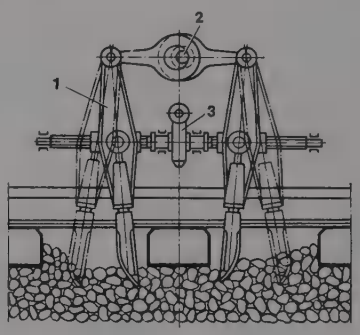

Figure 1. Diagram of the working element of a tamping machine: (1) tamping arm, (2) eccentric shaft, (3) squeezing mechanism

The working elements of a tamping machine designed for continuous operation are mounted on a railroad car frame or crawler chassis; they consist of wedge-shaped tamping plates equipped with internal vibrators and suspended on springs. The ballast layer is tamped by the vibration and by the wedge shape of the plates moving parallel to the faces of the ties. Aligning-tamping-finishing machines operate on the same principle to perform the entire cycle of jobs automatically—aligning the tracks, tamping the ballast layer, and grading and packing the ballast slopes. Such machines have electromagnets and hydraulic cylinders that grab, raise, and shift the rails and ties in order to lay them in the necessary position. The model VPO-3000 aligning-tamping-finishing machine can work up to 3 km of track per hr.

Manual tamping machines with pneumatic or electric vibrators are used for small jobs. S. A. SOLOMONOV [29–1387–1]

TAXIC COLLECTOR (Russian, *eklektor*), a device designed to collect and count invertebrates (mainly, small arthropods) that inhabit the soil or other substrate. The working principle is based on the use of the various taxes characteristic of the animals.

A taxic collector consists of a sieve located inside a funnel. Soil is placed in the sieve, and a vessel is positioned below the funnel. Animals moving downward from the upper soil layers fall into the vessel as a result of their response to light, desiccation, or elevated temperature. Taxic collectors may be designed specifically to operate on the principle of phototaxis, hydrotaxis, thermotaxis, or all three. They are used both in laboratories and in the field, especially in investigations conducted at a fixed location. A phototaxic collector in the shape of a box is used for the collection and counting of insects on the surface of the soil and on plants; the insects crawl into an illuminated test tube attached to the box.

[29–1767–3]

TCHADANTHROPUS, the name of a fossil primate, the bones (skull fragments) of which were discovered in 1961 by

Y. Coppens in the Djourab Desert in the northern part of the Republic of Chad. The position of *Tchadanthropus* in the classification of primates is unclear; some anthropologists classify it as *Australopithecus*, while others classify it as *Pithecanthropus*. *Tchadanthropus* is possibly about 1.5 million years old.

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TCHAIKOVSKY, PETR IL'ICH. Born Apr. 25 (May 7), 1840, in a settlement by the Kamsko-Votkinsk Plant, Viatka Province (now the city of Votkinsk, Udmurt ASSR); died Oct. 25 (Nov. 6), 1893, in St. Petersburg. Russian composer.

The son of a mining engineer, Tchaikovsky studied at the St. Petersburg School of Jurisprudence from 1850 to 1859 and served in the Ministry of Justice from 1859 to 1863. In 1861 he began attending the music classes at the St. Petersburg branch of the Russian Society of Music; the classes were reorganized as the St. Petersburg Conservatory in 1862. Tchaikovsky studied theory under N. I. Zaremba and composition under A. G. Rubinstein and graduated with honors from the conservatory in 1865.

From 1866 to 1878, Tchaikovsky was a professor at the Moscow Conservatory, where he taught composition, harmony, and orchestration; among his students was S. I. Taneev. Needing instructional materials, he translated several works on music theory and wrote a textbook, *Guide to the Practical Study of Harmony* (1872).

Tchaikovsky's first works of music criticism were published in 1868. As music reviewer for the Moscow newspapers *Sovremennaia letopis'* and *Russkie vedomosti* from 1871 to 1876 he fought in behalf of realism in Russian music. Tchaikovsky's artistic and social interests led to friendships with N. G. Rubinstein and the critics N. D. Kashkin and G. A. Larosh; he also became acquainted with L. N. Tolstoy, A. N. Ostrovskii, and actors at the Malyi Theater, notably P. M. Sadovskii. His links with progressive artistic and ideological trends of the 1860's were fostered by contacts with members of the Russian Five during private trips to St. Petersburg.

Tchaikovsky began to flourish as a composer in his Moscow period, from 1866 to 1877, during which he composed the Symphony No. 1 (*Winter Daydreams*, 1866), the Symphony No. 2 (1872; revised version, 1879), and the Symphony No. 3 (1875) and began work on the Symphony No. 4. In addition, he composed several program works for orchestra, including the fantasy overture *Romeo and Juliet* (1869; second version, 1870; third version, 1880) and the symphonic fantasies *The Tempest* (1873) and *Francesca da Rimini* (1876).

During this period Tchaikovsky also wrote the Concerto No. 1 for Piano (1875); *Sérénade mélancolique*, for violin and orchestra (1875); *Variations on a Rococo Theme*, for cello and orchestra (1876); and three string quartets (1871, 1874, and 1876). Other important works from the Moscow period are the operas *The Voyevoda* (1868), *Undine* (1869, destroyed by Tchaikovsky in 1873), *The Oprichnik* (1872), and *Vakula the Smith* (1874; second version entitled *Cherevichki*, 1885), the ballet *Swan Lake* (1876), incidental music to A. N. Ostrovskii's play *The Snow Maiden* (1873), art songs, and compositions for piano, including the cycle *The Seasons* (1876). In addition between 1868 and 1872 he transcribed for piano duet 50 Russian folk songs from the collections of K. P. Vil'boa and M. A. Balakirev and edited a collection of Russian songs compiled by V. P. Prokunin.

In the fall of 1877, Tchaikovsky traveled abroad, where he continued to work on the Symphony No. 4 (1876–77) and the opera *Eugene Onegin* (1877–78), which was staged at the Moscow Conservatory in 1879 through the efforts of the conservatory's students and at the Bolshoi Theater in 1881. The financial support of N. F. von Meck, whom Tchaikovsky never met but with whom he carried on an extensive correspondence between 1876 and 1890, enabled him to devote full time to composition. Until 1885 he lived alternately abroad—in Switzerland, Italy, and France—and in Russia, usually with his sister A. I. Davydova at the estate of Kamenka in the Ukraine.

Works of this second period include the operas *The Maid of Orleans* (1879) and *Mazeppa* (1883), the cantata *Moscow* (1883), the *1812 Overture* (1880), *Capriccio italien* (1880), three orchestral suites (1879, 1880, and 1883), the Concerto for Violin (1878), the Piano Trio (1882, dedicated to the memory of N. G. Rubinstein), the Piano Concerto No. 2 (1880), and the Piano Sonata in G major (1878). These works show the diversity of Tchaikovsky's creative interests and his mastery of a wide range of styles and genres.

After 1885, Tchaikovsky took up residence near Moscow, moving to Klin in 1892. Once again he became active in the music world. He was often in Moscow and St. Petersburg, and he took part in the musical life of those cities, especially in the activities of the Russian Society of Music—he was elected director of the society's Moscow branch in 1885—and the Moscow Conservatory. The premiere of the opera *Cherevichki* in 1887 at the Bolshoi Theater marked the beginning of his career as a conductor, which lasted until 1893. Although he conducted mainly his symphonic works, he also conducted his operas in Russia and abroad. His work was highly regarded; in 1892 he was elected a corresponding member of the French Académie des Beaux-Arts, and in 1893 Cambridge University awarded him an honorary doctorate in music.

Tchaikovsky composed a number of remarkable works between 1885 and 1893 in which tragic themes, as in the operas *The Sorceress* (1887) and *The Queen of Spades* (1890), the program symphony *Manfred* (1885), the Symphony No. 5 (1888), and the Symphony No. 6 (*Pathétique*, 1893), alternate with scores in which light and joy triumph, as in the ballets *The Sleeping Beauty* (1889) and *The Nutcracker* (1892), the opera *Iolanta* (1891), and the orchestral suite *Mozartiana* (1887).

Tchaikovsky's music, a landmark in realistic art, constitutes together with the works of A. S. Pushkin, L. N. Tolstoy, and A. P. Chekhov one of the supreme achievements of Russian culture. Tchaikovsky and the leading members of the Russian Five make up the pleiad of classic Russian composers who are the legitimate successors to the traditions of M. I. Glinka. Central to Tchaikovsky's work, which often reached genuinely tragic heights, was the theme of man's fierce struggle for the right to happiness. A sensitive lyric psychologist, he offered profound insights into man's inner world.

Tchaikovsky was deeply interested in the masterpieces of Dante, Shakespeare, Pushkin, Byron, N. V. Gogol, and A. N. Ostrovskii, as well as the events and color of various historical periods; he also found his subject matter in scenes from the life of the people, a wide variety of human characters, images of nature, the romantic atmosphere of fairy tales, and the child's view of the world. At the same time, he always concentrated on his own feelings, which he expressed with unparalleled accuracy.

Tchaikovsky made use of the rich store of artistic devices to be found in the great musical classics, but the primary source of his richly melodic musical language, which was not only strikingly democratic but innovative in its lyric and dramatic power, was the Russian folk song—particularly the folk chorus—and the Russian popular art song. Tchaikovsky embodied moods, characters, and philosophic reflections in their dialectically complex, and often contradictory, continuous unfolding and development against a broad, pictorial background suffused with a life-affirming enthusiasm.

One of the greatest of symphonic composers, Tchaikovsky is a worthy successor to L. van Beethoven. His symphonic thought is clearly revealed in a variety of works in his extensive and multifaceted legacy, in which vocal and instrumental genres continually enrich one another, especially the operas and symphonies. Of the ten operas, those based on the works of Pushkin deserve a special place. In *Eugene Onegin*, which contains lyric scenes and constitutes a new type of opera, the composer realized his ideal of an "intimate but powerful drama." *The Queen of Spades*, a vocal-symphonic tragedy, is matchless in its psychological profundity.

Tchaikovsky's orchestral works, both program and nonprogram compositions, are distinguished by their significant content and, at the same time, accessibility of expression. The last three symphonies are true "instrumental dramas." Tchaikovsky's three ballets, into which he introduced the principles of the symphonic drama, mark a new stage in the history of the ballet. His concerti

(particularly the First Piano Concerto), chamber works, and numerous (104) art songs have achieved popularity.

The great humanistic art of Tchaikovsky, which has inspired many composers of the late 19th and the 20th centuries, has been an inexhaustible source of lofty realistic traditions for progressive musical art. The music of Tchaikovsky has achieved world renown. The Moscow and Kiev conservatories, the theater of opera and ballet in Perm', and a concert hall in Moscow have been named in honor of Tchaikovsky. The international Tchaikovsky Competition has been held in Moscow since 1958. There are Tchaikovsky museums in Klin and Votkinsk; a museum of Pushkin and Tchaikovsky is located in Kamenka.

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V. N. BRIANTSEVA [29–24–4]

TEA AND SUBTROPICAL CROPS, INSTITUTE OF (full name, All-Union Research Institute of Tea and Subtropical Crops; VNIIChiSK), the center for the coordination of work on the technology of the cultivation of tea, citrus fruits, and other tropical crops in the USSR. The institute is under the jurisdiction of the Ministry of Agriculture of the USSR. It was founded in 1930 in the settlement of Anaseuli, Makharadze Raion, Georgian SSR.

As of 1976 the institute included departments of breeding, agrochemistry, agronomy, pedology, reclamation and microbiology, mechanization, the economics and organization of production, plant protection and agroecology, and agrometeorology. There is also a department of standardization, patenting, and scientific and technical information. The institute has laboratories of the physiology and biochemistry of plants, industrial biochemistry, radioactive research, and vegetative propagation of tea. There are branches in Sukhumi, Chakva, and Zugdidi. Also affiliated with the institute are the Kolkhida Experiment Station and the Imeretin, Adygei, and Adzhar experimental fields.

The Institute of Tea and Subtropical Crops develops and perfects the cultivation and propagation of tea and subtropical crops. It also develops new varieties. As of 1976 the following tea varieties developed at the institute were regionalized: Gruzinskii 1, Gruzinskii 2, Zimostoikii, Urozhainyi, and Kolkhida. Graduate courses are offered both at the institute and through the mail. The institute has published the journal *Subtropicheskie kul'tury* (Subtropical Crops) since 1939.

The Institute of Tea and Subtropical Crops was awarded the Order of the Red Banner of Labor in 1967.

V. E. DZHAKELI [29–113–3]

TEA-CLEANING MACHINE, a stationary machine that is used to remove foreign matter from harvested tea leaves.

The ChP-300 tea-cleaning machine is used on tea plantations in the USSR. In the machine, tea leaves from a hopper are fed by a loading conveyor to a cleaning conveyor. Foreign matter is then removed by an airflow produced by a fan and is dumped into a waste bin. The remaining mass is conveyed to mesh drums and, after sifting, is packaged. Unsifted tea leaves are conveyed from the drums to another waste bin.

The ChP-300 tea-cleaning machine is driven by a 1.5-kilowatt electric motor and a 1.7-kilowatt electric motor. It has an output of 0.3 ton/hr and is operated by one worker. [29–15–2]

TEA INDUSTRY, a branch of the food-processing industry for the production of loose and pressed teas from leaves of the tea plant.

The cultivation of tea was introduced into Russia in the 1840's in Georgia. In 1913, five tea factories were operating in Georgia and produced 131 tons of loose tea. The tea industry underwent considerable development in Georgia after the establishment of Soviet power. A large number of tea factories were constructed in the period of the five-year plans prior to World War II. In addition to loose black tea, the major product, the production of loose green and brick green teas was initiated.

The tea industry in the USSR maintains plants for the primary processing of tea leaves and for the packaging and pressing of natural tea. Factories for the primary processing of tea leaves are concentrated in three Soviet republics, namely, the RSFSR (Krasnodar Krai), the Georgian SSR, and the Azerbaijan SSR. In 1975, Georgia accounted for up to 95 percent of the total tea leaf harvest (see Table 1).

Table 1. Development of the tea industry in the Georgian SSR

	Number of primary processing plants	*Tea production (thousand tons)*
1940	34	8.8
1950	42	20.2
1960	65	38.2
1970	77	63.9
1975	84	82.5

Packaged tea under brand names is produced at 11 tea-packaging plants in the USSR (see Table 2). Tea production in 1975 at the largest plants was (in thousand tons) 16.5 at the Lenin Moscow Tea Factory, 13.4 at the Riazan' plant, 13.6 at the Irkutsk plant, 20.0 at the Samarkand plant, and 19.8 at the Tbilisi plant.

In 1975 loose black tea accounted for 90,000 tons of the total tea production, loose green tea accounted for 31,170 tons, and black brick tea accounted for 7,970 tons. In addition, 10,000 tons of green brick tea were produced. The annual per capita production of tea grew significantly between 1965 and 1975: from 366 g to 580 g, including an increase in packaged brand tea from 312 g to 507 g.

Table 2. Production of packaged brand-name tea in the USSR
(thousand tons)

1940	21.95	1970	87.50
1960	62.40	1975	129.18

An important feature of the tea industry in the USSR is the high degree of mechanization (80 percent in 1975) of the primary processing of tea leaves, especially in the drying and rolling stages, which require the most labor. Labor productivity in the industry increased by 25 percent during the ninth five-year plan

(1971–75). The first stage in developing production lines for rolling tea leaves was completed, and a radically new technology for processing tea leaves by rapid freezing—which significantly reduces the production cycle time—was developed. Technologies for the production of black and green instant teas and tea dyes and a stalk-removal machine for improving the appearance and quality of tea were developed. Tea-packaging factories were equipped with highly efficient, new automatic tea packers. The production of tea in packages for single-cup brewing has been introduced. The production of a yellow-colored tea with enhanced physiological benefits was begun in 1977. The average unit output of a tea-leaf-processing factory has reached 5,000 tons per year of raw material.

The world production of tea (excluding the USSR) in 1974 was more than 1.5 million tons. In addition to the leading tea-producing countries, such as India, Sri Lanka, and the People's Republic of China—where tea has been a traditional export item for many centuries—tea production developed rapidly in the 1970's in the African countries of Kenya and Uganda and in Vietnam, where tea factories have been built with the assistance of the USSR.

In 1974 tea production (in thousand tons) was 492 in India, 318 (estimate) in the People's Republic of China, 204 in Sri Lanka, 102 in Japan, 53 in Kenya, and 51 in Indonesia.

L. A. GOLUBEVA [29–30–3]

TEAL, the common name of about 20 species of small river ducks of the genus *Anas*. Teals are found everywhere except the polar regions. Many species are migratory.

There are four species in the USSR. The best known are the common, or green-winged, teal (*Anas crecca*) and the garganey, or garganey teal (*A. querquedula*). The Baikal teal (A. formosa), which is hunted intensively during its period of migration, is found in Siberia east of the Enisei, while the marbled teal (*A. angustirostris*) is found only in Middle Asia and Transcaucasia. All teals prefer shallow standing waters. They nest in meadows and forest clearings. The female lays eight or nine eggs, which are incubated for about three weeks. [29–616–6]

TEA-LEAF PLUCKER, MECHANICAL, a mounted or self-propelled machine that is used to pick mature flushes of leaves from rows of tea plants.

In the USSR, efforts at the development of mechanical tea-leaf pluckers were begun in 1930. The first Soviet mechanical tea-leaf plucker, which had a mower-type cutting bar, was drawn by a tractor or a horse. A trailer-type pneumatic tea-leaf plucker, which was powered by a motor mounted on it, was developed in 1951. Lot production of the ChSN-1.6 mechanical tea-leaf plucker, or the Sakartvelo, was inaugurated in 1963.

Intended for use in level areas or on slopes of up to 8°, the ChSN-1.6 mechanical tea-leaf plucker moves along rows of tea plants. The operating elements of the plucking device, which are controlled by an hydraulic servomechanism, are inserted into the crown of a tea bush to the required depth. Elastic inserts of blades that move back and forth "feel" for shoots and find the most brittle place for breaking off the shoots. The shoots to be picked are bent between the rigid supports of fixed blades and the elastic inserts of the moving blades and are plucked. Highly developed shoots, whose brittle part lies above the zone in which the inserts operate, are cut by pruners. The plucked leaves are fed through an air duct and flexible tubing to screen conveyors by means of an airflow produced by a fan and are discharged into receiving bins. The operating elements are driven by a power take-off shaft and by the hydraulic system of the tool carriage. The ChSN-1.6 mechanical tea-leaf plucker picks up to 90 percent of a mature flush. Its operating capacity is 0.2 hectare/hr at a speed of 1 km/hr.

The ChA-650/900 mechanical tea-leaf plucker is used on steep slopes (up to 16°). The plucking device is mounted on a tricycle carriage so that the device remains upright when it moves across a slope; it is equipped with a reel having rubber vanes. The rubber vanes bend the shoots under the cutting blade. The shoots are then pressed against picking rollers and are cut, fed to a conveyor, and discharged into a bin. Pins equipped with capron threads are fastened beneath the cutting blade. The pins deflect immature shoots so that they are not cut. The ChA-650/900 mechanical tea-leaf plucker picks up to 98 percent of a mature flush. Its capacity is 0.2 hectare/hr. [29–16–2]

TEA MOTH (*Parametriotes theae*), a moth of the family Eupistidae (according to other classifications, Coleophoridae or Tineidae).

The moths have lanceolate wings with pointed tips. The front wings have two round dark brown spots, and the hind wings are edged with a long fringe. The wingspread is 9.5–11 mm. The moths fly in July and August. They are active at night; during the day they rest immobile on the shoots of the tea plant. The eggs (60 or 70) are deposited in groups of two to five on leaf stalks or in cracks in the branches. The larvae hatch in ten to 15 days, gnawing their way into the cortex of the tea shrub and making tunnels through it. They feed on the parenchyma, and in the winter they live in the leaves. In the spring the larvae crawl out onto the shoots and gnaw passageways in them. Pupation occurs in late May.

Tea moths are found in Transcaucasia. They are harmful to the tea plant, causing infested shoots to die. Control measures include removing and burning the affected leaves and shoots.

[29–30–2]

TEA PRUNER, a machine that is used to prune tea plants in order to promote the development of shoots and to form rows of plants that are suitable for the mechanical picking of tea leaves.

Mounted tea pruners equipped with a pruning device having a segmented cutter are used on tea plantations in the USSR. Such a tea pruner may be mounted on a tractor, on a tool carriage, or on a mechanical tea-leaf plucker. Three types of tea pruners are used in the USSR. The first type, such as the ADV-1.3, cuts the tips of the shoots, shortening height by 5 cm. The second type—for example, the BShP-1A—forms rows 60–80 cm wide and 50–70 cm high and shapes the crowns of tea bushes into semiovals by cutting the bushes from the top and the sides. The third type, such as the APP-600A, is used to condition tea plantations by pruning tea plants to a height of 40–45 cm from the root collar.

Tea pruners can prune 0.08–0.13 hectare of tea plants per hour. [29–16–1]

TECHNICAL DRAWING (in Russian, *chertezh*), a scale projection of objects presented on some information carrier, such as standard or tracing paper, film, or a type of veneer, by means of graphic forms—points, segments of straight and curved lines, symbols, standard designations, and the like. Technical drawings may be used as illustrations to a text (to explain material to be learned) or as documentation for the manufacture of goods. They may be accompanied by explanatory notes, specifications, and instructions for manufacture of the article (when necessary) and may take the form of mechanical drawings, sketches, or diagrams. [29–327–1]

TENEBRIONIDAE, a family of beetles of the suborder Polyphaga. Members of the family may be tiny (body length, 2 mm) or quite large (50 mm). They are usually black, sometimes brown or brightly striped or spotted; in rare cases they may be white or have a metallic sheen. The body may be spherical or rod-shaped. The feet of the anterior and median legs are five-segmented, and those of the posterior legs are four-segmented. The beetles do not fly, and most species lack a posterior pair of wings. Because the larvae are cylindrical, hard, and usually yellow, resembling wireworms, they are referred to as false wireworms. They feed on the rootlets of plants. The adult beetles are polyphagous. Many species of Tenebrionidae excrete pungent defensive fluids. They are usually nocturnal or crepuscular.

The family consists of approximately 17,000 species, which are distributed over the entire globe except the polar regions. They are especially numerous in steppes and deserts, as well as in forests. The USSR has more than 1,000 species, which are mainly encountered in Middle Asia, Kazakhstan, and the Caucasus. Larval and adult representatives of some species damage crops and

pasture plants. Others damage food stores, developing in grain, flour, and flour products; these include the darkling beetles *Tenebrio molitor* and *T. confusum*.

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TENON (in Russian, *ship*), a projection on the end or lateral surface of a part, designed to be inserted into a recess or groove of corresponding shape and dimensions in another part. It can be used to effect a permanent or temporary joining of the parts. A tenon may be in one piece with an article, or it may be a separate insert (as a dowel). Joints made by a mortise and tenon are most often used in the manufacture of wooden structural elements (windows, doors, and the like), furniture, crates, and casting patterns. In machine building, end and face journals (pivots) are analogous to tenons; they usually have a cylindrical, conical, or spherical shape. [29–1214–3]

TENONING MACHINE, a woodworking machine for making tenons and lugs on parts to be joined in woodworking enterprises.

Machines may be designed to fashion frame or box tenons. On some machines the tenons are cut on one end of the workpiece with each operating cycle (single-side machines); in others tenons are cut simultaneously on both ends during one cycle (double-side machines). Machines of the first type operate in steps; those of the second type feature straight-through operation. Machines for fashioning box tenons can form both straight-sided and dovetail tenons. Straight-sided tenons are formed by ordinary milling-type planers mounted on the machine spindle; dovetail tenons are formed by end-milling planers mounted on vertical spindles. On double-side box-tenoning machines, the operating cycle is a combination of the step and straight-through formats: the ends of the workpieces are filed to size as the workpiece is moved, and the tenons are formed as the workpiece is held stationary. Frame tenons are cut on both types of machines.

On a single-side tenoning machine the workpiece is secured to the machine table, which executes a reciprocating motion; on double-side machines the workpiece is held by special chains and supports that execute continuous translatory motion. The workpiece is first cut to the necessary dimensions, and then the tenons or lugs are fashioned.

Tenoning machines have rigid, cast frames, tables with clamping mechanisms, and special columns on which are mounted tool heads with saws, milling-type cutters, or lug-cutting disks. The spindles rotate at speeds ranging from 3,000 rpm (on machines for straight-sided and frame tenons) to 9,000 rpm (on machines for dovetail box tenons).

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Derevoobrabatyviushchee oborudovanie: Katalog-spravochnik. Moscow, 1972. N. K. IAKUNIN [29–1218–4]

TENTACLE, a movable outgrowth on the bodies of coelenterates, mollusks, annelids, bryozoans, brachiopods, pogonophores, pterobranchs, and other invertebrates. Tentacles are usually located at the front end of the body and serve to capture food; sometimes they are involved in respiration and palpation. In coelenterates the tentacles abound in stinging cells. In gastropods they are used for palpation and olfaction, while in cephalopods they are used for capturing prey and for locomotion. [29–1620–1]

TENTACULATA (also Lophophorata or Podaxonia), a phylum of invertebrates. The Tentaculata are predominantly sessile marine animals. They are characterized by bilateral symmetry of the body, a secondary body cavity divided into two or three sections, a U-shaped intestine, and a highly developed tentacular apparatus that directs food particles to the mouth. The phylum comprises three classes: Phoronidea, Bryozoa, and Brachiopoda, which are considered by some taxonomists as independent phyla (*see* PHORONIDAE; BRYOZOA; and BRACHIOPODA). [29–1620–2]

TESTUDINATA, a subclass of reptiles. Testudinates are characterized by a body covered with a shell consisting of a convex dorsal portion (carapace) and a flat ventral portion (plastron). The two portions are rigidly connected on either side by a bridge of bone or freely connected by skin. The shell consists of dermal ossifications, as well as of enlarged ribs and riblike processes of the vertebrae. The clavicles and sternum are part of the plastron. The bony elements of the shell are called plates. In most testudinates they are covered with horny scutes and only in soft-shelled turtles and in the leatherback are they covered with skin.

In land tortoises the carapace is highly arched (rounded or parabolic in cross section) and can bear substantial loads, either evenly distributed or concentrated and percussive. In freshwater and marine species, it is flattened (elliptical) and "streamlined." The plastron in these testudinates is partially reduced or is segmented into mutually mobile parts, which increases the freedom of movement of the legs, head, and tail. The flattening and lightening of the shell is often compensated by the proliferation of nodular protrusions and "stiffening ribs" on the surface of the carapace, which strengthen it. The cranium is of the armored type (pseudostegalian structure) in living marine species; in the rest of the testudinates it has a false temporal arch (pseudapsidal type).

The testudinates have no teeth; the jaws are covered with horny plates, which form a semblance of a bill. The unique structure of the cervical vertebrae, which differ in shape, ensures great mobility of the neck. When a testudinate hides its head under the shell, the neck retracts either in a vertical plane (S-necked type) or in a horizontal plane, that is, sideways (side-necked type). There are usually few caudal vertebrae (the tail is somewhat longer in freshwater species). Development of the shell has resulted in the transfer of the girdles of the extremities beneath the ribs, an exceptional occurrence in vertebrates. In freshwater species the extremities are more mobile and have webbed digits. In sea turtles the legs have been modified to flippers, with the anterior ones being longer than the posterior ones.

The presence of a shell has considerably affected the internal structure of testudinates. The musculature of the trunk is partially reduced, while on the extremities and in the neck region it is considerably developed. Owing to the absence of costal respiration, air is "swallowed" by means of the sublingual apparatus, partially owing to movements of the extremities. In freshwater species gas exchange is partially effected by means of special anal sacs opening into the cloaca. Soft-shelled turtles have cutaneous respiration, a rare phenomenon in reptiles. The level of basal metabolism is low, and the intensity of metabolism is weak. In excretion, urea is principally discharged, and consequently the urinary bladder is large (in most other reptiles uric acid is primarily excreted; the urinary bladder is absent in many). The brain and the principal receptors are poorly developed.

Testudinates vary considerably in size. The largest living representatives are the sea turtles (the leatherback is up to 2 m long). In more ancient times, testudinates attained a length of 3 m.

Testudinates are descended from one of the branches of the oldest terrestrial reptiles—Cotylosauria. In the course of evolution, many became adapted to life in continental waters and seas. Testudinates are reliably known from the Triassic, although their appearance as early as the end of the Paleozoic cannot be excluded. They flourished from the second half of the Mesozoic to the end of the Neogene. Many genera and families were distributed more widely in past geological eras than today. For example, soft-shelled turtles, side-necked turtles, snapping turtles, and elephant tortoises once inhabited Europe; today they are preserved only on other continents. The majority of living testudinates inhabit tropical and equatorial latitudes.

Living testudinates are classified in five orders: Cryptodira, Pleurodira, Trionychoidea, Chelonioidea, and Dermochelidae. The order Dermochelidae has one species, the leatherback, which is sometimes classified in the order Chelonioidea. There are more than 210 species of living testudinates; terrestrial and freshwater species are found on all continents except Antarctica and on many large islands. There are seven species in the USSR: the European pond tortoise (*Emys orbicularis*), *Mauremys caspica*, the spur-thighed tortoise (*Testudo graeca*), *Agrionemys horsfieldi*, and the spiny soft-shelled turtle (*Trionyx sinensis*),

which are land tortoises, and the loggerhead (*Caretta caretta*) and the leatherback (*Dermochelys coriacea*), which are sea turtles.

Some testudinates live only on land (43 species), where some have adapted to digging burrows. Sea turtles, of which there are five species, live in the ocean, except during the reproductive period. The majority of living testudinates are semiaquatic, inhabiting rivers, lakes, marshes, and desalinated bays. During the cold or dry seasons, testudinates may fall into a torpor (winter and summer hibernation), enabling them to survive unfavorable weather conditions. Terrestrial species are basically herbivorous, while marine species are primarily so. Freshwater species feed mainly on other animals, such as fish, amphibians, and invertebrates. Testudinates can do without food for several months at a time. They usually mate on land, where they also lay their eggs (one to several hundred), which are buried in the ground. Some species lay eggs up to three or more times a year. The spherical or elliptical eggs are covered in most species with a limestone shell; in marine and some freshwater species they are covered with a leathery shell. The incubation period is two to three months. Sexual maturity is attained not earlier than two to three years of age. The males are usually smaller than the females; they have a slightly concave plastron, which may be a little higher than the carapace. Growth in testudinates is unlimited, slowing down considerably with the onset of sexual maturity. The life-span is several decades, with some species living more than 100 years.

A number of species are hunted; these are mainly sea turtles and a few freshwater species, more rarely terrestrial species. The flesh, fat, eggs, and sometimes the horny scutes are used, the last for various clothing accessories. There are farms for breeding and fattening turtles. Some freshwater species cause minor damage to the fishing industry; land tortoises damage agricultural crops. Many species are protected; in the USSR all land-tortoise species and the freshwater spiny soft-shelled turtle are protected. (*See* CRYPTODIRA; PLEURODIRA; TRIONYCHOIDEA; CHELONIOIDEA; and LEATHERBACK.)

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L. I. KHOZATSKII [29–211–1]

TETRAODONTIDAE (puffers), a family of fish of the order Plectognathi (or Tetraodontiformes). The fused jaw bones form plates that resemble four teeth. The skin is covered with spines or is naked. The pelvic fins are absent, and the pectoral fins are well developed, allowing the Tetraodontidae to move backward as well as forward. The stomach has saclike outgrowths that, when filled with air or water, make the fish resemble prickly balls.

The family comprises 19 genera, with more than 90 species. The Tetraodontidae are distributed in subtropical and tropical seas. There are four freshwater genera, including the most common genus *Tetraodon*. The meat of the Tetraodontidae is very tasty and is highly prized in the countries of the Far East. The skin, peritoneum, liver, and gonads are poisonous.

REFERENCE
Zhizh' zhivotnykh, vol. 4, part 1. Moscow, 1971. [29–361–2]

TETRAXONIDA, an order of marine sponges of the class Demospongiae. The Tetraxonida live in colonies or singly in oceans of primarily the temperate and warm belts at depths of about 100–400 m. The body is spherical, oval, or pillow-like; sometimes it is in the form of a shallow goblet. Frequently it is very strong and rigid and is 0.5 m and more in height. The skeleton usually consists of four-rayed siliceous spicules distributed radially within the body of the sponge, with an angle of 120° between the rays. The canals penetrating the walls of the body (canal system) are of the leuconoid type. There are about 1,500 known species of Tetraxonida, of which more than 50 are found in the seas of the USSR. The most common representatives are members of the genera *Suberites, Polymastia, Tetilla*, and *Geodia*.

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V. M. KOLTUN [29–361–4]

TEUFELSBRÜCKE, a bridge over the Reuss River in Switzerland across which Russian troops fought their way on Sept. 14 (25), 1799, in the course of Suvorov's Swiss Campaign of 1799. The road that ran along the Reuss from the village of Urseren to the bridge passed through a narrow (about 3 m) tunnel about 60 m long that was defended by a French detachment. Russian chasseurs were able to bypass the tunnel in a flanking movement, proceeding along the mountains and through the river gorge. They then repulsed the enemy and broke through to the Teufelsbrücke. Braving enemy fire, the Russian troops crossed the narrow, half-destroyed bridge, which was 22–23 m high, and reached the left bank of the river, thereby opening the way to the north.

[29–331–2]

THEA (tea), a genus of tropical perennial evergreen plants of the family Theaceae; some botanists place the plants in the genus *Camellia*. There are two species: *T. sinensis* and *T. assamica*. The former, which is divided into Chinese and Japanese varieties, is a shrub reaching 3 m in height; it grows in mountainous regions of Southeast Asia. *T. assamica*, a tree measuring as much as 10–15 m in height, occurs in the forests of Assam, India. Varieties of *T. assamica* include Assam, Lushai, Naga Hills, Manipuri, and Burma. *T. assamica* also includes a natural hybrid of *T. sinensis* and *T. assamica*, which is known as Ceylon tea. Both species are widely cultivated.

In the USSR local hybrids of the Chinese variety of *T. sinensis* are most commonly cultivated; *T. assamica* and the Japanese variety of *T. sinensis* are added to the principal plantings. Sometimes a third species, *T. maliflora* from China, is designated.

T. sinensis is densely branched. The oval or elongate-oval leaves are slightly narrowed at the base; they measure 60–70 mm long and 35–40 mm across. The leaves are dark green above and light green beneath. The primary root extends 2–3 m into the soil; the lateral roots lie in the surface layer of soil. The fragrant white or pink flowers are solitary or in groups of two, three, or four in the leaf axils. The fruit is a capsule with one to five dark brown hard-shelled seeds, which are rich in oil; the capsule dehisces upon maturation. One thousand seeds weigh about 1 kg.

The tea plant is thermophile and hygrophilous. It grows and develops well when the sum of average daily temperatures during the vegetative period is no less than 4,000°C. The plant tolerates brief frosts to −12°C without a snow cover (some varieties withstand temperatures as low as −14°C). In tropical areas the tea plant yields a harvest throughout the year. In the humid subtropics of the USSR vegetation begins in March or April, when the average daily temperature is higher than 10°C. Intensive shoot formation begins at temperatures no lower than 17°C. A harvest of 4,000 kg of leaf per hectare (ha) depletes 150 kg of N, 23.9 kg of P_2O_5, and 47.8 kg of K_2O from the soil. The best soils for tea cultivation are red and yellow soils that are highly permeable by air and water.

Tea is propagated by seeds or by vegetative methods. One- or two-year-old plants raised from seed in nurseries are set out in

the fields, or the fields are planted with seeds or cultivated with semilignified grafts and cuttings. The tea plant flowers in the fourth or fifth year and forms fruits annually. In the USSR the flowering season is from September until the onset of frost. Cross-pollination is by bees, flies, or other insects. The plant is fully formed by the seventh or eighth year. Productive shoots form annually from the growth buds in the leaf axils; it is the apices of these shoots—two or three leaves and the bud—that are harvested for the manufacture of tea. (The leaves harvested for tea are called the flush.) The growing period of productive shoots is 35 to 65 days. Under favorable conditions the shoots grow continuously. In the USSR two periods of intensive growth are observed: the spring period in May and the summer period in July and August. A tea plant lives 100 or more years; it is most productive from the tenth to 70th year.

Tea was first cultivated in China in the fourth century A.D.; the use of tea as a beverage is mentioned in manuscripts of 2700 B.C. The cultivation of tea in Japan and Korea dates to the ninth century. Tea cultivation was introduced to Indonesia in 1824, to India in 1834, and to Ceylon in 1842. The world area of tea plantations was 1.298 million ha in 1961–65 and 1.502 million ha in 1974. In 1974 the principal tea producers abroad were India (360,000 ha), China (336,400 ha), Sri Lanka (240,000 ha), Indonesia (102,400 ha), and Japan (63,000 ha). The plant is also grown in Africa (Kenya and other countries) and South America (Argentina).

In Russia tea was first used as a beverage in 1638, when the Mongol Altyn Khan sent Tsar Mikhail Fedorovich a gift of four poods of tea leaves. In 1679 an agreement was concluded with China for regular deliveries of tea to Russia. In the 18th century tea imports increased, and the popularity of the beverage rose. The appearance of Russian samovars dates from this period. The botanist N. A. Gartvis planted the first tea shrub in Russia in 1814 in the Nikita Botanical Garden, but the natural conditions of the Crimea proved unfavorable for growing tea. In 1847 tea cuttings acclimatized well at the Ozurgety Experiment Station (now the city of Makharadze) in Georgia. At the All-Russian Exposition of 1864, M. Eristavi demonstrated Georgian tea prepared from leaves gathered from a small tract in Gora-Berezhauli in Ozurgety District. In 1885, A. A. Solovtsev founded Russia's first commercial tea plantation in Chakva (Adzharia). The plant has been cultivated in what is now Krasnodar Krai since 1901 and in Azerbaijan since 1912. In 1913 the area of tea plantings in Russia was less than 900 ha, the gross yield of leaf was 550 tons, and the average yield was 6.1 quintals per ha.

After the October Revolution of 1917 tea cultivation developed rapidly. New plantations were established in Georgia, Azerbaijan, and Krasnodar Krai. In 1965 tea plantations in the USSR occupied 71,000 ha, the gross harvest of leaf from commercial plantations was 197,000 tons, and the average yield was 33.8 quintals per ha; in 1976 the corresponding figures were 76,800 ha, 375,000 tons, and about 50 quintals per ha.

Soviet plant breeders have developed—for the first time in the history of tea cultivation—local varieties of tea. The varieties Gruzinskii 1, Gruzinskii 2, Zimostoikii, and Kolkhida (a clonal variety) were developed by K. E. Bakhtadze at the All-Union Research Institute of Tea and Subtropical Crops. These local varieties yield 25 to 60 percent more than nonvarietal plantings. The establishment of new plantations and the replacement of old ones have been achieved with vegetatively propagated homogeneous varietal plant material. In 1976 nine varieties of tea were regionalized in the USSR.

Forest or shrub areas are used for tea plantations. Forest belts are planted around the plantation, overly moist lands are drained, and terraces are constructed on steep slopes. Autumn plowing is done to a depth of 45 cm. Inorganic fertilizers (150–200 kg/ha P_2O_5 and 100–140 kg/ha K_2O) are applied to exhausted or eroded soils, and then the fields are planted with legumes and cereal grasses. The field is plowed in the second or third year to a depth of 20–25 cm. On fertile lands no sodding is provided; manure (40–50 tons/ha) and inorganic fertilizers (up to 300 kg/ha P_2O_5) are applied before plowing. Green manuring is effective: lupine, serradella, and other plants are set out in summer and plowed under in early spring.

In the USSR espalier planting in dense rows is the most common method of planting tea. The distance between espaliers is 1.25 to 2.05 m. The young plants must be kept shaded, and the soil between rows must be loosened several times throughout the summer. Before the annual autumn shallow plowing, manure (40–50 tons/ha), phosphorus (100–150 kg/ha P_2O_5), and potassium (150–250 kg/ha K_2O) are applied. In the summer nitrogenous fertilizers (50 to 400 kg/ha N—depending on the age of the planting) are administered. Pruning and espalier formation by means of special pruning apparatus ensure maximum shoot formation and the formation of a broad semioval crown 60–80 cm in width and 50–70 cm tall. Withered and diseased branches must be removed regularly, and the fields must be irrigated. In the USSR the flushes are gathered manually or with tea-harvesting machines from late April or early May to October. After gathering, the tea leaf is cleaned with a special machine.

The most harmful diseases of the tea plant are bacterial wart, brown and gray leaf spot, and cercoseptoriosis. Pests include the cushion scale (*Pulvinaria floccifera*), armored scales (*Diaspididae*), the tea aphid (*Aphis theae*), and the tea moth (*Parametriotes theae*).

The tea industry of the USSR produces black and green loose teas with rolled leaves and green and black pressed, or brick, teas. In India, China, and Japan yellow and red oolong teas are also manufactured. Caffeine, vitamin preparations (for example, a preparation of vitamin P in tablet form), and various medicinal preparations are produced from the by-products of the tea leaf. The oil from tea seeds is used in the cosmetic industry and the canning industry (as a substitute for olive oil); it is also used as a lubricant for precision instruments and in soap manufacture. The leaves are used as a seasoning in China and Japan and as salad greens in Burma.

In the USSR loose black tea is produced by curing, or withering, the leaf at temperatures of 40°–50°C. The decrease in water content makes the leaf pliable. The dried leaf is then rolled and fermented. Enzyme action oxidizes the bitter fractions of tannin, thereby forming pleasantly astringent tannin, as well as essential oils (with the aroma of rose, lemon, orange, or vanilla) and other substances that determine the taste, color, and aroma of the tea. After drying, the tea is graded into groups according to size of particles. The finished product, composed of a mixture of teas from the various groups, is packaged in 25-, 50-, 75-, 100-, and 125-gram sizes and is wrapped. Loose green tea is prepared almost the same way as black tea, but before drying the leaf is treated with live steam at a temperature of 100°C to destroy the enzymes and preserve the green color.

Black brick tea is made by pressing the dust and siftings from the grading of loose tea into bricks of 125 or 250 g. Green brick tea is produced from coarse leaf gathered in autumn after the principal harvest of flushes or in spring during pruning. The raw material is roasted to preserve the green color, rolled, stored in piles for fermentation, and then dried and pressed into 2-kg bricks.

A technique for producing yellow tea has been developed: A mixture of two parts raw material for loose black tea after fermentation and one part raw material for green tea after curing are dried, graded, and packaged. The first batch was released for sale in 1977. Tea grades are named for their place of manufacture. The following loose black teas are popular in the USSR: Buket Gruzii, Krasnodarskii Buket, Gruzinskii, Krasnodarskii (extra, first, and second grades). Imported teas from India and Sri Lanka are sold under the names Indiskii and Iseilonskii.

To prepare tea as a beverage, dry tea (approximately one teaspoon per glass) is poured into a teapot (preferably porcelain) that has been rinsed with boiling water. The pot is filled two-thirds full with freshly boiled water (white with bubbles but not rolling) and then covered with a napkin to minimize escape of aromatic substances. After steeping (3½ to 5 minutes for black tea, 8 to 10 minutes for green), the remaining third of the teapot is filled with boiling water. Properly brewed tea from loose black tea is golden in color and has a specific aroma (without the odor of steamed leaves); there is brown foam on the surface.

Tea contains caffeine, essential oils, and tannins, which account for its tonic and stimulating effect. Tea tannins have some vitamin-P activity and a slight bactericidal effect. Consumption of strong tea is not recommended for persons suffering from insom-

nia, hypertension, heart disease, gastric and duodenal ulcers, or neuroses.

Certain tea substitutes from plant material (linden, carrot, and fruit teas) and mixtures of medicinal herbs (diuretic teas and others) are also called teas.

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V. E. DZHAKELI, V. P. TSANAVA, and U. D. URUSHADZE [29–18–1]

THEACEAE (Camelliaceae, Ternstroemiaceae), a family of dicotyledonous trees and shrubs. The evergreen leaves are alternate, simple, mostly leathery, and exstipulate. The regular flowers are usually bisexual, often solitary, and axillary or apical. Many species have large red, white, or, less frequently, other colored flowers. There are five or, less commonly, six or seven sepals; there are five or, rarely, four or more than five petals. There are usually numerous stamens. The gynoecium consists of three to five carpels (rarely two or ten). The ovary is usually superior. The fruits may be capsules, dry indehiscent fruits, drupes, or berries.

There are approximately 550 species, belonging to about 30 genera, distributed mainly in the tropics and subtropics of both hemispheres. The tea plant has great commercial importance, and the camellia is grown as an ornamental. Some species are grown for their wood. [29–32–2]

THOROUGHBRED, the fastest breed of horse in the world. The Thoroughbred was developed in Great Britain in the late 17th and early 18th centuries by crossing local breeds with Oriental breeds (the Barb, Turk, Arabian, and Turkmen) and European breeds (Neapolitan and Spanish). It has been improved strictly through pure breeding. The Thoroughbred is bred for speed and efficiency on racetracks. In the late 18th century the breed was imported by many countries, including Russia. In the USSR, it is one of the main breeds used in improving saddle horses.

The Thoroughbred is a large horse with a harmonious conformation. The head is delicate, the withers are high and long, the back is relatively short, and the legs are slender, with well-defined tendons. The coat is chestnut, bay, roan, black, or gray. The average measurements are as follows: height at the withers, 161 to 162 cm; chest circumference, 182 to 186 cm; and circumference of the front cannon bone, 19 to 20 cm. Thoroughbreds are used for sport and to improve saddle-horse breeds, including the Trakehner, Hanoverian, Budennyi, and Kustanai breeds. The world record for 1,200 m is 1 min 07.4 sec; for 2,400 m, 2 min 23 sec; and for 3,200 m, 3 min 19 sec. The countries of Europe and the USA have the greatest number of Thoroughbreds. In the USSR, Thoroughbreds are raised in stud farms in the RSFSR, Ukrainian SSR, Georgian SSR, Azerbaijan SSR, Kirghiz SSR, and Kazakh SSR. A continuous exchange between countries of purebreds is conducted to improve the breed. The USSR imports sires from Great Britain, France, and the USA and exports its horses to Italy, France, the Federal Republic of Germany, the German Democratic Republic, Czechoslovakia, Hungary, Bulgaria, and Poland.

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E. M PERN [29–643–1]

THYROID CARTILAGE, the large unpaired cartilage of the larynx, which first appeared in vertebrate evolution in mammals.

The thyroid cartilage develops from the second and third gill arches. In cloacal animals the arches retain their independence, being joined to the copula, while in marsupial and placental animals they are fused, forming two quadrilateral lamellae that are united at an angle on the ventral side (in humans on the anterior side). In children and women these lamellae are united at an obtuse angle; in men they form an angular projection, known as the Adam's apple. From the thyroid cartilage there pass the anterior cornua (in humans the superior cornua), in the direction of the hyoid bone (they are absent in pigs), and the posterior cornua (in humans the inferior cornua), which form a movable articulation with the cricoid cartilage. [29–1611–1]

THYROID GLAND, a specialized endocrine organ in vertebrate animals and man that manufactures and stores iodine-containing hormones that help regulate metabolism and the production of energy in the organism.

Anatomy. The thyroid gland develops in embryos from the epithelium of the branchial (pharyngeal) pouches embedded in the pharyngeal floor as a result of the transformation of the hypobranchial groove (endostyle) in lower chordates. The unpaired thyroid of cyclostomes is situated under the inferior wall of the gill part of the gut, while that of fishes is situated at the anterior margin of the branchial arteries (in bony fishes it includes the ventral aorta near the anterior gill arches, and in dipnoan fishes it is divided into two parts).

The paired thyroid gland of amphibians is situated near the sublingual apparatus (behind the second arch in caudates and under the posterior cornua in tailless amphibians). The unpaired thyroid of reptiles, often divided into two lobes, is situated under the trachea. The paired thyroid of birds lies at the base of the bronchi. The thyroid of mammals consists of two lobes connected by the isthmus, but in some animals it is divided into two separate parts. In lower vertebrates, the last (fifth) pair of gill arches gives rise to the ultimobranchial bodies (*see* ULTIMOBRANCHIAL BODIES), which secrete the hormone thyrocalcitonin (*see* THYROCALCITONIN). In mammals, this tissue is represented by the C cells of the thyroid. In man, the gland is completely formed by the eighth or ninth month of development of the fetus. It consists of two lateral lobes and a transverse isthmus, connecting the lobes near the lower ends. Sometimes a third lobe, the pyramid, arises from the upper part of the isthmus. The thyroid gland is situated in the neck, in front of the trachea and on the side walls of the larynx next to the thyroid cartilage (hence the name of the gland). The lateral lobes abut the walls of the pharynx and esophagus in back.

The external, or superficial, surface of the thyroid is convex, while the internal, or deep, surface, facing the trachea and larynx, is concave. The gland is about 50–60 mm in diameter; at the isthmus, it is 6–8 mm in diameter. It weighs 15–30 g (somewhat more in women). It is abundantly supplied with blood vessels, including the inferior and superior thyroid arteries. The superior cervical and stellate sympathetic ganglia provide sympathetic innervation, while branches of the vagus nerve provide parasympathetic innervation.

The main structural and functional units of the thyroid gland are the thyroid follicles (spherical or of irregular geometric shape) filled with a colloid substance having an iodine-containing protein, thyroglobulin (*see* THYROGLOBULIN). The follicles are very close to one another. Their walls are lined with a single layer of glandular epithelium. The structure of the gland also includes connective-tissue stroma, which are adjacent to the follicular wall and consist of collagenous and elastic fibers interspersed with blood vessels and nerves. The shape, volume, and height of the follicular epithelial cells vary with the functional condition of the gland: the epithelium is normally cuboidal, high and columnar (or cylindrical) when very active, and flat when inactive. The size of Golgi's complex and the number of mitochondria and secretory drops contained in the thyroid cells increases when secretion is active. The number and length of the microvilli arranged on the apical surface of the epithelium and facing the follicular cavity also increase when the gland is very active. The density, size, number, and location of the cytoplasmic (or albuminous) granules characterize both the process of biosynthesis and the secretion of specific products.

Physiology. Such basic biological processes as growth, development, and tissue differentiation depend on the normal functioning of the thyroid gland, which secretes two hormones—thyroxine and triiodothyronine (*see* THYROXINE and TRIIODOTHYRONINE). The biological effects of normal levels of the thyroid hormones are reflected in the maintenance of the organism's en-

ergy and biosynthesis processes at an optimal level. The action of the hormones on the process of biosynthesis and, consequently, on the body's growth and development, is mediated by the regulation of tissue respiration. Excessive amounts of the hormones intensify all types of metabolism, with catabolic processes, expenditure of substances and energy in the form of heat, and products of incomplete and incorrect metabolism predominating. The mode of action of the thyroid hormones entails stages of "recognition" and perception of cell signals and generalization of the molecular processes responsible for the nature of the response. Specific protein receptors in the cells of the various tissues "recognize" a hormone and trigger a biochemical reaction. The growth-stimulating action of the thyroid hormones, associated with the intensification of protein biosynthesis, is realized through the formation in the nuclei of the cells of the hormone-receptor complex that activates the synthesis of messenger RNA and the subsequent stages in the synthesis of structural proteins and protein enzymes.

Thyroid function is regulated by the central nervous system. When external and internal factors are constantly changing, the cerebral cortex plays the major role in regulating the hypothalamus-hypophysis-thyroid system. The thyroid also interacts with other endocrine glands. The hypophysis is an important factor in the regulation of thyroid activity; it produces thyrotropin (*see* THYROTROPIN), which stimulates the development and functioning of the thyroid gland (*see* NEUROSECRETION).

Thyroid diseases in man. Thyroid diseases—inflammations (*see* THYROIDITIS), tumors, injuries, and congenital anomalies—may cause the thyroid to enlarge (*see* GOITER) and function pathologically. They may also lower the production of hormones (hypothyroidism to the point where myxedema develops) or increase them (*see* GOITER, DIFFUSE TOXIC; HYPOTHYROIDISM; and MYXEDEMA).

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V. G. BARANOV and G. S. STEPANOV [29–1610–1]

THYSANURA, the order of primitive wingless insects most closely related to winged insects in regard to their development. The spindle-shaped body is usually covered with thin, shiny scales and in some cases is naked. It measures 10–20 mm in length. The insects have long, filamentous antennae, a mouth apparatus of the chewing type, and two compound eyes with two to three simple occelli between them. The thorax is continuous with the 11-segmented abdomen, which ends in a long, segmented axial filament and paired cerci. Fertilization is external and internal.

The order embraces approximately 360 species, which are encountered on all continents, predominantly in warm areas. The Thysanura live under rocks, in rock crevices, and in plant remains. The USSR has about ten species, including the silverfish. The insects have not been studied thoroughly.

Certain more primitive insects bearing a superficial resemblance to the Thysanura have been assigned to an independent order, Archeognatha, which was earlier considered the suborder Machiloidea of Thysanura. There are about 220 species of Archeognatha, fewer than ten of which inhabit the USSR.

[29–1602–1]

TIE, a support for rails in the form of a beam laid on top of the ballast layer of the roadbed. Ties ensure that the positions of the two rails do not change with respect to each other. They accept pressure from the rails and transmit it to the ballast layer. In the USSR ties are made of reinforced concrete (270 cm long) or wood (primarily softwoods) impregnated with antiseptics (275, 280, and 300 cm long); some foreign ties are made of metal. One kilometer of railroad track requires 1,600, 1,840, or 2,000 ties.

[29–1388–2]

TIE-SAWING MACHINE, a woodworking machine that makes ties by sawing logs longitudinally. Such machines may be equipped with circular saws or band saws.

In tie-sawing machines with circular saws, the feed motion may be accomplished by the moving log, which is fastened on a special carriage, or by the rotating saw, in which case the log being cut is held by clamps in a fixed position. In tie-sawing machines with band saws, a securely fastened log is fed to the saw. Circular-saw machines may have one or two saws; the upper, supplementary saw is mounted in the same vertical plane as the lower, primary one. Saw blades 4–6 mm thick with diameters of 1–1.6 m are used on circular-saw machines; the saw blades of band-saw machines are approximately 1.2 mm thick. Both types of machines make longitudinal cuts, and the short cutting edges of the saw teeth make the end cuts; the sawdust that forms is waste.

In some band-saw machines, the movement of the band saw is parallel to the grain of the log, and the short cutting edge cuts along the grain; instead of sawdust, a shaved strip is formed that is marketable as packing or for the production of Fibrolit.

N. K. IAKUNIN [29–1388–1]

TIME-FREQUENCY-DIVISION MULTIPLEXING, a method of transmitting electric telegraph signals over communications lines, in which a combination of frequency- and time-division multiplexing is used. The technique was proposed and demonstrated by a group of Soviet specialists under the direction of V. I. Kirsanov in the 1960's. During the next ten years it came into wide use.

Time-frequency-division multiplexing is used mainly in the switching telegraph networks of teletypewriter exchange services and direct circuits that use start-stop telegraphs as terminal equipment. The channel-forming equipment contains devices for creating within one standard telegraph channel up to four grouped frequency-division-multiplexed channels, in each of which 12 individual channels are created by means of time-division multiplexing. The transmission rate is 50 bauds for each time-division-multiplexed channel and 600 bauds for each frequency-division-multiplexed channel.

Time-frequency-division multiplexing combines the advantages of the synchronous and start-stop telegraphy systems. Its advantages include high noise immunity; the efficient use of the frequency spectrum in a standard telegraph channel, especially for the creation of a large number of channel groups; the possibility of extracting a portion of the channels at intermediate points along a communications line; and the ability to correct for envelope delay distortions in discrete signals. The principal operating disadvantage of time-frequency-division multiplexing is the necessity of using start-stop telegraphs having a closely controlled telegraph speed.

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M. I. MUSHKAT [29–85–4]

TINNITUS, a noise in the ears, a sensation arising in the absence of external acoustic stimuli. Tinnitus can occur in one ear or both ears.

Physiological tinnitus sometimes occurs under conditions of complete silence; it is due to the sensation of blood flowing in the small capillaries of the inner ear. In contrast, pathological tinnitus, usually accompanied by impairment of hearing, is caused by diseases of the middle or inner ear or auditory nerve, by intoxication with an industrial chemical (mercury, arsenic, phosphorus, lead), or by some drugs. Differences in the intensity and nature of the noise (buzzing, ringing, whistling) are diagnostic clues.

[29–1532–2]

TIRE, PNEUMATIC. In motor vehicles and other wheeled vehicles, pneumatic tires create the necessary adhesion (traction) between the wheels and the surface of the road and cushion the dynamic loads on the wheels that result from the motion of the vehicle. The tires ensure vehicle control, traction under difficult road conditions, stability, and riding comfort. They substantially affect the braking distance, fuel consumption, and many other performance and economic characteristics of the vehicle.

Pneumatic tires are classified according to purpose as passenger-car tires (for passenger cars and light trucks), truck tires (for all other trucks, buses, trolleybuses, and trailers), agricultural tires (for tractors and other agricultural vehicles), off-the-road tires (for construction, roading, and hoisting and conveying machinery), motorcycle tires (for motorcycles, motor scooters, and mopeds), and bicycle tires. Special-purpose tires include those for aviation, monorail transportation, and so on.

Pneumatic tires are multilayer rubber-and-textile products. Their manufacture accounts for about 50 percent of the rubber consumed and a substantial portion of chemical fibers and other reinforcing materials. In 1976 approximately 7 million tons of rubber was used to produce 780 million tires throughout the world.

Construction. The common element in all tires is the casing (Figure 1), which maintains a specific shape for the tire under the influence of the internal (inflation) pressure. The carcass, or body, plies are the foundation of the tire; they impart strength and resilience. They consist of several layers of rubberized textile or, in some cases, metal cord (cord fabric). In bias-ply tires the cords in adjacent plies cross one another, and the angle between the direction of the cords and a plane passing through the axis of rotation is 50°–55°; in radial-ply tires the cords of all the plies lie in this plane. The number of plies in radial-ply tires is about half that of bias-ply tires, so that the carcass is more flexible.

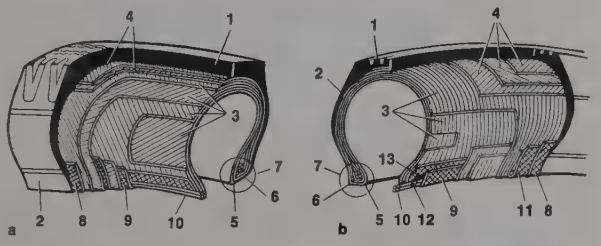

Figure 1. Diagrams of tire casings: (a) bias ply, (b) radial ply; (1) tread, (2) sidewall, (3) carcass plies, (4) breaker, (5) bead toe, (6) bead heel, (7) bead, (8) chaffer, (9) flipper, (10) bead wires, (11) supplementary metal-cord ring, (12) strip for wrapping bead wires, (13) rubber cord

The breaker is designed to provide a strong bond between the carcass plies and the outermost rubber layer (the tread); it is made of several layers of rubberized textile or metal cord (less often, of rubber). In bias-ply tires the cords of the breaker run at the same angle as the carcass plies; in radial-ply tires they run at an angle of 70°–85°, thus forming an inextensible belt that carries the major portion of the forces acting on the tires as a result of inflation pressure and external loads. Because of the combination of flexible carcass plies and a stiff breaker, radial-ply tires have a longer life, consume less power in overcoming rolling friction, and possess other service advantages over bias-ply tires.

The tread, which is formed as a single unit with the sidewalls, protects the carcass plies from mechanical damage and the effects of moisture. The thickest part, the section in contact with the road, has patterned projections and recesses of various sizes and shapes; the tread pattern determines the adhesion between the tire and the road, rolling resistance, resistance to abrasion, performance under difficult road conditions, running noise, and ease of control. The bead of the casing ensures that the tire is firmly seated on the wheel rim. The carcass plies are secured by bead wires.

An important construction feature is the method used to seal the tire, illustrated by tube-type and tubeless tires. The cavity of tube-type tires contains a ring-shaped inner tube with a valve, which retains the compressed air in the tire. In tubeless tires the air is retained by using chafers, by seating the tire on the rim under great tension, and by applying a rubber sealing layer to the inside of the casing. The advantages of tubeless tires are the high operating safety resulting from insignificant air leakage from a puncture, low weight, and ease of maintenance and repair. However, the necessary airtight fit on the rim requires special mounting equipment and greater precision in the fabrication of rims. The choice of tire construction depends on the application: for example, tubeless tires are best for passenger cars, where operating safety and a comfortable ride at high speeds must be ensured.

Operating characteristics. When stationary, a tire is subjected to the forces of the inflation pressure and the static load on the wheel; a rolling tire is additionally subjected to dynamic loads and loads arising from the redistribution of the vehicle's weight between the axles and wheels. Under the influence of these forces, a rolling tire undergoes continuous cyclical deformations that differ in magnitude and direction in the various zones of the tire. The total number of deformation cycles that occur during the life of a tire may reach several million. Such deformations cause spontaneous heating (heat buildup) in the tire to temperatures of 60°–90°C.

The most important service characteristics of tires are load-carrying capacity, service life, traction, rolling resistance, and shock-absorbing capacity.

The load-carrying capacity (the maximum permissible static vertical load on the tire) depends mainly on the tire's dimensions, inflation pressure, number and type of carcass plies, and operating conditions. The service life is defined as the tire mileage accumulated until the projections on the tread pattern become worn (for safe driving and for protection of the carcass from damage, the minimum height of the projections should be 0.5 mm for truck tires and 1.5 mm for passenger-car tires). The service life is reduced when road and climatic conditions are more severe, the load-carrying capacity is exceeded, the speed is increased, or the inflation pressure deviates from the optimum value for a given set of operating conditions (the inflation pressure ranges from 0.1 meganewtons per m^2, or 1 kg/cm^2, for automobile tires to 2 meganewtons per m^2, or 20 kg/cm^2, for aircraft tires). When the inflation pressure is reduced, the amplitude of the tire's deformations and the heat buildup are increased, which accelerates the onset of fatigue failure. When the pressure is increased, the stresses in the tire are increased, the danger of a rupture (blowout) in the carcass when driving over an obstacle is greater, and the tread wear is accelerated because of the higher contact pressure on the road. The average mileage for passenger-car tires ranges from 40,000 to 60,000 km, and for truck tires, from 60,000 to 100,000 km.

Traction is one of the most important factors affecting the driving safety of a motor vehicle. Inadequate traction is the cause of 25–40 percent of highway transportation accidents on wet roads and 5–10 percent on dry roads. The properties of the rubber in the tread as well as the tread pattern affect this characteristic.

The rolling resistance determines to a significant degree the fuel consumption in vehicular transportation and also affects the dynamic characteristics. It depends appreciably on the weight and construction of the tire and on the materials used in manufacture. The shock-absorbing capacity establishes a tire's properties as an element of the vehicle's suspension, which damps dynamic loads. Optimum shock-absorbing capacity in an automobile depends on the proper combination of tire shock absorption and shock-absorption characteristics of the other suspension elements.

Materials and production technology. General requirements for the rubber used in tires include long fatigue life and low heat buildup; in addition, the rubber used for treads must resist abrasion and weathering. Tire carcass must be very resilient, breakers must be heat resistant, and inner tubes must be airtight. The principal types of raw rubber used for tires are styrene-butadiene, stereoregular butadiene, synthetic isoprene, and natural rubber; the most important reinforcing materials are polyamide and rayon cords.

Tire manufacture includes the following production processes: preparation of the rubber stocks in mixers, processing of the cords (impregnation with synthetic latexes, heat stretching, stabilization, and coating with rubber on calenders), preparation of components (cutting out the rubberized cord, assembling the pieces, coating the pieces with layers of rubber, shaping the tread stock with extruders, making the sidewall components), assembly of the casing on special machines, shaping and vulcanization of the casings on a single machine, and processing of stock for inner tubes with extruders and vulcanization in compression molds. Many of the operations are performed on automatic transfer lines, including preparation of the rubber stocks and assembly

and vulcanization of the casings. (*See also* RUBBER, SYNTHETIC; RUBBER, NATURAL; and RUBBER, VULCANIZED.)

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V. F. EVSTRATOV [29–1210–1]

TJOKROAMINOTO, OMAR SAID. Born 1882 in the village of Desa Bakur, Java; died Dec. 17, 1934, in Jogjakarta. One of the leaders of the national and Muslim movement in Indonesia. Participant in the Budi Utomo.

In 1912, Tjokroaminoto founded the Sarekat Islam (Islamic Union), which he headed until his death. His skillful combining of Muslim goals with nationalistic and anticolonial goals and his talent as an orator furthered his popularity with the masses. Together with the other petit bourgeois leaders, Tjokroaminoto fought the Communist influence within Sarekat Islam, which led to a schism in 1923 and the collapse of the organization. In his struggle to influence the masses of workers and to counterbalance Marxism, Tjokroaminoto advanced the theory of Muslim socialism. Although he was in favor of class peace based on Islam in Indonesian society, he simultaneously denounced the domination of "criminal" (that is, foreign) capitalism in Indonesia. [29–679–5]

TRAN CAO UPRISING, a peasant uprising from 1516 to 1524 in the central regions of northern Vietnam, named for one of its leaders, Tran Cao, an important Vietnamese civil servant. The uprising, which was directed against the later Le dynasty (1428–1789), was also led by Phan At, originally from Champa and a servant of one of the members of the feudal house of Trinh. Supported by the townspeople, the rebels seized the capital, Hanoi, and proclaimed Tran Cao emperor. After a stubborn struggle with government troops, Tran Cao gave up the capital and commenced a guerilla war. After the death of Phan At, Tran Cao transferred power to his son, Qungu, and took monastic vows. The uprising was continued in the mountains until 1524, when it was suppressed by government troops. [29–42–3]

TRAN DAI NGIA. Born Sept. 13, 1913. Vietnamese scientist specializing in mechanics. Hero of Labor of the Socialist Republic of Vietnam.

From 1935 to 1945, Tran Dai Ngia lived in France, where he studied at the Higher School of Electrical Engineering, the Aeronautics Institute, and the Higher Construction School. From 1946 to 1954 he headed the artillery directorate of the People's Army of Vietnam. He served as deputy minister of industry and commerce from 1950 to 1960 and minister of heavy industry from 1960 to 1962.

In 1965, Tran Dai Ngia became chairman of the State Committee for Science and Technology. His works deal chiefly with mechanics. Tran Dai Ngia became a foreign member of the Academy of Sciences of the USSR in 1966. [29–39–3]

TRAN HUNG DAO (also Tran Quoc Tuan). Born 1226; died 1300. Vietnamese general who organized the Vietnamese people's struggle during the triple incursion of the Mongol feudal lords into Dai Viet (Vietnam) in 1257–58, 1284–85, and 1287–88. Commander in chief of the Vietnamese armed forces (1283).

On Apr. 9, 1288, Vietnamese forces under Tran Hung Dao won a major victory in a battle on the Bach Dang River that proved decisive in the expulsion of the Mongols from Dai Viet. In the struggle against the superior forces of the Mongol conquerers, Tran Hung Dao made extensive use of guerilla tactics, combined with concentrated attacks by the regular army. April 9, the day of Tran Hung Dao's victory over the Mongols in 1288, is celebrated as a national holiday in the Socialist Republic of Vietnam.

Tran Hung Dao wrote several works on the art of war, notably *An Elementary Manual on the Military Art.* [29–43–4]

TRAN PHU. Born 1901 in Quang Ngai Province; died September 1931. Seminal figure in the Vietnamese communist movement.

Tran Phu was a teacher by profession. In 1918, while still in secondary school, he founded the Society of Progressive Youth for Struggle Against the Colonialists. In 1925 he helped create the Hoi Phuc Viet (Society for the Renewal of Vietnam), later renamed the Tan Viet Cach Menh Dang (Revolutionary Party of New Vietnam).

In July 1927, Tran Phu conducted negotiations that led to the merger of the Tan Viet Cach Menh Dang with the Fellowship of Revolutionary Youth of Vietnam, thereby helping to establish the nucleus of the Communist Party of Vietnam (CPV), founded in February 1930 and renamed the Communist Party of Indochina (CPI) in October of that year. Later, as a member of the Fellowship of Revolutionary Youth of Vietnam, he studied in Moscow at the Communist University for Workers of the East. He was sentenced to death in absentia by a royal court.

Beginning in July 1930, Tran Phu, as a member of the Provisional Central Committee of the CPV, did important work toward convening a plenum of the committee. He was the author of the political theses for the first and second plenums, held in October 1930 and March 1931. The theses, based in part on the program of the Comintern, became the first program of the Communists of Vietnam. In October 1930 he became secretary general of the CPI. Tran Phu was arrested in Saigon on Apr. 18, 1931, and after five months of torture died in a prison hospital.

S. A. MKHITARIAN [29–43–2]

TRANSFER MECHANISM, a mechanism in rolling mills that is used to move rolled stock—such as billets, rails, or beams—in the lateral direction, for example, from one roller conveyor to another parallel to it. A transfer mechanism consists of a system of guide rails and endless chains or cables, to which special swinging fingers equipped with catches are fastened. When the catches encounter a rolled item, they grab and transfer it. In the reverse operation, the catches are retracted and pass freely under the rolled item. [29–1288–1]

TRANSFORMATION TEMPERATURE (also critical point; in Russian, Chernov point), any one of several specific critical temperatures at which a change in the phase and structure of steel occurs during heating and cooling. The most important are the two discovered by D. K. Chernov in 1868, which he called points *a* and *b*; the determination of their values and relative positions on the temperature scale marked the beginning of the scientific heat treatment of steel and was of enormous practical value.

According to Chernov the significance of point *a* (dark cherry temperature color) is that when steel is heated to a temperature below point *a*, it cannot be hardened no matter how rapidly it is cooled. For point *b* Chernov gave the following evaluation: when steel is heated to a temperature below point *b*, its structure does not change and a fracture retains its earlier form. According to Chernov, point *a* is the temperature above which steel must be heated in order to be hardened, and point *b* is the temperature above which heating tends to refine a coarse-grain structure. Later, in 1878, Chernov proposed point *d* (he defined point *c* as the melting point of steel), with a value of approximately 200°C, as the temperature to which steel must be rapidly cooled in order to achieve full hardening.

In modern representations, point *a* (now designated as A_1) corresponds to the eutectoid temperature. Point *b* is usually identified with the temperature, now designated as A_3, at which the dissolution of ferrite in austenite is completed when steel is heated. According to Chernov, steel heated above point *b* acquires after cooling a fine-grain structure, which thus determines the value of the point for the heat treatment of steel. Since in a number of cases heating above A_3 is not followed by the refinement of a coarse crystalline structure, the unqualified identification of point *b* with A_3 is apparently incorrect. Point *d* is now known as the temperature of martensitic transformation when steel is hardened, usually designated by M_S.

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V. D. SADOVSKII [29–255–2]

TRANS-KAMEN' ROUTE (Russian, Cherezkamennyi Put'; also Pechora Route), a route to Siberia used in the 16th and 17th centuries. The Trans-Kamen' Route passed through the Northern Urals, which at that time were known as the Kamen'. The route led from the Pechora River along a tributary called the Usa. After journeying a short distance overland to reach the Sob' River, travelers proceeded along the Sob' to the Ob' Valley and the city of Berezov. [29–193–2]

TRANSPORTATION ECONOMICS, in the USSR, the branch of economic science that studies patterns in the development and in the operations of transportation, which is regarded as a distinct sphere of material production.

Transportation economics, which includes the economics of railroad, maritime, river, motor-vehicle, air, and pipeline transportation, studies the engineering economics specific to each type of transportation as a part of the integrated transport network of the USSR. It studies operations, management organization, principles and methods for making optimal technological and organizational decisions, the economics of freight and passenger transportation, efficiency in developing a material and technical basis for transportation, the scientific organization of labor and wages, and categories and methods for measuring expenditures and results in transportation production.

Transportation economics, which is related to such branches of knowledge as national economic planning, industrial economics, agricultural economics, labor economics, statistics, economic geography, and the engineering sciences, develops scientific recommendations aimed at the improvement of transportation. These recommendations are used extensively in solving such important problems of the national economy as the proper locating of production throughout the various regions of the USSR, the selection of the proper dimensions of enterprises, and the provision of a viable economic basis for specialization and cooperation in production. Such recommendations help to relieve the transportation system of excessive work, to improve the system of material and technical supply in the national economy, to satisfy more completely the demand for shipping, and to reduce losses of industrial and agricultural output during transport. Research on the improved planning of passenger transport makes it possible to meet more fully the needs of the population in this area and to develop tourism.

Problems in transportation economics are studied at such institutions as the transportation economics subdepartment of the Moscow Institute of Transport Engineers, the Central Scientific Research Institute of the Ministry of Railroad Transport, and the Institute for Problems of Integrated Transport Systems. The present state and the development of transport economics are discussed in the publications *Zheleznodorozhnyi transport, Morskoi flot, Rechnoi transport, Avtomobil'nyi transport,* and *Grazhdanskaia aviatsiia.*

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I. V. BELOV [29–1807–1]

TRUNG BO (also Trung Phan, Trung Ky), the central part of Vietnam, comprising ten provinces. Area, 146,000 sq km. Population, 12.5 million (1975). The largest cities in Trung Bo, which is primarily an agricultural region, are Da Nang, Qui Nhon, Nha Trang, Cam Ranh, Phan Rang, and Phan Thiet. From the seventh to tenth centuries the kingdom of Annam occupied what is now Trung Bo. [29–767–2]

TRUNG TRAC AND TRUNG NHI, Vietnamese national heroines. The two sisters Trung Trac and Trung Nhi were descended from the noble family of Trung. The rebellion that they raised and led from A.D. 40 to A.D. 43 developed into the first national war of the Vietnamese people against the Han Dynasty of China (*see* TWO SISTERS' REBELLION). [29–782–2]

TRUONG CHINH. Born Feb. 9, 1907, in the village of Hanh Thien, Nam Dinh Province. Vietnamese political and state figure.

Truong Chinh joined the Fellowship of Revolutionary Youth of Vietnam in 1927 and the Communist Party of Indochina (CPI) in 1930. He was a member of the editorial board of the newspapers *Bua liem* (Hammer and Sickle) and *Cong doan bo* (Red Trade Union). He was imprisoned from 1931 to 1936 for revolutionary activities.

From 1936 to 1939, Truong Chinh directed the party's publications in Hanoi. He became a member of the Central Committee of the CPI in 1940 and a member of the Politburo and general secretary of the Central Committee of the CPI in 1941. He became a member of the Politburo of the Central Committee of the Workers' Party of Vietnam (WPV) in 1951 and served as the general secretary of the Central Committee until October 1956.

Truong Chinh was a secretary of the Central Committee of the WPV from 1956 to 1959 and deputy premier of the Democratic Republic of Vietnam (DRV) from 1958 to 1960. He was chairman of the Standing Committee of the National Assembly of the DRV from 1960 to 1976, a post he retained when the Socialist Republic of Vietnam was formed in 1976. In 1976 Truong Chinh became a member of the Politburo of the Central Committee of the Communist Party of Vietnam.

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In Russian translation:

Avgustovskaia revoliutsiia vo V'etname. Moscow, 1954. [29–782–3]

TSCHERMAK, GUSTAV (also Gustav Tschermak von Seysenegg). Born Apr. 19, 1836, in Littau, near Olomouc; died May 4, 1927, in Vienna. Austrian mineralogist and petrographer. Member of the Academy of Sciences in Vienna (1875).

Tschermak graduated from the University of Vienna. In 1860 he received the Ph. D. degree from the University of Tübingen. In 1861 he began teaching at the University of Vienna, where he was a professor from 1868 to 1906. From 1868 to 1877 he was director of the imperial mineral collection at the University of Vienna. Tschermak's major works dealt with the mineralogy of complex silicates, including feldspars, pyroxenes, amphiboles, chlorites, and micas. Tschermak clarified the dual role of aluminum in silicates and studied the phenomenon of isomorphism. He investigated meteorites and proposed a theory of their origin, according to which meteorites were formed during volcanic eruptions on asteroids. Tschermak was the author of *Lehrbuch der Mineralogie* (1881) and the founder of a journal later named after him, *Tschermaks mineralogische und petrographische Mitteilungen*, first published in 1871.

Tschermak was an honorary member of the St. Petersburg Academy of Sciences (1912). A hypothetical silicate found in pyroxenes (augites) has been named after him.

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TSCHERNING, ANTON FREDERIK. Born Dec. 12, 1795, in Frederiksværk, on Sjælland (Zealand) Island; died June 29, 1874, in Copenhagen. Danish state and political figure.

The son of a colonel, Tscherning took part in the Napoleonic Wars as a lieutenant. He taught at the Higher Military School in Copenhagen from 1830 to 1833. An opponent of absolutism and a left-wing liberal, Tscherning was chairman of the bourgeois-democratic Society of Friends of the Peasant from 1846 to 1856. From March to November 1848 he was minister of war and held the rank of colonel; he organized the Danish Army, which took part in the Danish-Prussian War (German-Danish War) of 1848–50.

In the period from 1849 to 1866, Tscherning was a deputy to the Constituent Assembly and the Folketing. Tscherning opposed the reactionary revision of the constitution in 1866.

[29–251–2]

TSCHUDI, AEGIDIUS (also Gilg Tschudi). Born Feb. 5, 1505, in Glarus; died there Feb. 28, 1572. Swiss historian.

From 1558 to 1560, Tschudi was chief magistrate of Glarus. A Catholic, he persecuted the followers of H. Zwingli. His main historical work was *Chronicon Helveticum* (Swiss Chronicle; vols. 1–2, 1734–36), which dealt with the period from 1000 to 1400; he incorporated many sources in this work, including some that he was the first to use. In the 19th century, historians identified as legendary much of the information contained in Tschudi's chronicle, such as the story of William Tell. [29–736–2]

TSWANA (also Chuana, Western Sotho), a language of the Sotho group of the southeastern Bantu languages. According to a 1970 estimate, Tswana is spoken in Lesotho, as well as in the western Transvaal and in northern Cape Province in the Republic of South Africa, by more than 1 million people.

The system of 9 vowels in Tswana exhibits the opposition open-closed in the phonemes [I], [e], [o], and [u]. Consonants include voiced and voiceless alveolar fricatives and affricates. Clicks, which occur only in ideophones, form a peripheral phonetic subsystem. Nasalization, palatalization, and alveolarization of consonants occur at morpheme boundaries.

Nouns are arranged in 18 categories, or noun classes, that form a system of concordances; there are two special classes made up of proper names, kinship terms, and totemic animals, and locative classes, which are weakly expressed in the other languages of the Sotho group. Classes are marked by monosyllabic prefixes. Verbs are conjugated by means of affixes; the diminutive aspect is formed by full reduplication of the verbal root.

The lexicon of Tswana abounds in ideophones. Sentences observe the following pattern: subject-predicate-object.

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N. V. OKHOTINA [29–702–3]

TUNNELING SHIELD, a movable prefabricated metal structure that provides for the safe driving of an underground excavation and makes it possible to install a lining in the excavation. A tunneling shield was first used in 1825 in Great Britain by M. I. Brunel to build a tunnel under the Thames River. In the USSR, tunneling shields have been used since 1932. They were used to build most of the subway tunnels in Moscow, Leningrad, Kiev, and other cities. Tunneling shields are used in the building of various types of tunnels and in the underground mining of mineral deposits.

Unmechanized tunneling shields are classified according to the shape and size of the cross section and the method used to separate the face from the rest of the tunnel. The cross section may be circular, elliptical, horseshoe-shaped, or rectangular. The size of the cross section may be 8.5–9.75 m (large), 5.7–6.7 m (medium), or 2.6–3.6 m (small). The face may be separated from the rest of the tunnel with or without the use of a cutoff wall, by means of dividing walls, or by means of a watertight bulkhead.

In an unmechanized tunneling shield (see Figure 4 in TUNNEL), the cutting edge of the shield prevents cave-ins and is used for the partial cutting of soft or friable rock. Propelling jacks, face jacks, piping, and controls are located on the shield's support ring. The overhanging part of the shield protects the site where the lining is erected. Horizontal and vertical bulkheads divide the shield into work compartments, which are required for tunnel driving by the full-face method. The shield is moved by means of the propelling jacks, which push against the forward end of the lining. The face jacks support the face; jumbo jacks advance the jumbo, or drill carriage.

Mechanized tunneling shields are used throughout the world. They are classified according to the area of application, the method used to break the rock, and the type of tool employed. Mechanized tunneling shields may be used in unstable, weak, or stable rock of varying hardness. The rock may be broken by means of shaving, rotary cutting, drilling, or spalling. The tool may be of the rotary, swinging, planetary, or combined type. The main dimensions of a mechanized tunneling shield depend on the diameter of the lining, geological conditions, and the type of mechanized equipment used.

The rate of advance depends on the type and cross-sectional size of the tunneling shield used. Under favorable conditions, the rate of advance may be as high as several hundred meters per month. For example, during the construction of the Leningrad Metro, tunnels were driven at a rate of 600 m/month.

The designs of tunneling shields may be improved by developing both interchangeable tools and standardized cutting tools and loading buckets.

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V. P. VOLKOV [29–1606–3]

TURBAN, a type of man's headgear that was once widely worn by Muslims of North Africa, Southwest Asia, South Asia, Middle Asia, and, sometimes, the Caucasus.

The turban is a length of fabric that is wound around the head. It is usually worn over a cap, fez, or skullcap, although it is sometimes worn—in India and Pakistan, for example—without any other head gear. It used to have ceremonial significance; for a Muslim who died on a journey, it served as a shroud. Among different peoples, the turban varies in color, quality of material, size, and method of winding, thereby indicating not only the nationality but also the social position of the wearer; for example, green turbans were worn by descendants of a prophet or by people who had been to Mecca, and white turbans were worn by other Muslims. [29–36–1]

TWINE, a twisted or spun yarn used to tie up small packages and sew soft containers, such as bags, in industry, agriculture, and trade. Twines are classified primarily by length-to-weight ratio (thickness), which lies in the range 800–8,500 tex, and by the material from which the twine is made, such as bast fiber, paper, and polypropylene. Twine is manufactured with a single-, double-, triple-, or six-thread structure. Some twines may be polished.

[29–1384–3]

TWINE PRODUCTION, the aggregate of manufacturing processes necessary to make twine.

Twine from bast fibers (hemp and flax) is manufactured by spinning and twisting. Manufacture begins with emulsification of the fiber to soften the plant gums, after which the material is carded to break up large complexes of fibers and remove trash. Sliver is then prepared on a system of drawing frames, with from two to three machine transfers. The spinning is done from the sliver; yarn up to 800 tex is produced on ring spinning frames, and yarns of 1,000 tex and more are spun on flyer spinning frames. The twine is then twisted from the resulting yarn and finished (sized and polished). Single-thread twine is manufactured only by sizing the yarn. Industrial twine is not finished. Double- and triple-thread twine is twisted from single-thread twine on twisters in double and triple structures, respectively, and then rewound into yarn packages. Six-thread twine is twisted in a triple structure from polished double-thread twine. It is then polished again and rewound onto spools or bobbins.

Paper twine is produced from special twine paper cut into strips in widths appropriate to the weight of the twine. The strips are twisted on twisters, and the twine is then polished with paraffin and rewound onto bobbins. Polypropylene twine is made by twisting flat polypropylene threads together.

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V. A. ZABELIN [29–1384–4]

TYPECASTING, the fabrication by casting of type and other composing materials for hand composition. Handcasting of type for composition and printing was originally developed by J. Gutenberg circa 1440. In 1838, D. Bruce, Jr., of the USA built the first manually driven typecasting machine, and in 1862, I. Johnson of Great Britain proposed a universal typecaster with a mechanical drive. Type and other composition materials are usually made at type foundries or sometimes at large printing enterprises. However, the production of conventional type is declining because of the increasing use of typecasting compositors and phototypesetting machines.

The preparation of new type consists of the following principal processes: development and approval of the type designs, fabrication of type matrices, casting of characters, and preparation of full sets of characters (fonts). The matrix is needed to form the casting mold and consists of a metal bar, usually of copper, carrying a recessed, nonreverse image of the character. Punches are first fabricated in order to make the matrix; they carry a mirror image of the character in relief and are produced on steel blanks by hand or machine engraving from designs, one for each letter, supplied by the artist. Under pressure in a press, the punch forms a depression in the matrix. The matrix may also be made directly by machine engraving through use of a metal template of the character design.

Typecasting is carried out on automatic typecasting machines. The matrix is placed in the machine, where it forms the end wall of the casting mold. Molten type metal is forced into the mold automatically under pressure. The alloy hardens to produce a piece of printing type. The cooled piece of type is forced from the mold and machined to remove burrs and the tongue. It then goes to the receiving table of the machine. The conditions of casting and processing on the machine must ensure accurate height (25.1 mm) and other casting dimensions as well as a smooth and clean surface. After casting of the required number of examples of a single letter (one matrix will withstand from 20,000 to 80,000 castings), the type matrix is replaced, and the other characters are cast. Depending on the type size, a typecasting machine may produce from 2,000 to 11,000 pieces of type an hour.

The type font is compiled from the cast pieces of type according to special tables that take into account the frequency of use of each letter in texts. The font includes a specific number of uppercase and lowercase letters and the numerals and symbols needed to compose texts in the given language.

The spacing material used to produce spaces within a line is cast on the same machines by using smooth plates instead of matrices. Rules and larger spacing materials are cast on special automatic machines that continuously cast a metal strip, which is automatically cut into pieces of the necessary length. Plastics, such as a copolymer of styrene with acrylonitrile or a polycarbonate, have also been used since the 1940's to cast large type and spacing materials. The use of plastics lowers the cost of composing materials, reduces weight, increases the life of the materials, and improves working conditions.

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N. N. POLIANSKII [29–1440–1]

UI BYONG, in medieval Korea, a people's militia, made up primarily of peasants, organized to repulse foreign invaders The *ui byong* first appeared in the late tenth century, during the invasion of the Khitans. In modern times the *ui byong* consisted of armed detachments of Korean patriots who fought against the Japanese aggressors. The partisan struggle waged by these detachments took on a wide scope in Korea between 1905 and 1908, after the establishment of a Japanese protectorate in 1905. Only by routing the main forces of the *ui byong* and driving them to remote regions were the Japanese imperialists able to annex Korea in August 1910.

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Istoriia Korei, vol. 1. Moscow, 1974.
[29–1625–1]

ULCHI MUNDOK. Born second half of the sixth century; died first half of the seventh century. Military leader of the Koguryo state and organizer of a victory over the Chinese invaders.

In 612 the Sui emperor Yang Kuang (Yang-ti) equipped an army of several million men and launched a campaign against Koguryo. The Korean troops, led by Ulchi Mundok, won a series of victories over the enemy, which was lured, through skillful maneuvering, into the interior as far as Pyongyang. The Sui army, now without food, was forced to retreat and was destroyed while crossing the Salsu (now the Chongchon) River.

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Istoriia Korei, vol. 1. Moscow, 1960. Pages 71–74. (Translated from Korean.)
[29–1625–2]

UNDERGROUND MINE CONSTRUCTION, the construction of enterprises, such as coal and ore mines, for the subsurface extraction of minerals. The construction of underground mines encompasses the digging of vertical, inclined, and horizontal underground mining excavations and the erection of buildings and structures on the surface. The surface structures and buildings include headframes, hoisting-machine buildings, buildings used for both administrative and general service purposes, machine repair shops, cooling towers, compressor houses, stores, and spur tracks. In underground mine construction, more than 60 percent of the total amount of construction and installation work is performed underground.

In prerevolutionary Russia, underground mines were constructed mainly in the Donets Coal Basin (the Donbas) and the Krivoi Rog Iron Ore Basin. In the USSR, underground mine construction experienced rapid development during the prewar five-year plans (1929–40). Large underground coal mines were constructed in the Donbas, in the Kuznetsk Coal Basin (the Kuzbas), and in Karaganda in Kazakhstan. Underground metal mines were constructed in, for example, the Krivoi Rog Basin and Perm' Oblast.

During the Great Patriotic War of 1941–45, the construction of underground mines was intensified in the eastern regions of the USSR. In the Kuzbas alone, 24 underground mines were put into operation during the war.

Between 1943 and 1950, the bulk of the work in underground mine construction was devoted to the reconstruction of wrecked or flooded mines in the Donbas, the Moscow Coal Basin, the Krivoi Rog Basin, and the Nikopol' Manganese Ore Basin.

The further development of underground mine construction was characterized by a greater reliance on specialized equipment and an improvement in the organizational forms of management. Between 1950 and the late 1970's, numerous underground mines were constructed or under construction in the USSR. They included coal mines (such as the Raspadskaia No. 1 Mine in the Kuzbas, the Krasnoarmeisk-Kapital'naia Mine in the Donbas, and the Vorga-Shor No. 1 Mine in the Pechora Coal Basin), potassium-salt mines (for example, those serving the Fourth Berezniki Potassium Combine in the Urals and the Fourth Soligorsk Potash Combine in Byelorussia), and iron mines (such as the Oktiabr'skaia-Saksagan' and Gigant-Glubokaia mines in the Krivoi Rog Basin and the Iakovlevo Mine in the Kursk Magnetic Anomaly).

As a rule, underground mines are constructed under complex mining and geological conditions at depths that reach 1,000 or more m. Such depths are characterized by high temperatures of the enclosing rock, elevated rock pressure, and gas emission. A substantial amount of excavation work is carried out to renovate existing underground mines and to prepare new levels in such mines.

The sinking of shafts is fully mechanized. BUKS-1m drilling rigs are used to drill blastholes. Loading machines are employed to load the bulk rock, and heavy-duty self-unloading buckets with a capacity of up to 5 m^3 are used to deliver the rock to the surface. Shafts are usually reinforced with cast-in-place concrete by pouring the concrete mix, through pipes, behind a movable metal formwork.

To put a modern underground mine into operation, 40 to 80 km of mining excavations are made. Every year, construction workers dig more than 360 km of mining excavations, including 25 km of vertical shafts. In 1976, the average shaft-sinking rate with the use of rock-loading complexes was 55 m/month in the coal industry and 43.6 m/month in the ore mining industry. The USSR is first in the world with respect to both the volume and the rate of sinking vertical shafts; a total of 401.3 m of finished shafts are sunk per month. Drilling rigs, rock-loading machines, and entry-driving machines are used to drive horizontal excavations. In 1975, about 15 percent of all excavations at underground mines constructed by the coal industry were made with cutting-loading machines; about 20 percent of all such excavations—that is, 1.5 times more than the planned standard—were made by high-speed techniques. In 1976, the average monthly excavation rate was 59.7 m of crosscuts and drifts in coal mines and 69.6 m in ore mines. The volume of ground removed per month in making excavations of large cross section—for example, pit bottoms and chambers—ranges from 300 to 460 m^3.

Underground mines are constructed by mine-construction organizations that are specialized in the type of work performed. The organizations include trusts that sink shafts, make horizontal or inclined excavations, install mining equipment, or construct buildings and structures on the surface. Such organizations belong to mine-construction combines or associations, for example, the Soiuzshakhtstroi All-Union Association of the Ministry of the Coal Industry of the USSR and the Tsvetmetshakhtstroi All-Union Association of the Ministry of Nonferrous Metallurgy of the USSR. The specialized Shakhtspetsstroi All-Union Trust of the Ministry of Installation and Specialized Construction Work of the USSR sinks shafts with the use of special methods, such as the freezing or grouting of rock.

Scientific research in underground mine construction is carried out by such research institutes as the All-Union Scientific Research Institute for the Organization and Mechanization of Underground Mine Construction (Kharkov), the Kuzbas Scientific Research Institute of Underground Mine Construction (Kemerovo), and the Donetsk State Institute for the Planning and Organization of Underground Mine Construction (Donetsk). Cutting-loading machines are developed by the Central Scientific Research Institute of Underground-mining Machine Building in Moscow.

In other socialist countries, large underground coal mines have been constructed in the Polish People's Republic, underground potassium-salt mines have been constructed in the German Democratic Republic, and large underground mines for the extraction of complex ores are under construction in the Mongolian People's Republic. Scientific and technical councils for the planning and construction of mining enterprises have been established in the framework of the Council for Mutual Economic Assistance (COMECON).

In capitalist countries, including the USA, the Federal Republic of Germany, Belgium, Great Britain, France, the Republic of South Africa, and Canada, underground mines are constructed, as a rule, by specialized firms.

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Proektirovanie ugol'nykh shakht. Moscow, 1976.

V. N. GOL'BERT [29–912–3]

UNION DE BANQUES SUISSES (also Union Bank of Switzerland), a major Swiss commercial bank, formed in 1912 when the Bank von Winterthur (founed 1862) and the Toggenburger Bank (founded 1863) merged. The bank expanded until 1969 by absorbing smaller banks.

The Union de Banques Suisses, whose headquarters are in Zürich, carries out a variety of banking transactions. It has a confidential investment company that invests depositors' capital in securities in Switzerland and abroad. The bank maintains 91 branches, 110 agencies, and eight subsidiary financial concerns in Switzerland and 30 branches and offices and four subsidiary financial concerns in foreign countries. It works with several multinational banking groups that invest in Latin America and the Far East and manages, with the Deutsche Bank, a bank in New York.

As of June 1977 the Union de Banques Suisses had total assets of 54.2 billion Swiss francs and capital and reserves of 3.4 billion francs; current accounts and deposits of other banks totaled 16.8 billion francs, and those of other clients, 25.5 billion. The bank had discounted notes and loans of 18.5 billion francs, accounts in other banks of 21.4 billion francs, and mortgages and securities of 10.1 billion francs. [29–995–1]

UNION JOINT, a detachable joint, formed by means of a union, that is used to connect the parts of a piping system to various tanks or machines. Besides a union, a union joint consists of a gasket, a locknut, and a reducer, such as an elbow or a coupling (Figure 1). The pipe to be connected is screwed into the reducer.

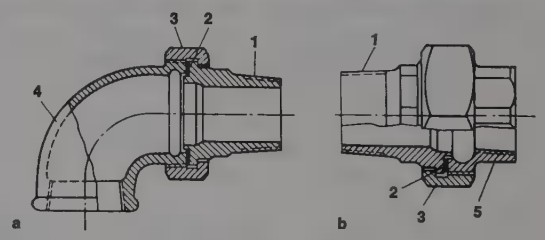

Figure 1. Union joints: (a) with an elbow, (b) with a coupling; (1) union, (2) gasket, (3) locknut, (4) elbow, (5) coupling

When the locknut is loosened, the reducer, together with the pipe screwed into it, may be turned relative to the axis of the union. A rigid, airtight joint is obtained by tightening the locknut. [29–1507–2]

UNIONS AND NIPPLES (in Russian, *shtutser*). A union or a nipple is a pipe fitting that is used to attach piping or a pipe joint to various tanks or pipelines. A union is a sleeve, while a nipple is a short piece of tubing. One of the ends of a union or a nipple has an internal or external screw thread; the shape of the other end depends on the method used to connect the fitting to adjoining parts.

The term "nipple" is also applied to a short piece of tubing of small diameter (10–20 mm) that is used to draw off water or air or to tap a liquid from piping in order to measure the pressure of the fluid. [29–1507–1]

UNITY OF BRETHREN (Unitas Fratrum), a religious sect that arose in Bohemia and Moravia in the mid-15th century after the defeat of the Taborites and formed itself into a church organization independent of papal Rome.

The first communities of the Unity of Brethren were established in 1457 in Kunvald in Bohemia by the followers of P. Chelčický. The sect was originally composed primarily of people from the peasant and artisan classes. It preached poverty, rejection of worldly concerns, humility, and passive resistance to evil. Later, the community accepted prosperous city dwellers and even members of the knightly and noble classes. In the late 15th century, the sect concentrated on education, and it founded

schools and printing shops. From this milieu came many scholars, including Jan Blahoslav and J. A. Comenius. The sect was persecuted by the authorities; after the defeat of the Czech uprising of 1618–20, the community was broken up and was banished from Bohemia and Moravia. In the 18th century, successors to the Unity of Brethren founded the Herrnhut communal movement in Germany, the Baltic region, and North America. [29–524–5]

UROMASTYX, a genus of lizards of the family Agama. The head is short and slightly flattened. The upper part of the body is covered with identical tiny scales, among which some species have irregularly placed enlarged tubercles with small spines. The short, slightly flattened tail is covered on top with large spiny scales, which are gathered into regular transverse spiny rings. The total length may reach 80 cm. Adults are a monotone gray or brown, sometimes with tiny dark spots, and the young have light transverse stripes and spots.

The genus embraces 13 species, which are distributed in North and East Africa and in Southwest Asia as far east as western India. They inhabit arid rocky and desert areas. They dig deep burrows, which in the case of some species attain a length of 4 m. The animals have an increased resistance to high atmospheric temperatures, remaining active when soil temperatures are 53°–57°C. The young feed on tiny invertebrates, while adults are mainly herbivorous. The females deposit up to 20 eggs. The flesh and fat of the animals are eaten in some countries. [29–1219–1]

UROPELTIDAE, a family of reptiles. The brightly colored body may reach a length of 35 cm. The tail is short, sometimes appearing to be chopped off, with the surface of the "chopped-off" part covered with carinal scales or with a single large shield. It serves as a source of support when the animal digs tunnels in the soil.

The family embraces eight genera, comprising 44 species, which are found in the southern part of the Hindustan Peninsula and in Sri Lanka. The Uropeltidae are burrowing animals. They live under rocks, under fallen tree trunks, and in the soil, frequently at high mountain elevations. They feed on worms and insects. The females are ovoviviparous, with three to eight young per litter. [29–1614–1]

VENEER, wood in the form of thin sheets obtained by peeling off short logs on veneer peeling machines (rotary-cut veneer), slicing logs on veneer-cutting machines (sliced veneer), and sawing on veneer-sawing machines or gang mills (saw cut veneer).

Saw cut veneer (1–10 mm thick) is made from spruce, Nordmann's fir, and Siberian stone pine. The highest quality veneer, it is used to make the soundboards of string instruments. The production of saw cut veneer entails substantial losses of wood in saw dust; the usable output of veneer is not more than 40 percent of the raw material.

Rotary-cut (0.1–10 mm thick), the most common variety of veneer, is made from birch, beech, oak, spruce, alder, aspen, pine, and other tree species. It is widely used to make plywood, plywood sheets, laminated wood plastics, and other types of laminated wood. Other uses include the decoration of cabinetwork, the production of matches and matchboxes, and the manufacture of separators for lead electrical accumulators.

Sliced veneer (0.2–5 mm thick) is produced from acacia, beech, oak, elm, chestnut, walnut, yew, ash, Karelian birch, mahogany, and other fine woods that have attractive grain. The desired decorative effect of the grain exhibited by different sections of the wood determines the direction of slicing. Several types of sliced veneer are distinguished on this basis, with radial, radial-tangential, tangential, and tangential-face cuts. Sheets sliced from one log in sequence are packed in bundles in the order of slicing to help select veneer by color and grain. Sliced veneers are used in cabinetwork.

The growing scarcity of fine wood and the difficulty of artificially reproducing a texture equivalent in decorative effect to natural wood grain have encouraged the development of thin and ultra-thin (0.08–0.15 mm) veneers of fine woods and the improvement of the natural grain of the wood of ordinary species by special treatment (slicing on an angle to the longitudinal axis of the trunk, wavy slicing and peeling, conical peeling).

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I. K. CHERKASOV [29–1404–1]

VERATRUM (false hellebore), a genus of large perennial herbs of the family Liliaceae. The rootstock is short and thickened. The leaves are plicate; the lower ones are broad and amplexicaul. The bisexual and staminate flowers are in a panicled inflorescence. The stellate perianth is corolliform and six-parted to the base. The fruit is a capsule that is segmented into three fruitlets.

There are about 25 species, distributed in the temperate and, less commonly, cold zones of the northern hemisphere. The USSR has nine species. *V. lobelianum*, which has yellowish green flowers, grows in the forest and forest-steppe zones in moist (often floodplain) meadows, in sparse forests, and amid shrubbery. *V. nigrum*, which has black-purple flowers, is found mainly in the steppe zone on slopes, in forest meadows (rarely in floodplain meadows), and amid shrubbery. The white-flowered *V. album* is found in the Carpathians on mountain meadows.

All species of *Veratrum* are poisonous. Alkaloids are present throughout the plant but mainly in the rootstocks and roots. Particularly poisonous are *V. lobelianum* and *V. album*, which produce severe poisoning and death of horses, cattle, and domestic fowl. These two species are most toxic when they are young. An infusion of their rootstocks and roots is used as an insecticide against skin parasites, for example, scabies. In veterinary medicine preparations obtained from the plants are used to improve digestion, to induce vomiting in pigs and dogs, and to treat hypodermosis in cattle.

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T. V. EGOROVA [29–172–1]

VERMES (worms), a heterogeneous group of invertebrates that includes about 46,000 species. As a general rule, worms have an elongated body whose walls consist of a cutaneous covering and musculature (the musculocutaneous sac). Locomotion is mainly peristaltic. Together with mollusks and arthropods, the Vermes belong to the group Protostomia. They cover an extensive morphophysiological range in the evolutionary series of invertebrates.

In the 19th century, the Vermes were regarded as a separate phylum. Scientists now consider that they constitute several independent phyla: Plathelminthes (flatworms), Nemathelminthes (nematodes), Nemertini, Echiurida, Sipunculida, and Annelida. The first three phyla are often united under the designation Scolecida. The remaining phyla are usually united with mollusks and arthropods in the higher group of trochophores (Trochozoa). Some zoologists consider Annelida and Arthropoda as subphyla of an extensive phylum known as Articulata.

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A. V. IVANOV [29–180–1]

VESPA, a genus of stinging hymenopterous insects of the family Vespidae (true wasps), belonging to the group of social wasps. The body reaches 3.5 cm in length, the females being larger than the males and the workers. The body is usualy brownish with yellow patterns or dressings; the wings are brownish yellow, and the thorax and abdomen are sometimes black. The insects build relatively large nests in the form of horizontally arranged honeycombs in hollow trees or abandoned burrows. Each nest contains up to 500 cells. As they build their honeycombs, the insects eat away at the bark of trunks and branches of various trees and shrubs, frequently causing them to dry out. They feed mainly on other insects, including honeybees; they also suck sap from tree wounds and nectar from flowers and eat fruits and berries.

Members of the genus carry dysentery and other infectious diseases. A sting from these wasps can be very dangerous, resulting

in edema, fainting, and general asphyxia. The genus embraces approximately 20 species, which are distributed in Eurasia and North Africa. Eight of these are found in the USSR. *Vespa crabro* is found in the European section of the USSR and in Siberia, *Vespa orientalis* in the Transcaucasus and Central Asia, and several species, including the largest, *Vespa mandarina*, in the Far East.

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G. M. Dlusskii [29–1153–3]

WALKING CONVEYOR, a conveying machine for the periodic movement of piece cargo in a straight line, used in assembly plants, foundries, and other industrial enterprises. It simultaneously transports from four to 70 loads with a total weight from 3 to 400 tons and with a step from 0.4 to 6 m. The length of a walking conveyor assembled from identical sections may reach 150 m; the conveying speed is from 1 to 20 m/min, and the duration of one cycle ranges from 0.2 to 10 min. The walking conveyor was introduced in the USSR in the 1960's. It has since been used in other countries as well because of its simplicity, low cost, and low weight.

A walking conveyor (Figure 1) has a stationary frame with guide rollers, a mobile frame resting on lift wheels, and a drive. Mechanical, pneumatic, or hydraulic devices are used for the drive and lift. In the starting position the mobile frame is lowered, and the loads are set on the stationary frame. At the start of each cycle, the mobile frame lifts the loads above the stationary frame (position I) by means of hydraulic cylinders and moves them forward by one step with the advance of the drive piston (position II). The hydraulic cylinders then lower the mobile frame and place the loads onto the stationary frame with a displacement of one step (position III). In the lowered position, the mobile frame, which is now without loads, returns to the starting position (position IV). The loads are placed and removed at the beginning and end of the conveyor. The conveyor may be automatically controlled. The period between movement cycles is determined by the nature of the production process. The principal disadvantage of walking conveyors is the need to overcome the inertia of the weight of the load and the frame in starting and stopping the drive.

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L. N. Kolobov [29–800–3]

WALL TAPESTRY, a pileless wall rug with a figured or ornamental design, made by hand in a filling rib weave.

To form the design, a weft of colored threads (usually wool or silk, but sometimes metallic gold and silver threads) is densely woven on a uniformly colored warp (wool or linen). A characteristic ribbed texture results. In tapestry weaving each thread of the weft is used only in the area in which its color is desired; this technique was known in antiquity and was used by the Copts. Two types of tapestries may be distinguished according to the type of loom used; high-warp is made on looms on which the warp is fastened vertically, and low-warp on looms with a horizontal warp. A cartoon, or painted sketch, the size of the tapestry serves as a model for the design.

Tapestry-making in Western Europe developed in the 12th and 13th centuries; in the Middle Ages wall tapestries were widely used to decorate dwellings and public buildings. Wall tapestries are examples of monumental decorative art. Particularly noteworthy is the Angers *Apocalypse*, which consists of seven huge tapestries depicting 105 scenes, of which 77 have been preserved (c. 1380, by the Paris studio of Nicolas Bataille, from cartoons by Jean of Bruges). Also well known are the six allegorical *Lady With the Unicorn* tapestries (late 15th to early 16th century, Paris, Cluny Museum), which are in the *millefleur* style; that is, their backgrounds consist of bunches of flowers.

The chief centers of medieval tapestry weaving were Paris, Arras, Tournai, and, beginning in the late 15th century, Brussels. In Brussels in the early 16th century the *Acts of the Apostles* tapestry series was executed for the Vatican from cartoons by Raphael; in the 17th century a tapestry series was produced in Brussels from cartoons by P. P. Rubens. In the mid-17th century large tapestry factories were founded in France under the direction of great artists, such as the Gobelins's royal factory in Paris and factories in Beauvais and Aubusson. The favorite themes for tapestries in the 17th and 18th centuries were mythological and historical scenes, allegories, hunting scenes, pastoral scenes, and landscapes (*verdures*).

In the 18th and 19th centuries tapestry weaving became completely dominated by the cartoon, and consequently many of the artistic qualities present in the older tapestries were lost. The decorative principles of tapestry weaving were revived in the mid-20th century by J. Lurçat.

In Russia, tapestry-making began during the reign of Peter I. A tapestry factory established in St. Petersburg in 1717 existed until 1859. One of the first works executed at the factory was *The Battle of Poltava*, from a cartoon by L. Caravaque (Hermitage, Leningrad). The factory reached the height of its activity in the

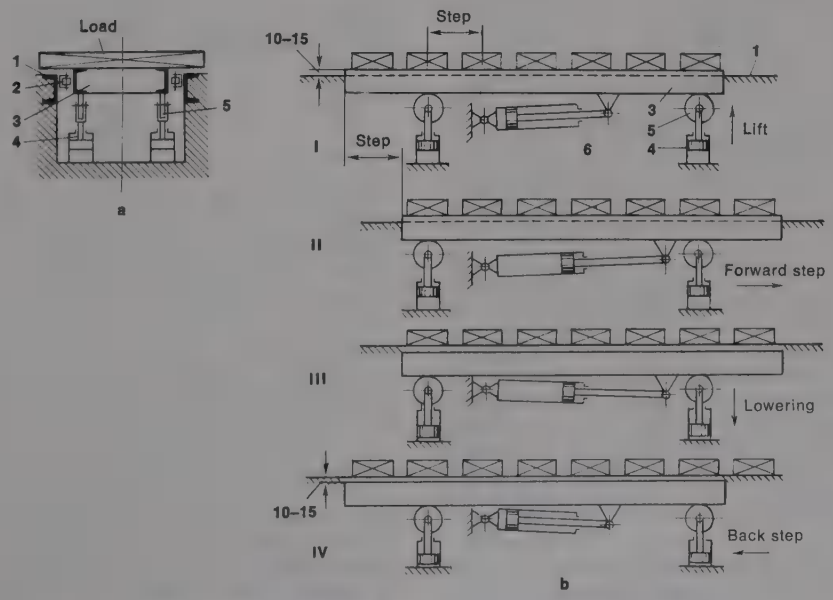

Figure 1. Walking conveyor: (a) end view, (b) side views of operating positions; (1) stationary frame, (2) guide roller, (3) mobile frame, (4) lift, (5) wheel, (6) drive

second half of the 18th century and the early 19th century. The decorative principle dominated Russian tapestry weaving in the classicist age, and many of the tapestries of this era, such as *Diana* and *Saturn* from the Gur'ev suite (1805–06, museums in Pavlovsk and Gatchina), were an integral part of architectural interiors.

The principal collections of tapestries in the USSR are located in Leningrad at the Hermitage and the Russian Museum and in Moscow in the museums of the Kremlin.

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G. A. ESIPOVA [29–1386–3]

WAR ECONOMY. (1) In capitalist countries, a specific part of the national economy that is responsible for the financing of the preparation and conduct of war; in socialist countries, the part of the national economy that strengthens defensive capability.

(2) A branch of knowledge (military economic science) that studies the economic aspects of national defense and warfare.

The war economy as a part of the national economy includes the production of various types of military products, as well as the distribution, exchange, and consumption of the products. Proponents of mercantilism and later scholars of classical bourgeois political economy wrote of the existence of a close interrelationship between war and economics. It remained for the founders of Marxism, however, to provide a scientific substantiation of the dependence of war on economics and the influence of economic conditions on the change in modes of warfare. "Nothing is more dependent on economic prerequisites than precisely the army and the navy. Armament, composition, organization, tactics, and strategy depend above all on the stage reached at the time in production and on communications" (F. Engels, see K. Marx and F. Engels, *Soch.*, 2nd ed., vol. 20, p. 171).

The history of war shows that military spending increases in absolute and relative terms with the development of the productive forces and with the improvement of the means of combat. Military spending reached its high point in the age of imperialism. The laws of development inherent in imperialism and the struggle for the redivision of the world have twice plunged mankind into bloody world wars and have caused numerous local wars. Two world wars have shown that success in war depends to a great degree on the quantity and quality of economic resources and on the effective mobilization and utilization of these resources. In the wars of the 19th century, the military spending of the warring nations accounted for between 8 and 14 percent of national income on the average, whereas in World War I this indicator was 24.2 percent in Austria-Hungary, 36.9 percent in Great Britain, 31.6 percent in Germany, 19.2 percent in Italy, 24.1 percent in Russia, 25.6 percent in France, and 15.5 percent in the USA. During World War II the corresponding figure was 43.4 percent in the USA, 55.7 percent in Great Britain, and 67.8 percent in Germany. In order to satisfy the enormous military requirements brought on by World War I and especially by World War II, it was necessary to place a significant part of the national economy of the warring nations on a military footing. Thus, according to some estimates, the share of military production in total US industrial production was 60.6 percent between 1941 and 1945.

With the worsening of the general crisis of capitalism, imperialist countries are increasingly resorting to the use of military force as an instrument of policy. Immediately after World War II, the imperialist countries—under the leadership of the USA—began preparing for a new world war by pursuing a "cold war" policy and forming aggressive military and political alliances directed against countries in the socialist community, the labor movement, the national liberation struggle of peoples, and other revolutionary forces of modern times. An arms race without precedent in history has come into being. The total annual sum of direct military spending throughout the world has increased from $120 billion in 1962 to more than $400 billion in 1977. While in the past the war economy developed appreciably immediately before and during wars, after World War II the prolonged and intensive arms race has led to the formation of a permanently active, ramified military sector of the economy.

The war economy is not separate from the civilian economy: a large number of branches and enterprises manufacture both civilian and military products or else produce items that can be used in the civilian and military sectors of the economy (footwear, fabrics, clothing, food, and the like). At the same time, there are certain features in the development of the war economy that stem from the character of military requirements, the purpose and specific properties of military products, and the existing mode of production. The state has a decisive influence on the development of the war economy. The state is the exclusive or principal purchaser and consumer of military products manufactured in the nation, and hence the scale and structure of the war economy are determined specifically by the demands of the state. "When capitalists work for defense, i.e., for the state, it is obviously no longer 'pure' capitalism but a special form of national economy. Pure capitalism means commodity production. And commodity production means work for an *unknown* and free market. But the capitalist 'working' for defense does not 'work' for the market at all—he works on government *orders*, very often with money loaned by the state" (V. I. Lenin, *Poln. sobr. soch.*, 5th ed., vol. 32, pp. 318–19).

The development of state-monopoly capitalism is most clearly manifested in the war economy. In addition to legislative, administrative, and political measures, bourgeois states make broad use of economic levers—in particular, all manner of financial incentives for military-industrial corporations—for the purpose of state-monopoly regulation of the war economy.

Data on the share of the gross national product (GNP) accounted for by the direct military expenditures of a country provide some idea of the relative size of the war economy, that is, the degree of militarization of the economy (see Table 1). However, this general indicator understates the actual level of military consumption, since officially published data on military expenditures do not include all types of military expenditures and data on the GNP may be considerably exaggerated if identical items are listed in two different reporting categories.

Table 1. Official figures for military expenditures of major imperialist countries

	1970		1976	
	(million dollars)	(percent of GNP)	(million dollars)	(percent of GNP)
USA	77,854	7.4	102,691	6.0
Great Britain	5,850	4.9	10,734	5.1
Federal Republic of Germany	6,217	3.3	15,220	3.6
France	6,014	3.3	12,857	3.7
Italy	2,599	2.8	3,821	2.6
Canada	2,061	2.4	3,231	1.9
Japan	1,592	0.8	5,058	0.9

The boundaries of maximum development of the war economy are determined by the war economy potential of a country. The defense industry is a basic link in the war economy. Its nucleus is the armaments industry: the aerospace and nuclear industries, military shipbuilding, and the manufacture of military electronic products, armored equipment, ammunition, artillery, and small arms weaponry.

A dominant position in the war economy of modern capitalism is occupied by the USA, which produces approximately three-fourths of all the aircraft, missiles, artillery, and small arms and two-thirds of the warships (mid-1970's) produced in all NATO (North Atlantic Treaty Organization) countries.

West European NATO countries constitute the second major center of the capitalist war economy. The ruling circles in these countries try to expand the coordination of the war economy and to make it more effective. Integrative processes encompass the development and production of armaments.

Both government and private enterprises participate in the manufacture of military products. In the USA and in West Euro-

pean countries, however, private capital occupies the major place in the war economy. The leading role is played by a few large corporations. In fiscal year 1974–75, 100 large American companies received 68.7 percent of government defense contracts; ten of the largest received 31.4 percent of the orders. Lockheed Aircraft Corporation occupied first place in total military contracts received ($2.1 billion), and the Boeing Airplane Company was second ($1.6 billion). Major suppliers of military products, which constitute the nucleus of the military-industrial complex, hinder détente and try to step up the arms race for the sake of higher profits.

The war economy in socialist countries is created for the purpose of protecting the interests of the working people and their revolutionary attainments. From its very inception, the first socialist country had to organize military production in order to defend itself against internal counterrevolution and military intervention.

After the Civil War of 1918–20, the Communist Party and the Soviet state—in addition to restoring the national economy and implementing a program of all-out socialist construction—devoted a good deal of attention to the development of the aircraft, tank, artillery, and other branches of the defense industry. The prewar creation of the war economy potential of the USSR served as the material basis for the accelerated development of the war economy and for the production of all types of armaments and combat matériel during the Great Patriotic War of 1941–45. Material, labor, and financial resources were mobilized to the utmost for the maximum possible satisfaction of the needs of the front. There was a sharp increase in absolute and relative military spending in the state budget of the USSR: the share of national income used for military purposes rose from 15 percent in 1940 to 55 percent in 1942. The selfless labor of the Soviet people, the major organizational effort of the Communist Party, and the advantages of socialist society and the socialist state system made it possible to increase the output of military products at a rapid rate, to surpass fascist Germany in all indicators of armaments production during the war years, and to outfit the army with sufficient quantities of highly effective types of weapons and combat matériel, all of which was of decisive importance in defeating the enemy.

In the face of the ever growing military economic preparations of imperialism and especially of NATO member nations in the postwar years, countries in the socialist community were compelled to develop and produce modern weapons and war matériel in order to strengthen their defensive capability. The USSR and other countries that are parties to the Warsaw Treaty of 1955 took measures to strengthen the defensive might of countries in the socialist community. The forms of military economic cooperation were expanded and improved among fraternal socialist countries that were compelled to spend considerable sums on military purposes in order to defend their attainments. Thus the defense spending of the USSR was 17.6 billion rubles in 1974 and 17.2 billion rubles in 1977 (the share of defense spending in the state budget of the USSR declined from 11.5 percent in 1970 to 7.2 percent in 1977). The CPSU and the Soviet state are concurrently engaged in a major effort to implement the program of the Twenty-fifth Congress of the CPSU (1976) on the further struggle for peace and international cooperation and for the freedom and independence of peoples. The USSR and other socialist countries are stepping up the struggle to halt the arms race, to reduce armaments and the armed forces, and to achieve genuine success in disarmament.

War economy as a branch of knowledge is a component of military science. It studies the interrelationships between war and the economy and the problem of evaluating and comparing the war economy potential of opposing countries and their coalitions. It defines the forms and methods for mobilizing the national economy and for placing it on a military footing in the case of necessity. It ensures the effectiveness of the system for the functioning of the war economy and the use of resources earmarked for military purposes. War economy theory is of a class nature.

Bourgeois military economic science was formed in the imperialist era. World War I and II exerted a significant influence on its development. The postwar arms race has promoted the further development of the war economy theory, especially in the USA. Works by bourgeois authors attempt to investigate economic preparations for modern war on the one hand and to justify and conceal the class and aggressive character of the unprecedented arms race and the development of militarism in capitalist countries on the other.

The military economic science of socialist countries investigates the patterns of development of the socialist military economy in the interests of warding off the menace of war and of frustrating imperialist aggression. It studies and substantiates ways and means of managing and strengthening the economic basis of national defense and the effective use of resources allocated for defense purposes, for the reliable protection of the attainments of socialism, and for the preservation of universal peace.

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R. A. FARAMAZIAN [29–1796–2]

WASHER, a machine part mounted under a nut or bolt head. Plain washers (Figure 1,a) are used to increase the load distribution where the load-bearing surface is uneven or of a soft material, where the bolt hole is elongated, or where the hole diameter is enlarged. Bevel washers (Figure 1,b) and spherical washers (Figure 1,c) are used to prevent the nut or bolt head from warping during tightening. Open, or C, washers (Figure 1,d) are quick-release types used in fixtures to save time in removing a used part and mounting a new one. Packing washers made of a soft material are mounted under the heads of threaded plugs to provide a hermetic seal. Spring lock washers (Figure 1,e) reduce the likelihood that a bolt or nut will loosen since the elastic force of the compressed washer acts on the connection. Tab lock washers have sections that can be bent (Figure 1,f) to prevent a nut or bolt from turning with respect to a load-bearing shaft or other part. End plates (Figure 1,g) prevent axial displacement of parts mounted on a shaft (such parts may be held fixed or rotate on the shaft). [29–808–3]

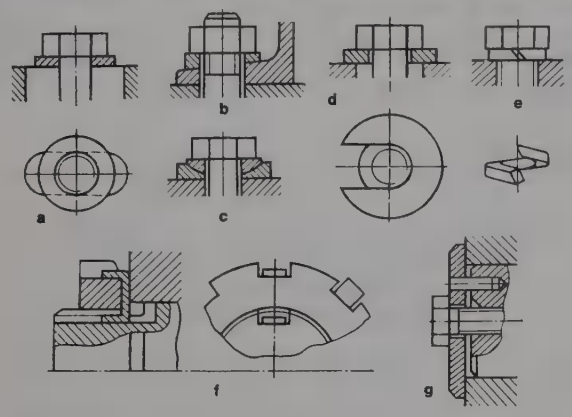

Figure 1. Washers: (a) plain, (b) bevel, (c) spherical, (d) open, (e) spring lock, (f) tab lock, (g) end plate

WATER HYACINTH (*Eichornia crassipes*; formerly *E. speciosa*), a perennial herbaceous aquatic plant of the family Pontederiaceae. The stem is short, with rosettes of oval leaves. The leaf petioles are filled with air and inflated like bubbles to ensure that the plant floats on the water surface. The rhizomes are long, so that if the water dries out, the plant takes root in the muddy bottom. The flowers are in a spicate inflorescence with a funnelform lilac perianth of six lobes and six stamens. The fruit is a capsule.

The water hyacinth is native to tropical and subtropical regions of North and South America. It has spread to the fresh waters of all tropical lands. A pernicious aquatic weed, it forms dense thickets in rivers, obstructing navigation and contaminating drainage and irrigation systems. The water hyacinth is controlled by mechanical and chemical methods; in some countries it is used as fertilizer or livestock feed. [29–1735–4]

WEST SPITSBERGEN CURRENT, a branch of the warm Gulf Stream current along the western shores of Spitsbergen, a continuation of the Norwegian Current. The mean annual temperature of the water is 1°–3°C, and the velocity of the current reaches 5.5 km/day. Water salinity is about 34.5%. When the current submerges north of Spitsbergen, it gives rise to a stream of warm intermediate waters in the Arctic Ocean. [29–1401–1]

WHAT IS TO BE DONE? (full title, *What Is to Be Done? Burning Questions of Our Movement*), a book by V. I. Lenin in which he comprehensively substantiated the need to create a new kind of proletarian party that would be fundamentally different from the reformist parties of the Second International—the party of the socialist revolution and of the dictatorship of the proletariat. In this book Lenin ideologically demolished "economism," showing it to be a variant of international opportunism, or Bernsteinism. The book was written between the fall of 1901 and February 1902 and was first published in Stuttgart in March 1902. It is part of Lenin's collected works (*Poln. sobr. soch.*, 5th ed., vol. 6, pp. 1–192).

The first chapter of the book, constituting a defense of the revolutionary Marxist trend in the working-class movement, showed that the Bernsteinians used the slogan "freedom of criticism" as a cover for their proposed revision of all the basic tenets of Marxism; for example, they advocated "class cooperation" and rejected the idea of the proletarian revolution and dictatorship of the proletariat. In Lenin's view, the creative development of Marxism, which would be enriched by the new experience gained from the class struggle of the proletariat, had nothing in common with the revisionists' attempts to subvert the fundamentals and principles of Marxism. " 'Freedom of criticism,' " wrote Lenin, "means freedom for an opportunist trend in Social-Democracy, freedom to convert Social-Democracy into a democratic party of reform, freedom to introduce bourgeois ideas and bourgeois elements into socialism" (*ibid.*, p. 9).

Economism in Russia was a variant of international opportunism. By worshiping the spontaneity of the working-class movement, stressing above all the economic aspect of the class struggle of the proletariat, and advocating a reformist approach to the political struggle, the Economists minimized in every possible way the role of socialist consciousness and the leading role of the party within the working-class movement; viewed objectively, they were the vehicle of bourgeois influence on the proletariat, inasmuch as they tried to disarm the working class, both ideologically and organizationally, in its struggle against autocracy and against the bourgeoisie. Economism was the chief obstacle on the road toward centralized rule by the revolutionary Marxist party.

Having unmasked the opportunist ideology of economism, Lenin substantiated and emphasized the significance of revolutionary theory and of the Marxist party as the leading force in the mass working-class movement; he showed the ineradicable connection linking all aspects of the class struggle of the proletariat—political, economic, and ideological—and emphasized with special force the significance of the party's theoretical (that is, ideological) work. Indeed, theoretical preparedness was particularly important for Russian Social Democracy, since this was the first time in history that a workers' party had to lead the people in a nationwide struggle for the victory of the bourgeois-democratic revolution.

The party could not have led the struggle for liberation without adopting a creative approach to this task and without independently reviewing the whole experience of the international proletarian movement. The party must march ahead of the spontaneous working-class movement and show it the way, and to this end it must be guided by revolutionary theory. "Without revolutionary theory there can be no revolutionary movement," wrote Lenin, and "the role of vanguard fighter can be fulfilled only by a party that is guided by the most advanced theory" (*ibid.*, pp. 24, 25).

The second chapter of *What Is to Be Done?* deals with the relationship between spontaneity and consciousness within the working-class movement. The Economists claimed that Social Democracy must not try to implant socialist consciousness in the working class; in their judgment, it was necessary to wait for the spontaneous working-class movement to work out a socialist consciousness by its own efforts. Lenin showed that the socialist doctrine is worked out by the ideologists of the working class and is carried over by the working-class party into the class struggle of the proletariat—a struggle that grows spontaneously out of the soil of capitalist relations.

As Lenin pointed out, world history shows that what the working class can work out by its own efforts alone is merely a trade-unionist consciousness. The socialist ideology is introduced into the working-class movement in the course of the complex, continuous, and bitter struggle against the bourgeois ideology. In Lenin's words, "the *only* choice is—either bourgeois or socialist ideology. There is no middle course (for mankind has not created a 'third' ideology, and, moreover, in a society torn by class antagonisms there can never be a non-class or an above-class ideology). Hence, to belittle the socialist ideology *in any way, to turn aside from it in the slightest degree* means to strengthen bourgeois ideology" (*ibid.*, pp. 39–40). In the early 20th century the Marxist party in Russia was faced with the task, as shown by Lenin, of

setting the working-class movement on the path of political struggle against tsarism and capitalism and arming it with the ideas of scientific socialism.

The third chapter of *What Is to Be Done?* throws a light on the relationship between economics and politics—that is, between the economic and the political aspects of the class struggle of the proletariat. Lenin criticized the Economists for their trade-unionist and reformist view of politics and substantiated the revolutionary policy of the Marxist party. The Economists' worship of spontaneity led them to minimize not only the role of socialist theory but also the political tasks of the working class and its party. Lenin showed that limiting the political struggle to a struggle for reforms would condemn the working class to eternal wage slavery; that the only way the proletariat can radically improve its economic position is by overthrowing the rule of the exploiters and struggling for the power of the working class; and that "the fundamental economic interests of the proletariat can be satisfied only by a political revolution that will replace the dictatorship of the bourgeoisie by the dictatorship of the proletariat" (*ibid.*, p. 46, footnote).

The ultimate goal of the struggle of the proletariat is the overthrow of capitalism and the establishment of its own rule for the purpose of building a socialist society. The immediate task of Russia's working class, as Lenin pointed out, was to overthrow the autocracy in order to create the necessary conditions for the struggle leading to the victory of the socialist revolution.

Lenin developed the idea of the hegemony of the proletariat in the impending bourgeois-democratic revolution—the idea of the revolutionary alliance of the working class and the peasantry—which he had first formulated in *What the "Friends of the People" Are and How They Fight the Social Democrats* (1894). In his view, the working class must assume the leadership of the general democratic movement in its role of fighting vanguard for political freedom; its party must therefore "expound and *emphasize general democratic tasks before the whole people*, without for a moment concealing [its] socialist convictions" (*ibid.*, p. 83). In Russia, according to Lenin, the party of the working class must combine the democratic struggle of all the people against autocracy with the socialist struggle of the proletariat against capitalism. Social Democracy, therefore, is obliged to carry out revolutionary propaganda and agitation among all the strata of the population, aiming for the political exposure of autocracy and of the entire sociopolitical system of tsarist Russia.

In the fourth and fifth chapters of his work, Lenin substantiated his plan for building a Marxist party, a rough outline of which he had presented earlier in the article "Where to Begin" (*ibid.*, vol. 5, pp. 1–13). The Social Democratic groups and committees that existed in Russia at the time, being scattered and poorly organized, were not capable of leading the effort to implement the political goals of the proletariat. What was needed was a single organization—that is, a party—and it was the necessity of building such a party that the Economists denied. Lenin addressed this point when he wrote that "the spontaneous struggle of the proletariat will not become its genuine 'class struggle' until this struggle is led by a strong organization of revolutionaries" (*ibid.*, vol. 6, p. 135).

Lenin held that building the party must start with a nationwide Russian political newspaper to disseminate the views of revolutionary Social Democracy. The newspaper's organized network of agents and correspondents was to serve as the skeleton around which the party would be built. Lenin's *Iskra* had become such a newspaper. According to Lenin's plan, the party was to consist of (1) a narrow circle of leading party workers—mainly professional revolutionaries—and (2) a broad network of party organizations.

In his "Conclusion," Lenin answered the question What is to be done? by reiterating the need to overcome the organizational confusion and ideological waverings in the ranks of Russian Social Democracy and to create a militant organization of revolutionaries (*ibid.*, pp. 180–83).

The historical significance of Lenin's book lies in its exposure of the ideological sources of opportunism in the working-class movement—namely, the worship of spontaneity—and its elaboration of the major political and ideological issues and programmatic, organizational, and tactical principles of the Marxist party. These principles constitute the ideological basis of the CPSU and of all communist and Marxist-Leninist parties.

Lenin's book went through 219 editions, with more than 11,918,100 copies printed in 58 languages of the peoples of the USSR and other countries (as of Jan. 1, 1977).

REFERENCE
Istoriia KPSS, vol. 1. Moscow, 1964. [29–696–3]

WHAT THE "FRIENDS OF THE PEOPLE" ARE AND HOW THEY FIGHT THE SOCIAL DEMOCRATS (A Reply to Articles in *Russkoe bogatstvo* Opposing the Marxists), the first basic work of V. I. Lenin, dealing with questions of dialectical and historical materialism, political economy, and scientific socialism and the idea of uniting socialism with the working-class movement and creating a Marxist working-class party in Russia. The book is part of Lenin's collected works (*Poln. sobr. soch.*, 5th ed., vol. 1, pp. 125–346).

In this work, Lenin criticized the views of the ideologists of liberal Narodnichestvo (Populism)—those sham "friends of the people," such as N. K. Mikhailovskii, V. P. Vorontsov, S. N. Krivenko, and S. N. Iuzhakov, who argued against Marxism in the magazine *Russkoe bogatstvo*—and formulated the ideological and theoretical principles as well as the basic program and tactics of Russia's revolutionary Social Democracy.

The book was written in 1894 and clandestinely hectographed in three separate issues. The first issue exposed the Populists' philosophical views. The second issue, which dealt with their political and economic theories, has never been found (Lenin reiterated his critique of these theories in *A Characterization of Economic Romanticism*, 1897). The third issue dealt with the Populists' tactics and their economic and political platform. Hectographed copies of the book were read in the revolutionary circles of St. Petersburg, Moscow, Kiev, Kharkov, and other Russian cities. Members of the Liberation of Labor and other Russian Social Democrats abroad were familiar with the book's contents.

In the book Lenin demonstrated the complete unfoundedness of the liberal Populists' philosophical and sociological views and of their subjective-idealist method, which exaggerated the role of ideas and of "critically thinking people" in history and rejected the concept of society's development according to objective laws. Lenin brought to light the dialectic-materialist essence of Marxist philosophy and the materialist conception of history. Refuting the Populist theory of the "active heroes" and the "passive crowd," he showed the people to be the true makers of history—the chief moving force of social progress. He exposed the Populists' attempt to "convict" the Marxists of being caught in the allegedly insoluble "conflict" between historical necessity and individual freedom; he revealed the fallacy of the Populists' assertion that outstanding individuals can successfully oppose the laws of history, and he showed that the power of the individual lies in his acting in accordance with the immediate requirements of social development rather than in opposition to historical necessity.

Approaching this question from a practical point of view, Lenin pointed out that the acknowledgment of historical necessity could not be reduced to passive contemplation of events but presupposed, under the conditions existing in Russia, vigorous action on the part of the Social Democrats aimed at rallying the working class for the struggle against autocracy and capitalism.

Lenin proved that the Populists' economic views were as unfounded as their philosophical tenets. The Populists of the 1880's and 1890's could no longer deny that capitalism was developing in Russia; they believed, however, that it had no future. They defended the concept of Russia's "indigenous" road to noncapitalist development, arguing that Russian capitalism was "artificial" in nature because of the country's lack of a domestic market. The Populists minimized the disintegration of the peasant commune and idealized small-scale commodity production, or "people's industry," holding up the latter in contrast to large-scale capitalist production, which would ruin the peasantry and thereby would allegedly reduce the domestic market.

Lenin showed that capitalism not only ruins the peasantry but also stratifies it, dividing it into the basic classes of capitalist society—the bourgeoisie and the proletariat. The destitute peasant sells his labor power and buys essential consumer goods,

while the rural bourgeoisie buys industrial products, including the tools of production. This means that capitalism creates and expands its own domestic market. The Populists misunderstood the very nature of capitalism, especially in its early stages. They claimed that the specific features of cottage industry—its dispersion over rural areas, the fact that the work was done at home, and the absence of large enterprises and consequently of a permanent labor force completely alienated from the land—made it a "people's industry," as opposed to capitalist industry. On the basis of his analysis of statistical data, Lenin revealed the fallacy of the Populists' assertions about the allegedly noncapitalist nature of the cottage industries.

The liberal Populists, having adopted the old erroneous views of peasant socialism and having fallen into even greater error, tried to shield the "people's industry" from the onslaught of capitalism. Their entire economic program was aimed at smoothing over the country's increasingly acute class antagonisms. What the liberal Populists proposed was a series of petty reforms that would not have affected the foundations of the bourgeois and landowning system. Having rejected the political program of the revolutionary Populists of the 1870's, they became the spokesmen of petit bourgeois and kulak interests.

Lenin described how the peasant's world had split up into rural bourgeoisie and proletariat; in his words, "the old Russian peasant socialism split up with it, making way for workers' socialism, on the one hand, and degenerating into vulgar petty-bourgeois radicalism, on the other" (*Poln. sobr. soch.*, 5th ed., vol. 1, p. 272). Under these conditions, the representatives of the proletarian party—that is, the Social Democrats—had to take upon themselves the defense of the interests of the broad toiling masses in the cities as well as in the countryside.

In his book, Lenin presented his scientific substantiation of the historic role of the proletariat, which was to lead the liberation movement of the toiling masses and throw off the yoke of tsarism, of the landowners, and of the bourgeoisie. He was particularly emphatic in pointing out that the foremost duty of the Russian Social Democrats was to prepare the assault on autocracy—the essential prerequisite for the coming victory of the working class over capital. The peasantry, with its interest in the complete elimination of all vestiges of serfdom, was the proletariat's ally in the struggle against the autocratic landowning system. For this reason, Lenin thought it necessary for the Social Democrats to support the peasants' demands, including "the complete abolition of landed proprietorship" (*ibid.*, p. 299).

Lenin developed the idea of the hegemony of the proletariat formulated by Marx and Engels, showing that the proletariat could play the leading role not only in the socialist but also in the bourgeois-democratic revolution. This was the point of departure for his thesis of the transformation of the bourgeois-democratic revolution into the socialist revolution. Lenin pointed out that the successful struggle of the working class and its allies for the overthrow of tsarism and capitalism was predicated on the existence of an independent proletarian party armed with advanced revolutionary theory. It was essential for the Russian working-class movement to break completely with all forms of Populism and with the theory and practice of petit bourgeois socialism. The Marxists, according to Lenin, must help the proletariat master the theory of scientific socialism and rally into a political force.

Lenin ended his book with the following prophetic words: "the Russian **WORKER**, rising at the head of all the democratic elements, will overthrow absolutism and lead the **RUSSIAN PROLETARIAT** (side by side with the proletariat of **ALL COUNTRIES**) *along the straight road of open political struggle to* **THE VICTORIOUS COMMUNIST REVOLUTION**" (*ibid.*, p. 312).

Lenin's book was the true manifesto of Russia's revolutionary Social Democracy; it dealt a crushing blow to the reactionary and utopian ideology and practice of liberal Populism. The book was important in providing theoretical preparation for the transition from Marxist propaganda of the type engaged in by small study groups to mass agitation carried out among broad strata of the proletariat and to the fusion of scientific socialism with the working-class movement.

As of Jan. 1, 1977, Lenin's book had gone through 123 printings, with 6,744,400 copies published in 33 languages of the peoples of the USSR and foreign countries.

REFERENCE
Istoriia KPSS, vol. 1. Moscow, 1964. A. F. KOSTIN [29–699–1]

WHIP ANTENNA, an antenna in the form of an asymmetrical dipole made from a rigid metal rod or a large number of metal coils strung on a flexible steel line. The rigid rod may be solid or may consist of several coupled sections. In the USSR, a whip antenna made from metal coils strung on a steel line is known as a Kulikov antenna. Whip antennas made from a shaped metallic strip, a braided wire, or a metal-coated dielectric rod are used less often.

The radiation pattern of a whip antenna in the horizontal plane is circular (see Figure 2 in ANTENNA). Therefore, whip antennas are especially suited for communication between ground-based objects whose relative position changes in time, for example, between mobile radio sets in motor vehicles or tanks.

REFERENCES
See references under ANTENNA. [29–1509–3]

WHITE NOISE, a generalized stochastic process of the type

$$<X, \phi> = \int_{-\infty}^{\infty} \phi(t)X(t)\,dt$$

where $\phi(t)$ is a finite function and $X(t)$ is a stochastic process with zero mathematical expectation and with the correlation function $B(s, t) = \delta(s - t)$. The generalized function δ is determined by the formula

$$\int_{-\infty}^{\infty}\int_{-\infty}^{\infty} \phi_1(s)\phi_2(t)\delta(s - t)\,dsdt = \int_{-\infty}^{\infty} \phi_1(t)\phi_2(t)\,dt$$

for any finite functions $\phi_k(t)$, where $k = 1, 2$. This process is a stationary stochastic process with a spectral density $f(\lambda) = \frac{1}{2}\pi$, $-\infty < \lambda < \infty$, and with an absolutely continuous spectral measure

$$F(\Delta) = \int_{\Delta} f(\lambda)\,d\lambda$$

White noise is used as a mathematical model in theoretical studies. Noise of any nature that has a uniform spectrum in a finite band of frequencies, such as the noise of electronic tubes, atmospheric noise, and oceanic noise, can be approximated quite well by the white-noise process.

REFERENCE
Prokhorov, Iu. V., and Iu. A. Rozanov. *Teoriia veroiatnostei*, 2nd ed. Moscow, 1973. [29–1532–1]

WHORTLEBERRY (*Vaccinium myrtillus*), sometimes called bilberry, a low shrub (15–40 cm tall) of the family Vacciniaceae. The branches are angularly ribbed, and the leaves fall for the winter. The solitary drooping flowers are urceolate-spherical in shape and greenish pink in coloration. The fruit is a nearly round black berry with a blue-gray bloom. The whortleberry occurs in Eurasia and North America, in damp or marshy coniferous and mixed forests (often referred to as whortleberry forests). In the USSR the whortleberry is common in the taiga, the tundra, and high-elevation regions. The berry is edible in fresh and dried form; its juice is used for coloring wines. Infusions, teas, or cornstarch puddings made from the berries are used as binding agents to treat diarrhea. The related species *V. arctostaphylos*, which occurs in the Caucasus, is a tall shrub or small tree (up to 3 m tall) with edible berries. The whortleberry is sometimes assigned to the family Ericaceae, with Vaccinoidea designated as a subfamily. [29–250–1]

WIDE-FILM MOTION PICTURE, a type of motion picture in which films from 50 to 70 mm in width are used for photographing and projecting. Wide-film motion pictures gained acceptance in the mid-1950's, after experience in the filming and exhibiting of 35-mm wide-screen motion pictures using anamorphic optics indicated that the increase in image dimensions was achieved at some cost in image quality. The development of wide-film formats marked a new stage in the progress of motion pcitures, characterized by a substantially increased image size on the screen and improved image quality, which was achieved by the use of

film of twice the width of standard film, improved wide-angle optics, and a six-channel stereophonic system of sound recording and reproduction. Some wide-film systems use anamorphic compression in addition to the wider film.

Beginning in 1955, a number of wide-film systems (Todd-AO, Super Panavision, Ultra Panavision, and a Soviet system) were proposed in the USA and the USSR; they have since become widely used in modern motion-picture photography.

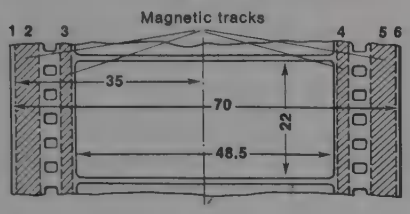

Figure 1. Frame dimensions of the positive film used in the Soviet wide-film system: (1–6) sound tracks

The Todd-AO system was developed jointly by the American Optical Corporation (AO) and the producer M. Todd. The photography uses 65-mm negative film exposed at 24 frames per sec (570 mm/sec). The frame area is calculated for a height of five standard perforations and is approximately 3.5 times greater than the area of standard 35-mm film. Copies are printed on 70-mm color positive film having the same perforations as the negative. The greater size of the positive film accommodates six magnetic sound tracks with no change in the size of the image; five of the tracks are for stereophonic sound reproduction through loudspeakers placed behind the screen, and the sixth is for the production of sound effects in the auditorium. The frame on the integrated film copy has an aspect ratio of 1:2.2. The first US film made with the Todd-AO system was *Oklahoma*, first exhibited in late 1955.

Super Panavision, developed in 1958 by the optical firm Panavision, Inc. (USA), has technical specifications similar to those of Todd-AO. The principal differences are in camera design (both mounted and hand-held) and, in particular, in the selection of high-quality camera optics.

Ultra Panavision, developed jointly in 1962 by the motion-picture studio Metro-Goldwyn-Mayer, Inc. (USA) and Panavision, Inc., uses 65-mm film for cinematography (with the same frame parameters as for Todd-AO) and anamorphic projection optics having a low anamorphic compression of 1.25:1, which makes it possible to obtain wide-film copies with an aspect ratio of 1:2.75. Optical printing is used to derive all types of film copies from the original negative; the copies are printed on 70-mm motion-picture film. The principal merit of Ultra Panavision is that a sense of participation similar to a panoramic motion picture is created without the use of complicated and cumbersome equipment.

The Soviet wide-film system was developed by the Motion Picture and Phototography Institute (NIKFI) and the film studio Mosfil'm. It uses film of the same width (70 mm) for both photographing and copying, thereby substantially simplifying preparation and processing and ensuring compatibility with many foreign systems so that exchange of motion pictures is possible. The Soviet system uses a six-channel magnetic sound track on the integrated film copies (see Figure 1). The first Soviet wide-film feature motion picture, *Tale of Fiery Years* (Mosfil'm), was released in 1961. Universal projection equipment can be used for 70-mm films as well as 35-mm wide-screen and standard films with optical or magnetic stereophonic sound tracks.

The wide-film motion picture has significantly enriched the graphic resources of motion-picture photography, especially for large-scale productions. The increased frame area with the favorable aspect ratio of 1:2.2 makes it possible to maintain the necessary image sharpness for projection on large and extra large screens. The use of an integrated film copy, in which the image is combined with multichannel stereophonic sound, lends verisimilitude to the events shown on the screen.

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Konoplev, B. N. *Osnovy fil'moproizvodstva*, 2nd ed. Moscow, 1975.
M. Z. Vysotskii [29–1231–1]

WIDE-ROW SOWING, planting the seeds of agricultural crops in rows spaced more than 25 cm apart. Wide spacing, usually measuring 60, 70, or 90 cm, is used for raising such crops as potatoes, sugar beets, corn, sunflower, cotton, feed roots, and many other vegetables. Rows set 25 to 45 cm apart are used for beans, millet, buckwheat, and other crops. Wide-row sowing provides an adequate feeding area, thereby ensuring good shoot development. It also makes possible mechanized row space tilling, enabling timely weeding, soil loosening, and fertilizer application. The sprouts are thinned to achieve correct arrangement of plants in each row. [29–1230–3]

WIDE-SCREEN MOTION PICTURE, a type of motion picture in which the standard projection screen is replaced with a wider screen having an aspect ratio from 1:1.66 to 1:2.35. The larger screen size, together with stereophonic sound reproduction, considerably expands the graphic possibilities of the art of motion pictures and increases the impact of the motion picture on the viewer (especially in color feature films during outdoor, crowd, and battle scenes). There are several wide-screen systems presently in use, including those with anamorphic compression, those using a cropped frame (the most common), and Techniscope.

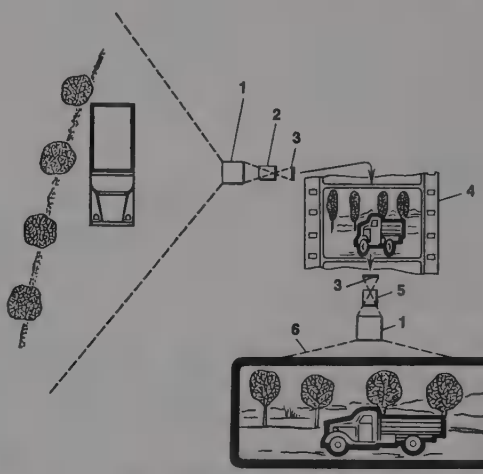

Figure 1. Diagrams of the filming and projection of a motion picture by means of anamorphic optics: (1) anamorphic optics, (2) camera lens, (3) motion-picture film, (4) compressed image on the film, (5) projector lens, (6) image expanded on a wide screen

Systems using anamorphic optics (first proposed by E. Abbe in 1897) compress the frame during filming of the motion picture and expand it during projection. In 1927 the French scientist H. Chrétien designed the Hypergonar anamorphic lens that approximately doubled the horizontal field of view. The CinemaScope system, developed by the US motion-picture company Twentieth Century–Fox Film Corporation under the Chrétien patent, has enjoyed wide use in the USA and other countries. The first motion picture filmed in CinemaScope was *The Robe*, released in the USA in 1953. In the USSR the first wide-screen feature film, *Il'ia Muromets*, was released by the Mosfil'm motion-picture studio in 1956. The anamorphic optical system used for modern wide-screen motion pictures compresses the image in the horizontal by a factor of 2:1, which places it within the confines of a somewhat enlarged, four-perforation frame on standard 35-mm motion-picture film. The usable frame area (Figure 1) is thus increased correspondingly.

The use of a cropped frame in the wide-screen systems that gained wide use abroad in the mid-1950's reduces the height of the standard 35-mm frame to such dimensions that the aspect ratio corresponds to the required aspect ratio of the screen (Figure 2). The frames may be masked in the camera or in the projector. In the latter case the frame is composed during filming so that the most important objects will not be cut off, that is, not masked,

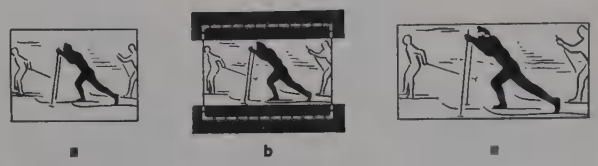

Figure 2. Method of obtaining a cropped frame: (a) standard frame with an aspect ratio of 1:1.37, (b) same frame cropped at top and bottom with an aspect ratio from 1:1.66 to 1:1.85, (c) frame as projected on a wide screen by means of short-focus optics

during projection. In order to accomplish this, two lines are marked (as shown by the broken lines in Figure 3) on the ground glass of the camera viewfinder; they permit the cameraman to restrict the height of the frame section containing the most important visual material. This method of viewfinder cropping is most commonly used when filming wide-screen motion pictures for which frame masking will be done during projection. It makes it possible to use a film copy with an aspect ratio of 1:1.37 for television programs, thus eliminating the need for cropping the image above and below by means of a mask. The principal advantage is that the photographic and projection processes are practically unchanged. However, the technique reduces the useful frame area considerably, thereby requiring additional magnification for projection on a wide screen through the use of close-focus optics. Image sharpness is also somewhat degraded, and graininess is increased. Cropping gives satisfactory results for aspect ratios in the range from 1:1.66 to 1:1.85 when high-quality film, high-quality optical projection systems, and high-power light sources are used.

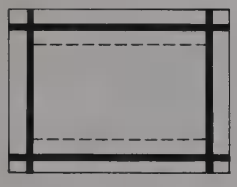

Figure 3. Boundary lines (broken lines) in the viewfinder of a motion-picture camera used in composing for subsequent masking

Techniscope was developed in 1964 by the photographic film company Technicolor Corporation mainly to reduce the costs of producing wide-screen color films. Filming is accomplished with a standard camera equipped with a spherical optical system and a modernized pull-down mechanism that produces a negative frame with a height corresponding to the dimension of two perforations (instead of four as in standard systems). A wide-screen positive copy with anamorphic compression is produced on special equipment by means of optical printing (Figure 4). The system substantially reduces the cost of negative motion-picture film and can provide the film copies required for television programs. However, the resolution is inferior to other wide-screen systems because of the 2:1 reduction in the area of a negative frame compared with the positive obtained by enlargement during optical printing and simultaneous anamorphic compression.

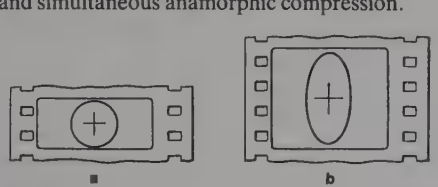

Figure 4. (a) Negative with two perforations per frame as filmed in Techniscope, (b) positive with an aspect ratio of 1:2.35 obtained from the negative

In the USSR the Motion Picture and Photography Institute (NIKFI) and the Mosfil'm motion-picture studio in 1974 jointly developed a wide-screen motion-picture system known as the Universal Frame Format. The system photographs on 35-mm film with a standard optical system and uses the entire area of the frame between perforations. In the printing process, copies can be obtained for practically all formats used in modern theaters—standard 35-mm, 35-mm wide-screen with anamorphic compression, masked 35-mm, 16-mm, and 70-mm (wide-film with stereophonic sound).

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M. Z. VYSOTSKII [29–1233–1]

WIDE-WEB COAL MINING, an extraction method in which bulk coal is broken up by the working elements of coal-cutting machines to a depth of from 0.8 to 2 or more m. The set of equipment required for wide-web coal mining comprises a wide-web stoping machine (*see* CUTTING-LOADING MACHINE), a scraper face conveyor (*see* CONVEYOR), an individual face support (*see* MINE SUPPORT), and special supports. As a rule, the scraper face conveyor can be dismantled.

Wide-web coal mining includes manual operations, for example, the erection of the face support and the assembly, dismantling, and shifting of the conveyor. The cut coal is partially loaded on the conveyor by hand. The operations are cyclic, that is, are repeated when each strip is extracted.

Wide-web coal mining is not widely used. (*See* NARROW-WEB COAL MINING.) [29–1228–6]

WILD ROSES (in Russian, *shipovnik*), species of wild plants of the family Rosaceae. The plants are usually erect shrubs; there are some arboreal forms of medium height and some almost herbaceous plants. Lianas are rare. The stems and branches usually have thorns. The leaves are usually deciduous and odd-pinnate with paired adnate stipules. Very rarely are the leaves simple and exstipulate. The flowers most frequently are not double, but occasionally they are double to some degree. The inflorescences are corymbose or corymbose-paniculate; the flowers are solitary or, sometimes, in pairs or larger groups. Wild roses occur in the northern hemisphere, mainly in temperate and subtropical regions and in the mountains of the tropics. The plants grow in forest and steppe zones, reaching the alpine belt in the mountains. They usually occur on the edges of forests, in shrubby thickets, along rivers and streams, on damp and steppe meadows, and on slopes and rocky placers.

There are about 350 to 400 species (according to other data, 100 to 250), including 250 (according to other data, 60 to 150) in the USSR. Many species are endemics. Wild roses are a valuable source of vitamins. The fruits of some species accumulate large quantities of vitamin C, together with other vitamins. Particularly large quantities of vitamin C are found in the cinnamon rose (*Rosa cinnamomea*), the prickly rose (*R. acicularis*), and the Japanese *R. rugosa*. Wild roses are used extensively as ornamental hedges and as stock for cultivated roses. The fruit is used as a food in fresh, dry, or canned form.

The dried ripe fruits of various species are used medicinally as raw materials for vitamins. The pulp is used in tincture, syrup, candy, or lozenge form mainly for treating vitamin deficiencies. An oil extract and oil are used externally to treat trophic ulcers and some disorders of the skin and mucous membranes. *Kholosas*, a cholagogous substance, is made from a concentrated water extract of the fruits of *Rosa canina*.

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M. E. KIRPICHNIKOV [29–1217–2]

WOOD SCREW, a screw designed to be driven into wood or some other soft material, in which it forms a thread by deforming the material. The threaded section of a wood screw is conical in shape, either over the entire length or only at the end. The head is usually spherical or flat, and the slot may be straight or cruciform, for use with a suitable screwdriver. [29–1551–2]

WOOL, one of the primary natural textile fibers, the raw material of the wool-processing industry. Most of the wool processed industrially comes from sheep; considerably smaller quantities of similar fibers are obtained from goats, camels, yaks, hares, rabbits, horses, cows, deer, dogs, and other animals. Possessed of useful qualities, such as low heat conduction and high moisture absorption, wool is a valuable material for the manufacture of fabrics, knitwear, carpets, and other articles. The world production of wool from sheep totaled 2.6 million tons in 1976. Most was produced by Australia (747,000 tons), New Zealand (311,000 tons), and Argentina (160,000 tons). The USSR produced 432,800 tons in 1976.

Grease, or fleece, wool is obtained from live animals by shearing (sheep, goats, and others), combing (camels, yaks, dogs, goats, and rabbits), or gathering during molting (cows, horses, and yaks). Wool removed from the hides of slaughtered animals is called pulled wool. Wool is a keratinized filament produced by the animal's skin. Animals produce a hairy outer coat and a downy undercoat. In sheep the outer coat consists of guard, transitional, and surface hairs; the downy undercoat is homogeneous. Fibers from the outer coat have a cuticle, a cortex, and usually a medulla; undercoat fibers have a cuticle and a cortex. The cuticle is a thin (0.5–2 micrometers) protective fiber casing. It accounts for the wool's spinning and felting properties. Damage to the cuticle leads to deterioration of the cortical layer and lessens the usefulness of the wool. The condition of the cortical layer, located underneath the cuticle, affects the strength, elasticity, resiliency, and other properties of the wool. The medulla may be solid or porous (with air cavities) and is situated along the fiber axis. Increased medullation lessens the usefulness of the wool.

The guard hairs consist of coarse, usually longer fibers of low crimp whose cuticle scales are not ring-shaped. Their use characteristics are inferior to those of undercoat and transitional hairs. The transitional hairs have a length, thickness, and structure intermediate between guard hairs and fibers from the undercoat. The medullary layer is poorly developed or absent. Transitional hairs have better use characteristics than guard hairs. The undercoat consists of the finest fibers, which are usually shorter than those of the guard and transitional hairs.

Sheep's wool may be classified as uniform or nonuniform depending on the composition of the fibers. In uniform wool the undercoat and transitional fibers are grouped together to form staple fibers (the transitional fibers of wool from long-wool breeds form uniform locks). In nonuniform wool the undercoat, transitional, and guard hairs are formed into locks. Staple fibers and locks are the elements of the fleece—the wool covering of sheep that is removed in one piece by shearing.

The physical properties of wool that determine its use characteristics and market qualities include fineness, crimp, length, strength, elasticity, resiliency, stiffness, flexibility, extensibility, hygroscopicity, color, and luster. The average thickness is 10–25 micrometers (μm) for undercoat fibers, 30–50 μm for transitional fibers, and more than 50 μm for guard hairs. According to the Soviet scale, uniform wool is divided into 13 classes of thickness: from class 32 (55.1–67 μm average thickness) to class 80 (14.5–18.0 μm). Guard hairs usually have little crimp; undercoat fibers of uniform wool have normal crimp, and transitional fibers of uniform wool are flat. Crimp gives fibers additional resiliency. The longest wool—40 cm and longer—is found in sheep of the long-wool meat breeds (Lincoln and others) and some coarse-wool breeds (Highland Carpathian and others). Short wool—4 cm to 7 cm—is found in fine-wool and some coarse-wool breeds (Gissar and others).

The color of wool is determined by the presence of the pigment melanin in the cortex along the entire length or in part of the fiber. The principal colors of wool are white, black, and red-yellow. White wool is the most highly valued because it can be dyed any color. The wool of Lincoln sheep and Angora goats is especially lustrous. The production uses of wool depend to a certain degree on the luster, which affects the external appearance of the article. The yolk, suint, and foreign mineral matter in wool covers and mats the fibers. Washed wool is usually required for commercial processing, with the exception of some types of felting. The ratio in percent of the weight of washed wool, with correction for conditioning moisture, to the original weight of unwashed wool is called the yield.

The production use of wool is determined by the complex of properties inherent in the type of wool. Fine wool is uniform and consists of medium-fine (18–23 μm) and fine undercoat fibers. The staple is of uniform fineness and length, has uniform crimp along the entire length of the fiber, and possesses good physicomechanical properties and use characteristics. Semifine wool is uniform, consisting of coarsened undercoat fibers or transitional hair (average fineness up to 25 μm). It has a larger but less uniform crimp in the staple and lock and sometimes less uniformity of length. This group also includes crossbred and crossbredlike wools, which have good use characteristics, and yak wool, which has poor felting properties and good resiliency. Semicoarse wool is nonuniform and consists of undercoat fibers, transitional hairs, and a small quantity of fine guard hairs. Its fibers are of irregular fineness and length. Coarse wool is nonuniform and consists of undercoat fibers, transitional hairs, and, frequently, dry and dead hair. The nonuniformity of fiber fineness and length is greater than is the case with semicoarse wool. Sheep's wool is used for the production of various fabrics, knitwear, carpets, and felted articles.

Goat's wool is primarily nonuniform. It is characterized by poor use characteristics and spinning and felting properties. Consequently, in goats with nonuniform wool, it is the undercoat that is primarily used, principally for knitted articles. Goats of the Angora and Soviet wool breeds yield uniform semifine wool (mohair) consisting of transitional hairs; such wool is characterized by its luster and strength.

Camel hair is nonuniform. Its color ranges from white to dark brown. It is characterized by great strength and resiliency, good luster, and poor felting properties. It is used to produce high-quality beaver cloth, blankets, rugs, and knitwear. The mane is used to make drive belts and filter cloth used in the extraction of vegetable oils.

Yak wool is nonuniform and is used in cloth manufacture. The coat fibers of hares and rabbits are characterized by fineness, high extensibility, and good felting properties. They are a valuable raw material for the felting industry. Knitwear and felt are manufactured from the undercoats of certain rabbit breeds. Horsehair is a low-quality raw material used for the production of coarse felts. Cow hairs have good felting properties and are used mainly in the felting industry. Deer also provide fibers, large quantities of which consist of dead hair; the fibers are used in the saddlemaking, mattress, and furniture industries and as an insulation material. The hair of some breeds of dogs is used for handmade knitted goods. The wool of llamas, guanacos, alpacas, and other animals is used in small quantities.

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V. V. KALININ [29–1148–1]

WOOL FABRIC, a textile made of all-wool yarn, a combination of wool and other yarns, or yarn made by blending wool with other fibers.

Cottage production of woolen fabrics was practiced in early classical times in the East—in Sidon, Babylon, and Baghdad. The production of woolens developed further during the Middle Ages, during which the greatest production was concentrated in Flanders, Holland, England, France (Sedan), and Saxony; Florence became famous for its fine woolens, the most important items of its trade. During the second half of the 18th century, the appearance of improved cards, roving frames, and spinning frames mechanized the production of wool fabrics.

In Russia, cottage production of wool fabrics existed in Kiev and Novgorod as early as the tenth century. An enterprise for the production of fine woolens was established in Moscow in 1650, but it could not compete with imported goods and soon closed. Concerned about supplying the army, Peter I the Great sup-

ported the creation of factories for producing woolens. The first such factory to supply the army was established in 1698; in the 1720's there were already approximately 15 enterprises weaving wool. However, the production of wool worsteds was begun only in the second half of the 19th century.

In 1977 the USSR produced 800 million sq m of wool fabric in a range of approximately 2,000 articles. All-wool and part-wool fabrics are distinguished by the type of raw material used. All-wool fabrics may contain up to 10 percent chemical fibers, usually introduced to achieve superficial effects. Part-wool fabrics may contain up to 25 percent reclaimed wool and from 10 to 80 percent other fibers. If chemical fibers are blended into the yarn with the wool, the resulting fabrics are termed blended. If the fabric is manufactured from wool yarn interwoven with cotton yarns or chemical fibers, the fabric is called mixed.

Depending on the type of yarn used, wool fabrics may be classified as worsteds, fine woolens, and coarse woolens. Worsted fabrics are from relatively fine and smooth single-ply or twisted yarn that has been combed before spinning. They have a smooth surface and a clearly defined weave pattern. Fine woolens are made from fluffy woolen yarn. They have a surface nap that partially or completely obscures the weave pattern. The nap may be specially combed, cut, or pressed. Coarse woolens are made from coarse-wool woolen yarn and are also felted and napped. They exhibit good wear resistance and resistance to the effects of light and dry cleaning and high resiliency, hygroscopicity, and low thermal conductivity. The adding of synthetic fibers (polyamides and polyesters) to wool increases the wool's wear resistance, but somewhat decreases its hygroscopicity and makes it more susceptible to pilling. The use of viscose fibers and cotton yarn makes wool fabric less expensive, but also renders it less crease resistant. Part of the production of wool fabric is used for industrial purposes, but the majority is used to make clothing—dresses, suits, and coats.

Wool dress fabrics include worsteds and fine woolens. They are manufactured in twill, plain, small-figured, combination, and large-figured weaves. They may be bleached, piece-dyed, yarn-dyed, mélange, or printed fabrics. Worsted dress fabrics are relatively fine and lightweight (150 to 300 g/sq m). Fine woolen dress fabrics are fluffier, softer, and heavier (200–350 g/sq m), and they have a heavier nap. They are manufactured as part-wool fabrics.

Most wool suit fabrics are worsteds (170–340 g/sq m). Some all-wool worsteds are wool serge, wool crepe, and tricot. Part-wool worsted suitings are quite varied; two examples are worsted cheviot and worsted diagonal. Some wool suitings are made of blended two- or three-component yarns; they are usually yarn-dyed and resemble tricot. Fine woolen suitings are heavier (260–520 g/sq m) and fluffier and sometimes exhibit a nap. They provide more warmth and are most often used for everyday winter suits and jackets.

Wool coat fabrics are made as worsteds, fine woolens, and coarse woolens. Worsteds (187–540 g/sq m) with an open weave are piece-dyed. Gabardines and diagonals are made from combed yarn in a twill weave; bouclé is made from fancy yarns in a small-figured weave. Fine woolens also include drab cloth and soft, fluffy coatings usually used mainly in women's and children's coats. Coarse woolens are primarily heavy fabrics made from coarse woolen yarn blends and are used for government and military clothing.

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L. V. POTAPOVA and N. V. MULLER [29–1150–2]

WOOL SPINNING, a group of production processes used to convert wool or a blend of wool with chemical or cotton fibers into yarn.

Wool is blended to reduce the cost of yarn, to improve certain properties (such as wear resistance), and to permit standardization of production processes. Depending on the type of wool being processed, the length-to-weight ratio of the yarn, and the intended use of the yarn, the process used may be French, Bradford, semiworsted, or woolen spinning, which differ mainly in the type of carding.

The French system of spinning wool is used to make yarns with length-to-weight ratios from 15.5 to 42 tex from pure wool and wool blended with chemical fibers. The raw material is opened and blended before being carded. The sliver obtained is then processed by several passes through two-stage drawing frames to prepare it for combing, which is done on a batch-type comber. The sliver is then straightened on drawing frames. In order to remove stresses in the fibers and to fix them in a straightened condition, the sliver is smoothed on a machine; this process may sometimes precede dyeing. Sliver prepared in this manner is aged for several days in a humidified compartment, which helps reduce the static electricity in the fibers. The sliver is sent to a shop to be processed into a spun roving. The roving is again aged, after which it is delivered to ring spinning frames.

The Bradford spinning system produces yarns (usually from coarse and semicoarse wool) having a length-to-weight ratio from 30 to 83 tex. The principal features of the system are the use of continuous combers and roving (fly) frames to produce twisted roving.

Semiworsted spinning is used to make yarns with a length-to-weight ratio of 42 tex or higher from semifine, semicoarse, and coarse wool blended with chemical fibers. Carded sliver is processed in several transfers on drawing frames, one of which has an automatic thickness regulator, and is then sent directly to a ring spinning frame.

Woolen spinning is used to make yarns with a length-to-weight ratio from 42 to 400 tex from grease wool, chemical fibers, and the waste spinning materials from woolen and worsted spinning. Cotton fibers and reclaimed wool obtained by processing all-wool or part-wool rags may also be used. The components are blended on blending machines, after which oil is added and the stock is opened up on a mixing picker. The stock is carded on carding frames that include two or three roller cards. A flyer separates the fibers longitudinally into individual slivers, which are rubbed to form the roving that is sent on to a spinning frame. (*See also* SPINNING.)

V. V. ZHOKHOVSKII [29–1147–2]

WORM GEAR, a mechanical device for transmitting rotation between shafts whose axes cross (usually at right angles) by means of a worm and a mating gear (the worm wheel or worm gear). The worm is a screw having a trapezoidal or nearly trapezoidal thread, and the worm wheel is a gear wheel with special curved teeth. The worm wheel subtends the worm over a specific arc (usually up to 100°). The worm is usually the driving member, and the worm wheel is driven; in rare cases (as in step-up gearing) the worm may be the driven member. Cylindrical worms are used in the most common (single enveloping) worm gearing; worms having threads on a toroidal surface are used in double enveloping worm gearing.

Depending on the number of thread starts, worms may be classified as single-, double-, or quadruple-threaded; depending on the profile of the thread helix, they may be classified as Archimedean, concave, or other type. The helix of an Archimedean worm in an axial cross section is described by a trapezoid and is easily machined on a lathe. Worms with a concave helix profile show promise for offering lower contact stresses and better conditions for the formation of an oil wedge. Involute worms are preferred for power transmissions; the helix profile in a cross section is described by an involute. The gear ratio of a worm gear is $i = z_2/z_1$, where z_1 is the number of starts on the worm and z_2 is the number of teeth on the worm wheel.

Gear ratios for worm gears are usually between 8 and 100 (in a number of cases, for example, the drives for machine-tool tables of large diameter, it may be as high as 1,000). Worm gears are used in machine drives and control devices because they afford high gear ratios in a transmission of relatively small size. The advantages of worm gears include smooth and noiseless operation. They may be irreversible, or self-locking; that is, they may transmit rotation only from the worm to the worm wheel, so that some mechanisms can be made without a locking device. A disadvantage is the substantial slip between the mating members—the worm threads and gear teeth. This results in intense evolution of heat, increased wear, and a tendency to seize; it also accounts for the relatively low efficiency of worm gearing (averaging 0.7–0.75

in single-threaded, 0.8–0.85 in double-threaded, and 0.86–0.92 in quadruple-threaded worm gears).

In order to reduce wear and decrease the chances of seizing, gear wheels are made from materials having excellent antifriction properties—mostly bronzes, such as true bronze (for slip velocities of 5–35 m/sec) and aluminum-iron bronze (for slip velocities up to 10 m/sec). For economy of use of nonferrous metals, worms are made up as composites with a bronze rim mounted on a hub of steel or pig iron. For slip velocities up to 2 m/sec and large diameters, the worm wheels can be made entirely of pig iron. The worm wheels used in instruments and small transmissions can be made of a resin-impregnated plastic laminate or nylon. The worms are usually made of high-grade carbon or alloy steels that are heat-treated to a high degree of hardness. The surfaces are ground and polished to improve the finish.

The low efficiency and substantial heat evolution of worm gears have limited them to low- and medium-power applications (usually up to 50 kilowatts, rarely up to 200 kilowatts). They are used in hoisting and conveying equipment, metal-cutting machine tools, motor vehicles, trolleybuses, metallurgical machinery, and hydraulic engineering installations. Well-lubricated reduction worm gears enclosed in a housing are the most widely used type.

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XENOPUS, the genus of tailless amphibians of the suborder Aglossa of the family Pipidae. On the head, next to each eye, there are short feelers. The lateral line organs are located on the sides of the body. There are sharp black claws on the three center toes of the hind feet. The genus comprises eight species, which are distributed in tropical Africa. Its members are aquatic. In tadpoles the external gills and larval teeth are absent. A pair of long sensory tentacles are located near the mouth and there are two gill openings. The most common species is *Xenopus laevis*, which is used as a laboratory animal. [29–1407–6]

XINGU, a river in Brazil, a right tributary of the Amazon. The Xingu is 1,980 km long and drains an area of 513,000 sq km. It rises in the eastern part of the Mato Grosso Plateau, where it is called the Culuene. As it crosses the northern part of the Brazilian Highlands, it is a powerful, torrential stream with rapids and waterfalls. After its last rapids, Cachoeira Grande, the Xingu flows into the Amazon Basin. Its final section, which is accessible to ships, is 160 km long and reaches a width of 8–12 km. The chief tributary of the Xingu is the Iriri, a left tributary. The Xingu is fed by rain; high water occurs from October until April or May. The mean flow rate is 16,000 cu m per sec. The Xingu is navigable for 190 km from its mouth. [29–1206–2]

YGYATTA, a river in the Yakut ASSR, a left tributary of the Viliui. The Ygyatta is 601 km long and drains an area of 11,200 sq km. It rises on the Viliui Plateau and cuts through traprock to form *shivery* (rocky sections with fast-flowing water). The lower course lies in the Central Yakut Lowland. The river is fed by rain and snow and has a mean flow rate of approximately 30 cu m per sec. The Ygyatta freezes over in October, and the ice breaks up in May. [29–1624–3]

YNYKCHANSKII, an urban-type settlement in Ust'-Maia Raion, Yakut ASSR. Ynykchanskii is located 176 km east of the settlement of Ust'-Maia and 471 km southeast of Yakutsk. Gold is mined in the vicinity. [29–1626–1]

YR (also *iyr, zhir*), a general term for songs among a number of Turkic peoples. Among the Kumyks in Dagestan, *iyr* is the name given to men's songs of a declamatory type performed improvisationally by *skaziteli* (singers of epic folk songs) called *iyrchi*. [29–1626–2]

ZAQAZIQ, AL-, a city in Egypt, in the eastern part of the Nile delta; capital of the *muhafazah* (governorate) of Sharqiyah. Population, 173,000 (1970). Al-Zaqaziq is a trade and transportation center and a railroad and highway junction. The city has a food-processing industry and cotton-ginning enterprises. [29–1694–4]

ZARQA, AL-, a city in northern Jordan, on the Amman-Irbid highway. Population, 232,000 (1975). Al-Zarqa has an oil refinery and a cement plant; the city is the commercial center for an agricultural region. [29–1694–5]

ZUBAYR, AL-, a city in southeast Iraq. Population, more than 30,000. The city is a highway junction and has a railroad station. Al-Zubayr is an oil-production center. [29–1694–6]

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