

The New Encyclopædia Britannica

PROPÆDIA

Outline of Knowledge
and
Guide to the Britannica

How to use the PROPAEDIA

As its title indicates, the PROPAEDIA, or Outline of Knowledge, is intended to serve as a topical guide to the contents of the *Encyclopædia Britannica*, enabling the reader to carry out an orderly plan of reading in any field of knowledge or learning chosen for study in some depth. The PROPAEDIA's table of contents gives the reader an overview of the Outline of Knowledge as a whole; the introductory essays for each of the ten parts illuminate the major concerns of that part of human knowledge; the headnotes that are affixed to parts and divisions prepare the reader for examination of the subjects being covered there; and the outlined presentations of these subjects, with their lists of related article titles, enable the reader to carry on a course of study that may be more or less extensive and detailed in accordance with individual interests and desires.

Structure. Each of the 10 parts, 41 divisions, and 177 sections that make up the PROPAEDIA is marked in the table of contents by a heading, which is followed by the number of the page on which that unit of the PROPAEDIA begins. This structure provides three ways to utilize the outline: (1) one may turn to any of the parts as a whole and examine the contents of that part; (2) one may select a particular division of a part and examine the contents of that division; or (3) one may focus on a single section or several sections of such a division and examine the contents of that section or those sections.

Sectional outlines. The sectional outlines present, in an orderly arrangement of topics, subjects that are treated in articles in the MACROPAEDIA and MICROPAEDIA. Each section number incorporates the numbers of the part and division to which it belongs. For example, Section 725 is the fifth section in Part Seven, Division II; Section 96/10 is the tenth section in Part Nine, Division VI. In each sectional outline the major subjects are indicated by

capital letters ("A," "B," etc.). There are always at least two major subjects, but there may be many more in a given section. When it is necessary to subdivide a major subject, up to three additional levels may appear in the outline; the first is indicated by Arabic numerals, the second by lowercase letters, and the third by Roman numerals, as shown below:

B. Metallurgy

1. Mineral processing: crushing and grinding of ores, concentration of metallic minerals
2. Extractive metallurgy: separation of metallic elements from mineral form
 - a. Pyrometallurgy: processes that involve the use of heat
 - i. Roasting: oxidizing, reducing reactions
 - ii. Smelting: processes for removing molten metal from molten slag

The INDEX, with its alphabetically arranged subject headings, is indispensable in finding where a given subject appears in the Outline of Knowledge. These headings, where appropriate, carry specific citations pointing to the part, division, or section of the PROPAEDIA that covers the subject in question. A subject referred to in a sectional outline is, in many cases, treated fully in an article of the same title in the MACROPAEDIA or MICROPAEDIA, each such title being included in the list of suggested reading at the end of the section. These titles, as well as significant references to the subjects in other contexts, are cited in the INDEX. It may be helpful to compare the functions of the PROPAEDIA and the INDEX: Both are guides to the contents of the *Encyclopædia Britannica*, but the PROPAEDIA's primary purpose is to indicate *what* subjects are covered, while the INDEX's primary purpose is to indicate *where* they are covered.

THE CIRCLE OF LEARNING

"The alphabetical system of arrangement," observed the Editors of the Eleventh Edition of the *Encyclopædia Britannica* (1910–11), "with its obvious advantages, necessarily results in the separation from one another of articles dealing with any particular subject." Consequently, "the student who desires to make a complete study of a given topic must exercise his imagination if he seeks to exhaust the articles in which that topic is treated." This result is certainly a serious defect in the system for anyone who feels—as did the Editors of the Eleventh Edition—that an encyclopaedia should not be merely a "storehouse of facts," but should also be "a systematic survey of all departments of knowledge." To remedy this defect, the Editors constructed a "Classified Table of Contents," which they believed to be "the first attempt in any general work of reference at a systematic subject catalogue or analysis of the material contained in it."

Remarkable as it was at the time, that Table of Contents did not fully succeed in achieving its objective of overcoming the defects of an alphabetical organization of encyclopaedic articles by means of a topical presentation of their content. A quick glance at the 24 major categories into which the Table of Contents was divided will reveal that the alphabet was still the thread on which the parts were strung: I. Anthropology and Ethnology; II. Archaeology and Antiquities; III. Art; IV. Astronomy; V. Biology; VI. Chemistry; VII. Economics and Social Science; VIII. Education; IX. Engineering; X. Geography; XI. Geology; XII. History; XIII. Industries, Manufactures and Occupations; XIV. Language and Writing; XV. Law and Political Science; XVI. Literature; XVII. Mathematics; XVIII. Medical Science; XIX. Military and Naval; XX. Philosophy and Psychology; XXI. Physics; XXII. Religion and Theology; XXIII. Sports and Pastimes; XXIV. Miscellaneous. In each of these categories, the only further subdivisions involved the distinction of general from particular subjects, and the distinction of both of these from biographical entries. Under each of these headings, titles of the encyclopaedia's articles were listed in strictly alphabetical order.

In planning this Fifteenth Edition of *Encyclopædia Britannica*, the Editors, while deciding to retain the alphabetical ordering of the articles in the set, sought to improve upon the effort that their predecessors had made to overcome the defects of an alphabetical organization by giving the reader a truly topical, and totally nonalphabetical, Table of Contents. It would

serve the purpose that the Editors of the Eleventh Edition had in mind, which was to enable the reader to "make a complete study of a given topic"—that is, a department of knowledge or field of learning.

It may be asked why it was not thought better to abandon the alphabetical principle entirely and construct a purely topical encyclopaedia, in which all the articles would be assembled, volume after volume, according to some general schema for the organization of human knowledge. The answer is twofold. First, a purely topical organization of the articles themselves cannot avoid the appearance of a certain tendentiousness or arbitrariness in the editorial commitment to one rather than another organizing schema or set of principles. The reader is, therefore, provoked to ask: Does this order, volume by volume and article by article, reflect the only right or proper exposition of the whole of human knowledge?

Second, a purely topical encyclopaedia provides its readers with only one mode of access to its contents. This may be alleviated somewhat, perhaps, by the addition of an alphabetical index; but an index, by its very nature, serves the purpose of enabling the reader to look up *particular* items of information; it does not provide a general and systematic mode of access to the contents of the encyclopaedia.

The basic plan of the new *Britannica*, therefore, aims to give its readers access to its contents by both the topical and the alphabetical modes. General and systematic topical access is provided by the Outline of Knowledge contained in this volume, called the "Propædia" because it is a kind of preamble or antechamber to the world of learning that the rest of the encyclopaedia aims to encompass. Alphabetical access is provided not only by the two-volume Index but also by the alphabetical ordering of the short articles in the Micropædia.

Unlike the Classified Table of Contents in the Eleventh Edition, which was alphabetically organized by categories and subjects, the Outline of Knowledge in this Fifteenth Edition is a purely topical presentation of the subjects covered in the articles to be found in both the Macropædia and the Micropædia. It is, therefore, reasonable to ask how such a purely topical outline of encyclopaedic content avoids the tendentiousness or arbitrariness that is attributable to an encyclopaedia in which the articles themselves are topically rather than alphabetically arranged. Does not the Outline of Knowledge here presented reflect, perhaps even con-

ceal, a commitment to one set of organizing principles rather than another? Does it not embody biases or preconceptions that are not universally acceptable?

It is hardly possible to say “No, not at all” to these questions. Two points, however, can be made affirmatively that tend to reduce or alleviate whatever degree of arbitrariness remains unavoidable in a topical outline of the whole of human knowledge. One is that the Outline of Knowledge, while conceived by the Editors, was constructed and corrected in the light of detailed recommendations, directions, and analytical contributions from scholars and experts in all the fields of knowledge represented. A list that includes the advisers who worked with the Editors in the construction of the Outline of Knowledge follows Part Ten of the Propædia.

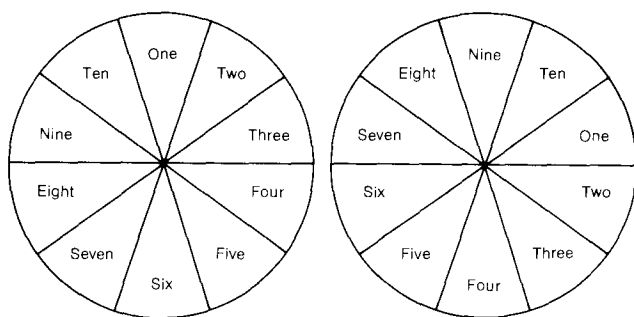
The second point is that the Outline of Knowledge is conceived as a circle of learning. To say that the contents of an *en-cyclo-paedia* form a circle of learning is more than a literal transliteration from Greek to English. In Greek or English, reference to the circle introduces a powerful metaphor, the understanding of which should help the reader to overcome whatever arbitrariness still resides in the Outline of Knowledge in spite of determined efforts on the part of all concerned to minimize this defect. A circle is a figure in which no point on the circumference is a beginning, none is a middle, none is an end. It is also a figure in which one can go from any point, in either direction, around the circumference; in addition, one can go across the circle from any point to any other; or, by any number of transecting lines, starting from a given point, one can go to any number of other points on the circumference, near or far.

The 10 parts into which the Outline of Knowledge is divided are disposed not along a finite straight line beginning at this point and ending at that; they are disposed rather as segments of the circle. While it is true that, in this arrangement, one part may lie next to another and at some distance from still another, it is also true that, since the circle can rotate around its axis, any one of the 10 parts may be regarded as standing at the top of the circle, or at the left or right side of it, or at the bottom. In other words, with the circular arrangement of the parts, and with the rotation of the circle, the reader can begin anywhere in the circle of learning and go to adjacent parts around the circle; or, moving along interior transecting lines, the reader can go from any part across the circle to parts that are not adjacent on the circumference. This view of the Outline of Knowledge can be represented in a number of diagrams.

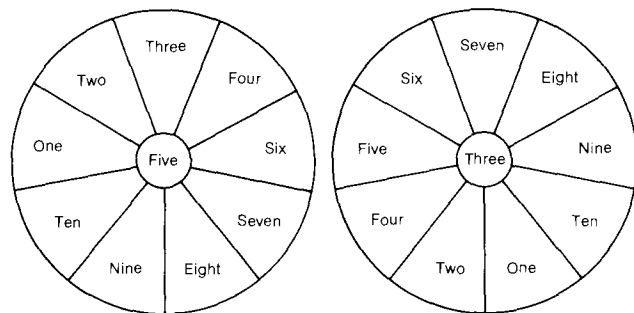
For a synopsis of the subject matter covered in each of the 10 parts of the outline, the reader is referred to that part of the Table of Contents set forth on pages 9–15 of this volume. The titles of the individual parts are given in the following list:

- Part One. Matter and Energy
- Part Two. The Earth
- Part Three. Life on Earth
- Part Four. Human Life
- Part Five. Human Society
- Part Six. Art
- Part Seven. Technology
- Part Eight. Religion
- Part Nine. The History of Mankind
- Part Ten. The Branches of Knowledge

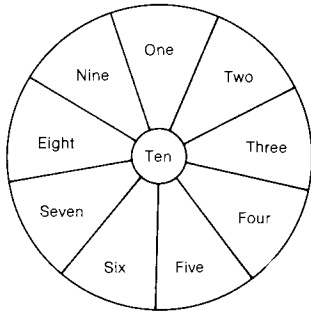
The pair of diagrams below shows the 10 parts as segments of a circle. Part One is placed at the top of the diagram to the left, and Part Nine is at the top of the diagram to the right, to illustrate the effect achieved by rotating the circle.



The second pair of diagrams, following, places one of the 10 parts at the centre of the circle with the remaining nine parts as segments of the circle formed by lines radiating from the centre. The point being made here is that any part can occupy the central position—the place in the circle of learning at which one begins, going thence in all directions to the remaining nine parts. To illustrate this, Part Five occupies the centre in the diagram to the left; Part Three, the centre in the diagram to the right.



The final diagram offers still another approach to the circle of learning. In this diagram, Part Ten occupies the central position; and here there is only one diagram rather than a pair because the reason for placing Part Ten in the central position applies to it alone and to none of the other nine parts.



The reason for this special placement of Part Ten stems from the one organizing principle to which the Editors were explicitly committed in planning and producing this new *Britannica*. Briefly stated, that principle involves a distinction between (a) what we know about the world of nature, of man and society, and of human institutions *by means of* the various branches of learning or departments of scholarship; and (b) what we know about the branches of learning or departments of scholarship—the various academic disciplines themselves. For the most part—there are a few exceptions—Parts One through Nine represent the knowledge of nature, of human society, of human institutions, and their history. In clear contradistinction, Part Ten mainly covers the disciplines themselves—the branches of knowledge or fields of scholarship—by which one inquires into, thinks about, or comes to have knowledge of the world in which he lives. Part Ten examines the nature, methods, problems, and history of the various branches of knowledge or scholarly disciplines, the actual content of which is set forth in Parts One through Nine.

Thus, for example, Section 10/34 in Division III of Part Ten examines the nature, methods, problems, and history of the biological sciences; but the knowledge of life that the biological sciences afford is outlined in Part Three. Or, to take another example, Section 10/41 in Division IV of Part Ten examines historiography and the study of history; but the actual history of mankind is outlined in Part Nine.

There are, however, three departments of learning that are exclusively treated in Part Ten—both with regard to the nature and history of the disciplines themselves and also with regard to the knowledge or understanding afforded by these disciplines. They are logic (in Division I of Part Ten), mathematics (in Division II), and philosophy (in Division V). The reason for this exceptional treatment of these three disciplines is given in the Introductory Essay to Part Ten.

The special character of Part Ten thus explains the diagram in which it occupies the centre of the circle of learning, but that must not be interpreted as attributing prime importance to it. This diagram simply indicates the special function Part Ten performs in relation to the other parts. It alone stands in close relation to all the rest; there are varying degrees of relatedness among the other parts. For example, Parts Three and Four,

dealing with Life on Earth and with Human Life, are closely related; Parts Four and Five, dealing with Human Life and with Human Society, are also closely related; but Part Four has a different relatedness to Part Three, on the one hand, and to Part Five, on the other. In the presentation of the Outline of Knowledge, the headnotes and the cross-references give the reader an indication of these interrelationships.

Anyone who is in a position to compare the classified list of articles in the Eleventh or even the Fourteenth Edition with the Outline of Knowledge will be persuaded, the Editors think, that whereas the immediately preceding editions of *Britannica* represented a 19th- and early 20th-century view of the state of human knowledge, the new *Britannica*, in its Fifteenth Edition, is an encyclopaedia that reflects the many changes and innovations in man's knowledge and understanding that are emerging at the end of this century and will continue into the next.

The reader's attention should be called to the following features of the Propædia, or Outline of Knowledge:

1. It serves as a Table of Contents for the long articles in the Macropædia and also for the tens of thousands of shorter articles in the Micropædia.
2. Each of the 10 Parts of the Outline and the several Divisions of each of those Parts is prefaced by a brief summary of the topics covered.
3. The Divisions of each Part are followed by a number of Sections in which each of the topics covered is outlined.
4. At the end of each sectional outline, there is a list of Suggested Readings, first in the Macropædia, second in the Micropædia, which is followed by a list of the biographical articles that are relevant to the subjects covered in the outline of that Section.
5. In the topical outline of each Section, cross-references are made, when relevant, to other Sections in the Propædia on which related subjects are treated.

Because it is constructed in this manner, the Propædia provides the reader who wishes to pursue the study of a whole field of knowledge with an easily used guide. The Propædia thus offers readers a more comprehensive and detailed study guide for the use of the *Encyclopædia Britannica* than has ever been furnished before.

To facilitate their use of the Propædia as a study guide, readers should turn to pages 9–15, which follow. Here they will find a synoptic Table of Contents of the Propædia itself, set forth in the order of the 10 Parts, under each of which the component Divisions are listed, and under each Division, the component Sections.

This synoptic Table of Contents gives readers an overview of the Outline of Knowledge as a whole. The introductory essays for each of the 10 Parts, each writ-

ten by an authority in that field, illuminate the major concerns of that area of human knowledge.

The Propædia, or Outline of Knowledge, helps readers answer for themselves the question that, in its most general form, is as follows: *What can I learn from the Britannica concerning one or another area of human knowledge?* More specifically, the question might be: *What can I learn about the Earth?* or *What can I learn about art?* The reader's interest may be even more specific. In the field of the Earth sciences, the question might be: *What can I learn about the Earth's constituent minerals and rocks?* or *What can I learn about weather and climate?* In the field of art, the question might be: *What can I learn about the theory and classification of the arts?* or *What can I learn about music?*

Another point should be mentioned because, in the view of the Editors, it distinguishes the Fifteenth Edition from all preceding editions.

The Outline of Knowledge presented in this Propædia volume was constructed *before* those articles themselves were named, outlined, commissioned, written, and edited. The outline served as the basis for determining what articles should be written, what their scope should be, how they should be related to other articles, and so on. It was, therefore, in origin a table of *intents* rather than a table of *contents*. It represented the intentions of the Editors in laying down a

comprehensive plan for producing a new encyclopaedia, appropriate to the state of human knowledge and learning at the end of the 20th century and looking forward to emergent developments in the century to follow. What was originally, or in the planning stage of the work, a Table of Intents, then subsequently became, after the writing and editing of the articles was completed, a Table of Contents that tries to reflect accurately and faithfully the actual content of the articles.

All preceding editions of *Britannica*, as most other encyclopaedias, have been constructed from classified lists of articles. Such classified lists may vary from one edition to another, as they have from the First Edition of *Britannica* through the Fourteenth, but the variations are relatively minor as compared with the fact that they are all the same in form—nothing but classified lists of articles, as exemplified by the one presented in the Eleventh Edition, already referred to. In sharp contrast to such editorial procedures, the Fifteenth Edition has the distinction of being planned not in accordance with a classified list of articles, but rather in the light of an orderly topical outline of the whole of human knowledge, in the form of the circle of learning that is an *en-cyclo-paedia*.

MORTIMER J. ADLER
Director of Planning

CONTENTS

Part One. Matter and Energy

INTRODUCTION: The Universe of the Physicist, the Chemist, and the Astronomer *by Nigel Calder* page 17

Division I.	Atoms: Atomic Nuclei and Elementary Particles	21
	111. The Structure and Properties of Atoms	21
	112. The Atomic Nucleus and Elementary Particles	23
Division II.	Energy, Radiation, and the States and Transformation of Matter	27
	121. Chemical Elements: Periodic Variation in Their Properties	27
	122. Chemical Compounds: Molecular Structure and Chemical Bonding	29
	123. Chemical Reactions	34
	124. Heat, Thermodynamics, and the Nonsolid States of Matter	37
	125. The Solid State of Matter	40
	126. Mechanics of Particles, Rigid Bodies, and Deformable Bodies: Elasticity, Vibrations, and Flow	43
	127. Electricity and Magnetism	45
	128. Waves and Wave Motion	48
Division III.	The Universe: Galaxies, Stars, the Solar System	51
	131. The Cosmos	51
	132. Galaxies and Stars	53
	133. The Solar System	56

Part Two. The Earth

INTRODUCTION: The Great Globe Itself *by Peter J. Wyllie* 61

Division I.	The Earth's Properties, Structure, and Composition	65
	211. The Planet Earth	65
	212. The Earth's Physical Properties	66
	213. The Structure and Composition of the Earth's Interior	68
	214. The Earth's Constituent Minerals and Rocks	69
Division II.	The Earth's Envelope: Its Atmosphere and Hydrosphere	73
	221. The Atmosphere	73
	222. The Hydrosphere: the Oceans, Freshwater Bodies, and Ice Masses	75
	223. Weather and Climate	77

Division III.	The Earth's Surface Features	page 79
231.	Physical Features of the Earth's Surface	79
232.	Features Produced by Geomorphic Processes Acting on the Earth's Surface	81

Division IV.	The Earth's History	85
241.	Origin and Development of the Earth and Its Envelopes	85
242.	The Interpretation of the Geologic Record	86
243.	The Eras and Periods of Geologic Time	88

Part Three. Life on Earth

INTRODUCTION: The Mysteries of Life by <i>René Dubos</i>	91
--	----

Division I.	The Nature and Diversity of Living Things	95
311.	Characteristics of Living Things	95
312.	The Origin of Life and the Evolution of Living Things	96
313.	The Classification of Living Things	98

Division II.	The Molecular Basis of Vital Processes	112
321.	Chemicals and the Vital Processes	112
322.	Metabolism: Bioenergetics and Biosynthesis	115
323.	Vital Processes at the Molecular Level	116

Division III.	The Structures and Functions of Organisms	117
331.	The Cellular Basis of Form and Function	117
332.	The Relation of Form and Function in Organisms	118
333.	Coordination of Vital Processes: Regulation and Integration	120
334.	Covering and Support: Integumentary, Skeletal, and Muscular Systems	122
335.	Nutrition: the Procurement and Processing of Nutrients	123
336.	Gas Exchange, Internal Transport, and Elimination	124
337.	Reproduction and Sex	126
338.	Development: Growth, Differentiation, and Morphogenesis	128
339.	Heredity: the Transmission of Traits	129

Division IV.	Behavioral Responses of Organisms	130
341.	Nature and Patterns of Behavioral Responses	130
342.	Development and Range of Behavioral Capacities: Individual and Group Behaviour	131

Division V.	The Biosphere: the World of Living Things	132
351.	Basic Features of the Biosphere	132
352.	Biological Populations and Communities	133
353.	Hazards of Life in the Biosphere: Disease and Death	135
354.	Biogeographic Distribution of Organisms: Ecosystems	136
355.	The Place of Humans in the Biosphere	137

Part Four. Human Life

INTRODUCTION: *The Cosmic Orphan* by *Loren Eiseley* page 139

Division I.	Stages in the Development of Human Life on Earth	143
	411. Human Evolution	143
	412. Human Heredity: the Races of Mankind	145
<hr/>		
Division II.	The Human Organism: Health and Disease	146
	421. The Structures and Functions of the Human Body	146
	422. Human Health	150
	423. Human Diseases	151
	424. The Practice of Medicine and the Care of Health	158
<hr/>		
Division III.	Human Behaviour and Experience	159
	431. Human Nature and Experience: General Considerations	160
	432. Influence of the Current Environment on a Person's Behaviour and Conscious Experience: Attention, Sensation, and Perception	161
	433. Current Internal States Affecting a Person's Behaviour and Conscious Experience	163
	434. Persisting Capacities and Inclinations That Influence Human Behaviour and Conscious Experience	164
	435. Development of a Person's Potentials: Learning and Thinking	165
	436. Personality and the Self: Integration and Disintegration of the Person as a Whole	166

Part Five. Human Society

INTRODUCTION: *Man the Social Animal* by *Harold D. Lasswell* 169

Division I.	Social Groups: Peoples and Cultures	173
	511. Peoples and Cultures of the World	173
	512. The Development of Human Culture	178
	513. Major Cultural Components and Institutions of Human Societies	179
	514. Language and Communication	180
<hr/>		
Division II.	Social Organization and Social Change	186
	521. Social Structure and Change	186
	522. The Group Structure of Society	188
	523. Social Status	189
	524. Human Populations: Urban and Rural Communities	190
<hr/>		
Division III.	The Production, Distribution, and Utilization of Wealth	191
	531. Economic Concepts, Issues, and Systems	191
	532. The Consumer and the Market: Pricing and the Mechanisms for Distributing Goods	192
	533. The Organization of Production and Distribution	194
	534. The Distribution of Income and Wealth	198
	535. Macroeconomics	199
	536. Economic Growth and Planning	201

Division IV.	Politics and Government	page 202
	541. Political Theory	202
	542. Political Institutions: the Structure, Branches, and Offices of Government	204
	543. The Functioning of Government: the Dynamics of the Political Process	205
	544. International Relations: Peace and War	206

Division V.	Law	208
	551. Philosophies and Systems of Law; the Practice of Law	208
	552. Branches of Public Law, Substantive and Procedural	210
	553. Branches of Private Law, Substantive and Procedural	212

Division VI.	Education	215
	561. The Aims and Organization of Education	215
	562. Education Around the World	216

Part Six. Art

	INTRODUCTION: The World of Art <i>by Mark Van Doren</i>	219
--	---	-----

Division I.	Art in General	221
	611. Theory and Classification of the Arts	221
	612. Experience and Criticism of Works of Art; the Nonaesthetic Context of Art	222
	613. Characteristics of the Arts in Particular Cultures	224

Division II.	The Particular Arts	225
	621. Literature	225
	622. Theatre	234
	623. Motion Pictures	236
	624. Music	238
	625. Dance	244
	626. Architecture, Garden and Landscape Design, and Urban Design	246
	627. Sculpture	249
	628. Drawing, Painting, Printmaking, and Photography	250
	629. Arts of Decoration and Functional Design	254

Part Seven. Technology

	INTRODUCTION: Knowing How and Knowing Why <i>by Lord Ritchie-Calder</i>	261
--	---	-----

Division I.	The Nature and Development of Technology	265
	711. Technology: Its Scope and History	265
	712. The Organization of Human Work	266

Division II.	Elements of Technology	page 268
	721. Technology of Energy Conversion and Utilization	268
	722. Technology of Tools and Machines	270
	723. Technology of Measurement, Observation, and Control	271
	724. Extraction and Conversion of Industrial Raw Materials	274
	725. Technology of Industrial Production Processes	277

Division III.	Major Fields of Technology	280
	731. Agriculture and Food Production	280
	732. Technology of the Major Industries	283
	733. Construction Technology	286
	734. Transportation Technology	288
	735. Technology of Information Processing and of Communications Systems	290
	736. Military Technology	293
	737. Technology of the Urban Community	296
	738. Technology of Earth and Space Exploration	297

Part Eight. Religion

	INTRODUCTION: Religion as Symbolism <i>by Wilfred Cantwell Smith</i>	299
--	--	-----

Division I.	Religion in General	303
	811. Knowledge and Understanding of Religion	303
	812. The Religious Life: Institutions and Practices	305

Division II.	The Particular Religions	306
	821. Prehistoric Religion and Primitive Religion	306
	822. Religions of Ancient Peoples	308
	823. Hinduism and Other Religions of India	312
	824. Buddhism	315
	825. Indigenous Religions of East Asia: Religions of China, Korea, and Japan	317
	826. Judaism	320
	827. Christianity	323
	828. Islām	334
	829. Other Religions and Religious Movements in the Modern World	336

Part Nine. The History of Mankind

	INTRODUCTION: The Point and Pleasure of Reading History <i>by Jacques Barzun</i>	339
--	---	-----

Division I.	Peoples and Civilizations of Ancient Southwest Asia, North Africa, and Europe	343
	911. Early Peoples and Civilizations of Southwest Asia and Egypt, the Aegean, and North Africa	344
	912. Peoples of Ancient Europe and the Classical Civilizations of the Ancient Mediterranean World to AD 395	350

Division II.	Peoples and Civilizations of Medieval Europe, North Africa, and Southwest Asia	<i>page</i> 356
921.	Western Europe, the Byzantine (Eastern Roman) Empire, and Eastern Europe from AD 395 to <i>c.</i> 1050	356
922.	The Formative Period in Islāmic History, from AD 622 to <i>c.</i> 1055	361
923.	Western Christendom in the High and Later Middle Ages (<i>c.</i> 1050– <i>c.</i> 1500)	363
924.	The Crusading Movement, the Islāmic States of Southwest Asia, North Africa, and Europe, and the States of Eastern Christendom from <i>c.</i> 1050 to <i>c.</i> 1480	372
Division III.	Peoples and Traditional Civilizations of East, Central, South, and Southeast Asia	375
931.	China to the Beginning of the Late T'ang (AD 755)	375
932.	China from the Late T'ang (AD 755) to the Late Ch'ing (<i>c.</i> 1839)	377
933.	Inner (Central and Northeast) Asia to <i>c.</i> 1750	379
934.	Japan to the Meiji Restoration (1868), and Korea to 1910	381
935.	The Indian Subcontinent and Ceylon to <i>c.</i> AD 1200	383
936.	The Indian Subcontinent from <i>c.</i> 1200 to 1761, and Ceylon from <i>c.</i> 1200 to 1505	385
937.	The Peoples and Civilizations of Southeast Asia to <i>c.</i> 1600	387
Division IV.	Peoples and Civilizations of Sub-Saharan Africa to 1885	388
941.	West Africa to <i>c.</i> 1885	389
942.	The Nilotic Sudan and Ethiopia from <i>c.</i> AD 550 to 1885	390
943.	East Africa and Madagascar to <i>c.</i> 1885	391
944.	Central Africa to <i>c.</i> 1885	392
945.	Southern Africa to <i>c.</i> 1885	392
Division V.	Peoples and Civilizations of Pre-Columbian America	394
951.	Andean Civilization to <i>c.</i> AD 1540	394
952.	Meso-American Civilization to <i>c.</i> AD 1540	395
Division VI.	The Modern World to 1920	396
961.	Western Europe from <i>c.</i> 1500 to <i>c.</i> 1789	397
962.	Eastern Europe, Southwest Asia, and North Africa from <i>c.</i> 1480 to <i>c.</i> 1800	406
963.	Europe from 1789 to <i>c.</i> 1920	408
964.	European Colonies in the Americas from 1492 to <i>c.</i> 1790	420
965.	Development of the United States and Canada from 1763 to 1920	422
966.	Development of the Latin-American and Caribbean Nations to <i>c.</i> 1920	428
967.	Australia and Oceania to <i>c.</i> 1920	433
968.	South Asia Under the Influence of European Imperialism from <i>c.</i> 1500 to <i>c.</i> 1920	434
969.	Southeast Asia Under the Influence of European Imperialism to <i>c.</i> 1920	436
96/10.	China from 1839 Until the Onset of Revolution (to <i>c.</i> 1911), and Japan from the Meiji Restoration to <i>c.</i> 1910	438
96/11.	Southwest Asia and North Africa (<i>c.</i> 1800–1920), and Sub-Saharan Africa (1885– <i>c.</i> 1920) Under the Influence of European Imperialism: the Early Colonial Period	440

Division VII.	The World Since 1920	page 443
971.	International Movements, Diplomacy, and War Since 1920	443
972.	Europe Since <i>c.</i> 1920	447
973.	The United States and Canada Since 1920	453
974.	Latin-American and Caribbean Nations Since <i>c.</i> 1920	457
975.	East Asia: China in Revolution, the Era of Japanese Hegemony, and the Influence of the United States in the 20th Century	461
976.	South and Southeast Asia: the Late Colonial Period and the Emergence of New Nations Since 1920	464
977.	Australia and Oceania Since 1920	468
978.	Southwest Asia and Africa: the Late Colonial Period and the Emergence of New Nations in the 20th Century	469

Part Ten. The Branches of Knowledge

INTRODUCTION: Knowledge Become Self-conscious by <i>Mortimer J. Adler</i>	475
---	-----

Division I.	Logic	479
10/11.	History and Philosophy of Logic	480
10/12.	Formal Logic, Metalogic, and Applied Logic	481

Division II.	Mathematics	483
10/21.	History and Foundations of Mathematics	483
10/22.	Branches of Mathematics	485
10/23.	Applications of Mathematics	490

Division III.	Science	492
10/31.	History and Philosophy of Science	493
10/32.	The Physical Sciences	495
10/33.	The Earth Sciences	499
10/34.	The Biological Sciences	501
10/35.	Medicine and Affiliated Disciplines	503
10/36.	The Social Sciences and Psychology and Linguistics	506
10/37.	The Technological Sciences	508

Division IV.	History and the Humanities	509
10/41.	Historiography and the Study of History	509
10/42.	The Humanities and Humanistic Scholarship	511

Division V.	Philosophy	513
10/51.	History of Philosophy	513
10/52.	The Nature and the Divisions of Philosophy	517
10/53.	Philosophical Schools and Doctrines	520

Division VI.	Preservation of Knowledge	522
10/61.	Institutions and Techniques for the Collection, Storage, Dissemination, and Preservation of Knowledge	522

Board of Editors	<i>page</i> 524
Advisers	524
Authors of Propædia Essays	530
Initials of Contributors	531
Names of Contributors	655
Authorities for the Micropædia	675

Introduction to Part One:

The Universe of the Physicist, the Chemist, and the Astronomer

by Nigel Calder

“Give me matter and I will build a world from it.” For 200 years since the philosopher Immanuel Kant uttered it, physicists, chemists, and astronomers have striven to make good that boast. That they can now tell an almost unbroken story of events from the birth of the universe to the origin of life on Earth is the cumulative result of many lifetimes spent in careful observation and experiment. Yet even amid this success in updating the first verses of Genesis, new questions nag. Why does familiar matter adopt the forms it does? Are the laws of nature that are known to us enforced throughout the vast, tumultuous universe? What unimaginable worlds of fire or blackness can nature conjure up, quite different from our own?

When men presume to take the fire of the Sun and put it experimentally in a bottle, they forfeit all hope of certainty and repose. Yet the great quest for control over nature starts gently enough. A child at play with building blocks or sand or a rubber ball is a human mind engaged in discovering how matter behaves. Experiments with the rubber ball, for example, reveal laws of reflection. The child finds that the ball will come back to him only if he projects it accurately at a right angle to a flat surface (wall or floor); otherwise it bounces away from him and another child may grab it and interrupt the research program.

If all grown-up children had abandoned this kind of play, the human species would still believe that the Earth was at the centre of the universe, that the planets were propelled by angel-power, and that thunder was the voice of God. But some adults retained the boundless inquisitiveness of the young. Isaac Newton, not the most modest of discoverers, likened himself to a child playing on the seashore. Critics nowadays refer scathingly to the “expensive toys” of the physicists who want many millions of dollars to build a particle accelerator. Not unfairly—a particle accelerator, for all its awesome complexity and cost, is simply a modern way of continuing the experiments with the rubber ball, to see what happens when the ball is very small and travels almost at the speed of light.

By strange paths, play leads to far-reaching results. After the discovery that an electric current creates magnetism, Michael Faraday made a note to look for electricity from magnetism. He played repeatedly with magnets and wires until, ten years later, he discovered electromagnetic induction. Today, giant turbogenerators confirm his discovery 60 times a second, as they feed electric power to our factories and kitchens. In James Clerk Maxwell’s hands, Faraday’s ever-changing electric currents transformed themselves into mathematical equations predicting the existence of waves that traveled at the speed of light—indeed *were* light and invisible radiations of a similar kind, including radio waves. Other researchers who were unwittingly taking atoms to pieces came up with a beam of electrons, which inventors turned into a magic pencil;

today those waves and electrons enable lesser men to preen themselves on television screens in 260,000,000 homes.

In this latter part of the 20th century, a word-association test for *physicist* may very well evoke *bomb*. By coincidence, investigators of the nature of matter and energy stumbled upon a way of breaking open the storehouse of energy in the nucleus of the atom just at the time the human species was entering a period of unprecedented warfare. The swarms of nuclear-powered submarines that cruise with nuclear-tipped, city-killing missiles are a grim enough outcome of the “game.” The fact remains that the heart of physics itself is not directed to any such purpose but is an open, cooperative effort by scientists of all nations to understand the material universe we live in.

We inhabit an electric world. It is true that gravity stops us from falling headfirst into the abyss of space; true also that the daylight that powers all life comes from the nuclear reactor that we call the Sun. But of the great set of natural forces known to the physicist—gravitational, nuclear, and electromagnetic—the last, electromagnetism, is the chief governor of events on Earth.

It operates so discreetly, though, that when men started rubbing amber on their sleeves and found it attracted dust, or considered the seeming magic of the north-pointing lodestone, nothing suggested that these were more than curiosities. There was laughter when Benjamin Franklin said that lightning was electric—until he proved it. Nothing suggested that the colour, quality, and chemical behaviour of all familiar matter would be explained by research in electricity and magnetism. But that is in the nature of physics: you ponder the falling of an apple and realize what holds the planets in their courses; you look to see what happens when you pass electric currents through a gas and, in due course, you find out what holds a stone together and why grass is green.

A series of discoveries in the late 19th and early 20th centuries illuminated the hidden mechanisms of our electric world like star shells on a dark night. Diligent work by chemists had shown that all matter was composed of vast numbers of atoms, different for each chemical element and capable of combining in predictable ways to make molecules and crystals. Indeed there was a remarkable pattern in the so-called “periodic table”: when the chemical elements were listed by weight, it turned out that elements 3, 11, and 19 . . . all had similar properties; 4, 12, and 20 . . . were also very much alike, and so on.

This pattern made sense only when the physicists discovered the construction of atomic matter. An atom consists of a heavy nucleus surrounded by a number of lightweight electrons exactly neutralizing the electric charge on the nucleus. The electrons group themselves around the nucleus in “shells,” like the layers of an onion, each shell being capable of accommodating a definite number

of electrons. The outward face of the atom, its outermost shell of electrons, is crucial in determining its chemical behaviour. The number of electrons to be fitted in depends on the charge on the nucleus. In some elements, the metals, there are only one or two easily detachable electrons in the outermost shell. Other elements, the most reactive nonmetals, fall short by only one or two electrons in having a complete outermost shell. These "surplus" and "missing" electrons create a supply-and-demand situation in which atoms combine chemically by exchanging or sharing electrons. The repetition of chemical properties throughout the periodic table arises as one shell of electrons is completed and the next one begins to fill.

The mechanisms sketched in these last few sentences account for almost all the chemical behaviour of all the matter on Earth. The electrical and magnetic behaviour of materials also depends on the arrangements of electrons in their atoms and, in some cases, on the combined effects of many atoms packed together in a crystal. The strength of the chemical bonds formed by electrons, and the related forces between molecules, determine whether materials are solids, liquids, or gases; and they help to fix the strength and flexibility of solids, but in this case the explanations are complicated by the invisible flaws that exist in all materials. The colour of materials is explicable by the "jumps," from one position to another in the vicinity of an atom, which the rules allow an electron to make as the atom, molecule, or crystal absorbs or emits light of particular energy, or colour. Make the same electrons in vast numbers of atoms "jump" the same way simultaneously and you have a very intense laser beam.

Light and its invisible counterparts—radio waves, infrared, ultraviolet, and X-rays—are the purest form of energy. These "electromagnetic radiations" are created by the jerking of electrons, sometimes quite gently, as in a radio antenna, and sometimes very fiercely, as when a beam of fast-moving electrons is suddenly halted by the target in an X-ray tube. The normal "jumps" of electrons in atoms are of intermediate intensity. All these radiant forms of energy can travel through empty space, for example from the Sun to the Earth.

But energy can readily change from one form to another. Sunlight captured by green leaves is converted into the chemical energy of plant-stuff. Coal is plant-stuff buried millions of years ago when continents collided, and a boiler can convert the chemical energy of coal into a scalding jet of steam that turns the blades of a turbine—these are forms of kinetic energy, the energy of directed movement. Using Faraday's trick, the turbine can generate electrical energy. At the end of this chain of transformations, you can switch on the electrical energy and reconvert it to light energy, thereby enjoying the benefits of sunlight after the Sun has set.

The vibrations of sound and the gravitational energy of water about to cascade down a mountainside are other forms of energy. Sooner or later, though, a shout dies away, water comes to rest, the light from your electric bulb is absorbed in the wallpaper. Where has the energy gone? It has been taken up in those random motions of atoms and molecules that we call heat. All energy degrades to meaningless heat eventually.

Unless there were continuous supplies of new energy,

life and indeed all interesting activity in the universe would quickly cease. For example, your brain is kept functioning by food—chemical energy produced by sunlight just in the past few months. Those new supplies of energy come from the transformation of matter into energy.

The Sun is a very ordinary star, lying in the suburbs of a galaxy consisting of about 100,000,000,000 stars; we see the rather flat cross section of the galaxy as the Milky Way, a brushstroke of light across the night sky. There is nothing special, even, about our Galaxy; it is just one of vast numbers of galaxies scattered like ships in a great ocean of space.

The universe is a battleground between gravity and nuclear forces. To make a star, gravity sweeps together a mass of hydrogen gas; it becomes hot and nuclear reactions begin. The nuclei of hydrogen atoms combine together to make heavier elements almost, but not quite, as heavy as the sum of the hydrogen nuclei that went into them. The little bit of matter that is lost is converted into a relatively immense amount of energy. It would blow the star apart but for the strenuous restraint of gravity. A balance is struck, and the size and brightness of a star depends on its mass and on how much of its nuclear fuel has been burned. Fortunately, our star, the Sun, is a slow-burner; nevertheless, inexorable physical changes billions of years from now will make the Sun grow to fill the whole of our sky and swallow the Earth.

In a star more massive than the Sun, this "burning" of nuclear fuel proceeds faster and culminates in a vast explosion called a supernova. In the explosion, nuclear reactions proceed apace and make all the different chemical elements. The diverse atoms, heavier than hydrogen, of which our own bodies are constructed, were made in stars that exploded before the Sun was formed. Some of the heavy material was left swirling around the newborn Sun and made the Earth. Radioactive energy stored in some of the elements provided an internal source of heat for the Earth that accounts for volcanoes, earthquakes, and the slow movements of continents. Sunlight stirred the materials on the surface of the Earth into chemical activity. Eventually this activity became organized in peculiar ways, and life began.

So far, so good. But there are new mysteries that are "out of this world," in the sense that matter and energy are involved in events far more violent than anything normally encountered on the Earth or even in the Sun. The paramount questions with which physicists are now wrestling can be paraphrased as follows: Why is hydrogen the raw material of the universe? Experiments with the nucleus of the hydrogen atom—the proton—are undertaken in the big accelerators that transform the stuff of the atomic nucleus into bizarre, short-lived particles. These particles have properties, similar to electric charge, called the hypercharge and the baryon number. For example, the proton itself has, besides an electric charge of +1, a hypercharge of +1 and a baryon number of 1. However the particles may transform themselves in violent interactions, the totals of charge, hypercharge, and baryon number do not change.

Attempting to find out why this partial order remains amid the confused varieties of nuclear matter, theorists are led to the idea that the particles we see consist of

combinations of other, quite different particles that they have named quarks. An early success of this theory was the prediction of the existence of a new combination, a particle called the omega minus that eventually turned up in 1964 during an experiment with the big machine at the Brookhaven National Laboratory, Long Island, N.Y. The quarks themselves have not been discovered at the time of writing.

The next big leap in understanding may well come when the theory of how small pieces of matter behave is blended with the theory of gravity, which at present concerns the huge pieces of matter that make up our universe of galaxies, stars, and planets. With such a "unified" theory physicists may at last be able to answer that question about the raw material of the universe—why hydrogen? At the same time, we shall perhaps come to understand why matter was formed in the "big bang," with which (as many astronomers now suppose) the universe came into existence some 10,000,000,000 years ago, or why the "big bang" was not merely a "big flash."

Even so fundamental an advance would not exhaust the opportunity for fresh discovery in the physical sciences. Another set of pregnant problems results from very strange objects recently discovered in the sky, namely "hot" galaxies, quasars and pulsars. The quasars, in particular, are compact objects of such extraordinary energy that existing laws of physics seem scarcely able to account for them. The pulsars, which flash many times a minute, are also very odd, but less baffling. They are evidently remnants of exploded stars that have collapsed to the enormous density

of the material of the atomic nucleus. If an ocean liner were compressed to the density of a pulsar, it would be no bigger than a grain of sand.

The evidence of the pulsars encourages a further idea—one of the strangest in the whole history of man's study of matter and energy. In a pulsar, nuclear forces prevent collapse to even greater densities. But if the collapsed star were even more massive, gravity would be stronger and it would overwhelm even the nuclear forces. Then there would be nothing to stop the process until the whole star had collapsed to smaller than a peanut. Through the intense gravitational field thus set up, no light could escape, and the star would in effect disappear from the universe. Only its gravity would remain, like the grin of the Cheshire Cat in *Alice in Wonderland*, and, if a space traveler ran into one of these "black holes," he too would be drawn to the same invisible kernel, there to disappear forever—or at least until the laws of physics change.

The possibility that such black holes exist holds out a hope of explaining the quasars as objects of this kind from which material somehow "bounces" out. But that is only a little comfort when scientists have now to reexamine the theory of gravity, which they thought Einstein had cleared up 60 years ago, and to work out the implications of a universe peppered with black holes where the familiar laws of nature are unlikely to apply. There is even the uncomfortable suggestion that our whole universe may be just a big black hole in someone else's universe! Physics, the master science, cannot evade these new battles of the mind.

Part One. Matter and Energy

Three points should be noted about the scope of Part One and its relations to other parts.

The sciences of physics, chemistry, and astronomy have themselves been the object of historical and analytical studies regarding their nature, scope, methods, and interrelations. Part Ten, on the branches of knowledge, is concerned with such studies. The outline in Section 10/32 of Part Ten deals with the sciences of physics, chemistry, and astronomy and treats their history, their nature and scope, and their principal problems and interrelations.

The design and operation of observational and experimental instruments are important in the development of the physical sciences. The treatment of scientific instrumentation is placed in Section 723 of Part Seven, on technology.

Accounts of the several kinds of mathematics used in observation and experiments, and in the derivation and application of physical theories, are set forth in Division II of Part Ten.

The three increasingly complementary physical sciences of physics, chemistry, and astronomy house the knowledge and the organizing theories about matter in all its dimensions, from subatomic particles to the cosmos, about all the states of matter, all the forms of energy, and all the interrelations of matter and energy.

Division I. Atoms: Atomic Nuclei and Elementary Particles 21

II. Energy, Radiation, and the States and Transformation of Matter 27

III. The Universe: Galaxies, Stars, the Solar System 51

Division I. Atoms: Atomic Nuclei and Elementary Particles

The outlines in the two sections of Division I deal with subatomic and atomic physics.

Section 111. The Structure and Properties of Atoms 21

112. The Atomic Nucleus and Elementary Particles 23

Section 111. The Structure and Properties of Atoms

A. The atomic nature of matter

1. The atom as consisting of the nucleus surrounded by electrons, the arrangement and behaviour of which determine atomic interactions
2. Early philosophical speculations on the possible atomic nature of matter
3. The scientific evidence for the existence and the nature of atoms
 - a. Developments in chemistry
 - b. The development of spectroscopy and the discovery of atomic spectra
 - c. The discovery of the electron as a particle and as a component of all matter
 - d. The discovery of X rays
 - e. The discovery of the radioactive transformation of one element into another
 - f. The Brownian movement of suspended particles
 - g. The development of mass spectrometry
 - h. The development of scattering and resonance studies with atomic and molecular beams
4. Models of atomic structure
 - a. The Rutherford model of the atom
 - b. The Bohr-Sommerfeld model
 - c. The wave-mechanical theory of the electronic structure of the atom

- B. Atomic weights
 - 1. Variations in atomic weight as a result of variations in isotopic composition
 - 2. Significance of atomic weights in chemistry
 - 3. Atomic weight scales
 - 4. Methods used for determining atomic weights: chemical methods, physical methods
- C. Atomic spectra and the electronic structures of the atom
 - 1. Atomic spectra: their significance and interpretation
 - a. The spectrum of the hydrogen atom
 - b. The emission spectra of singly and multiply ionized atoms
 - c. Atomic absorption spectra
 - d. The effects of magnetic fields and the effects of electric fields on atomic spectra
 - e. Intensities, isotope shifts, and fine and hyperfine structures of atomic spectral lines as related to atomic structure
 - 2. Theories of the origin of atomic spectra in quantized electronic transitions: the classical Bohr theory, wave-mechanical interpretations
- D. X rays and atomic structure
 - 1. General X-ray phenomena
 - 2. The theory of X rays and their spectra
 - a. The structure of the atom as related to the emission of characteristic X rays, absorption edges, fluorescence yield, mesic atoms
 - b. Continuous X rays and bremsstrahlung; *i.e.*, the radiation produced by the sudden retardation of a fast-moving charged particle in an intense electrical field
 - 3. Detection and measurement of X rays
 - 4. Applications of X rays in biological, medical, industrial, and scientific fields
[see 423.B. and 723.G.8.]
 - 5. Diffraction of X rays by crystals
[see 125.A.2.]
- E. The concept of antimatter
 - 1. General properties of antimatter
 - 2. Production of antiparticles in high-energy collisions
 - 3. Invariance of the laws of physics under charge conjugation, an operation in relativistic mechanics that transforms every particle into its antiparticle
 - 4. Speculations about the possible existence and role of antimatter in the universe
- F. The fundamental physical constants: dimensional and dimensionless constants
 - 1. Measurement of the physical constants
 - 2. Interrelationships among the constants
 - 3. Standards of measurement

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the structure and properties of atoms

Analysis and Measurement, Physical and Chemical
 Atoms: Their Structure, Properties, and Component Particles
 Physical Science, Principles of
 Physical Sciences, The

MICROPAEDIA: Selected entries of reference information

General subjects

<i>atom models:</i>	Franck–Hertz experiment	<i>laws and principles:</i>	<i>other:</i>
Aufbau principle	Fraunhofer lines	complementarity principle	antimatter atom
Bohr atomic model	ionization	Pauli exclusion principle	atomic mass atomic radius
electronic configuration	potential	quantum mechanics	energy state excitation
octet	magnetic resonance	Schrödinger equation	matter orbital
Rutherford atomic model	spectral line series	selection rule	positronium
shell atomic model	Stark effect	uncertainty principle	quantum number
<i>experimental effects</i>	Stern-Gerlach experiment	wave-particle duality	transition X ray
<i>results:</i>	Zeeman effect		zero-point energy
Auger effect	<i>fundamental</i>		
Brownian motion	<i>constants:</i>		
electron	molar gas constant		
paramagnetic resonance	Planck's constant		

Biographies

See Section 10/32 of Part Ten

INDEX: See entries under all of the terms above

Section 112. The Atomic Nucleus and Elementary Particles

A. The structure of the atomic nucleus and general nuclear phenomena

1. General properties of atomic nuclei
 - a. Mass
 - b. Charge: atomic number
 - c. Radius
 - d. Spin
 - e. Magnetic moment: nuclear magnetic resonance phenomena
 - f. Electric quadrupole moment
2. Components of atomic nuclei
 - a. Neutrons
[see D., below]
 - b. Protons
 - c. Other possible short- and long-lived components
3. Isotopes: atomic species with the same atomic number but with different atomic masses
[see B., below]
4. Systematic relationships between nuclear masses and nuclear binding energies
5. Nuclear models and the properties of nuclear states
6. Theories of nuclear structure and nuclear binding force
7. General nuclear phenomena and reactions
[see C. and E., below]
8. The formation and evolution of the atomic nuclei in the universe

B. Isotopes: atomic species with the same atomic number but with different atomic masses

1. Classification of isotopes or nuclides
2. Isotopic composition of the elements
3. Formation of isotopes by nuclear reactions
[see E., below]

4. Effects of isotopic substitution on physical and chemical properties of substances
 5. Chemical and physical separation of isotopes
 - a. Mass spectrometry
 - b. Other methods of separation; *e.g.*, diffusion, centrifugal separation, thermal diffusion
 6. Applications of radioactive and stable isotopes
[see 242.D.2. and 723.G.8.]
- C. Radioactive nuclei: their properties and their radiations
1. The phenomenon of radioactivity
 2. Types of radioactivity
 3. Sources of radioactivity: naturally occurring radioactive elements, particle bombardment
 4. Interaction of radiation with matter
[see I., below]
 5. The energy release associated with radioactive decay
 6. Nuclear models used to explain nuclear binding: the liquid drop model, the shell model, the unified model
 7. Rates of radioactive transitions
 - a. Exponential decay law
 - b. Alpha decay
 - c. Beta decay
 - d. Gamma decay
 8. Applications of radioactivity
[see 723.G.8.]
 9. Measurement and characterization of radioactivity
[see I.4., below]
- D. The neutron as a component of the nucleus and in nuclear reactions
1. Properties of neutrons
 2. Sources of neutrons
 3. Manipulation and control of neutrons
 4. Nuclear reactions produced by neutrons
 5. Neutron detection based on the secondary effects of nuclear reactions
- E. Reactions of atomic nuclei
1. The classification of nuclear reactions
 - a. The types of nuclear reactions classified according to the kind of bombarding radiation or particles
 - b. The types of nuclear reactions classified according to the nuclear processes involved or according to their products
 2. The energy relationships of nuclear reactions
 3. Theories and models of nuclear reactions
- F. The splitting of atomic nuclei by nuclear fission
1. Phenomena of nuclear fission
 - a. Spontaneous and induced fission reactions
 - b. Products of nuclear fission
 - c. The energy released in fission
 2. Fission chain reactions: the critical mass
 - a. Nuclear explosions: nuclear, or atomic, bombs
 - b. Controlled nuclear fission
 3. Nuclear models and theories of nuclear fission: liquid drop model, adiabatic models, statistical models

- G. The fusion of atomic nuclei
1. Phenomena of nuclear fusion
 2. Nuclear fusion reactions
 - a. General types of fusion reactions
 - b. The energy released in fusion reactions
 - c. Requirements for intensive fusion reactions
 3. Occurrence of thermonuclear reactions
 - a. Thermonuclear reactions in the Sun and the stars
 - b. Thermonuclear explosions: the hydrogen, or thermonuclear, bomb
 4. Basic conditions required for a thermonuclear reactor
 - a. The formation of a suitable plasma
 - b. The confinement and control of high-temperature plasma
 5. The possible approaches to controlled fusion: prospects for the future
- H. Subatomic, or elementary, particles
1. Development of the concept of subatomic particles as the fundamental units of matter and energy
 - a. The discovery of the various particles
 - b. Yukawa mesons and the theory of nuclear forces
 - c. Advances in quantum field theory: renormalization theory, dispersion theory
 - d. The known elementary particles
 2. The fundamental forces associated with particle interactions
 3. Systems for classifying the elementary particles
 - a. According to the forces that influence them
 - b. According to the kind of statistics they follow
 - c. According to their particle–antiparticle symmetries
 - d. According to stability
 - e. According to charge multiplets
 - f. According to unitary symmetry, or the $SU(3)$ classification
 - g. According to charged-hypercharge multiplets
 4. Elementary particles and the laws of conservation and symmetry
 - a. The theory of subatomic particles and the quantum mechanical symmetry operations
 - b. Dynamic symmetries: space and time inversion
 - c. Violation of conservation laws: charge conjugation, time reversal, parity
 - d. Internal symmetries
 5. Sources of the unstable elementary particles
 - a. Formation of resonances in high-energy accelerators
 - b. Production by cosmic ray interactions
 6. Relations of the weak interactions to strong and electromagnetic interactions described by conserved current and algebra of current
 7. Other particles suggested by contemporary theoretical ideas
 8. Reactions of elementary particles with atoms
 9. Theories of nuclear structure and nuclear forces involving the elementary particles
- I. Effects of the passage of nuclear, or elementary, particles, nuclear radiations, or ionizing radiation through matter
1. The fundamental processes involved when energetic particles or radiations interact with or pass through matter
 - a. The passage of electromagnetic waves and their interaction with atomic structure

- b. The passage of particles or radiations through matter
2. Secondary and tertiary effects of radiation: physical effects, molecular activation and related phenomena, chemical effects, biological effects
3. Utilization of high-energy radiation in biological, medical, and technological fields
4. The use of fundamental processes of interaction between radiation and matter for the detection and characterization of nuclear and elementary processes
 - a. Mechanisms of detection systems: ionization and charge collection, conversion of the distributed energy of the primary ionizing particle into light
 - b. Properties of ionization media
 - c. Major types of radiation detectors: scintillation counters, ionization detectors, spark chambers, cloud chambers, bubble chambers
[see 723.F.7.]
 - d. Applications of radiation detectors in science, technology, and industry
[see 723.G.8.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the atomic nucleus and elementary particles

Analysis and Measurement, Physical and Chemical	Radiation
Atoms: Their Structure, Properties, and Component Particles	Subatomic
Physical Sciences, The	Particles

MICROPAEDIA: Selected entries of reference information

General subjects

<i>conservation laws and symmetry:</i> charge conjugation charge conservation CP violation Eightfold Way energy, conservation of gauge theory isospin momentum, conservation of parity spin time reversal <i>nuclear interactions:</i> excitation fission product neutron capture nuclear energy nuclear fission nuclear fusion nuclear reaction nucleosynthesis spallation spontaneous fission thermonuclear reaction transmutation <i>nuclear structure:</i> binding energy collective model compound-nucleus model isotope	liquid-drop model magic number magnetic resonance nuclear magnetic resonance nuclear model nuclide shell nuclear model <i>particle interactions:</i> cross section fundamental interaction pair production proton-proton cycle scattering <i>radiation detection:</i> cloud chamber coincidence counting ionization chamber solid-state detector spark chamber <i>radioactivity:</i> activity alpha decay beta decay decay constant fallout gamma decay gamma ray half-life isomer metastable state	radioactive isotope radioactive series radioactivity <i>subatomic particles:</i> alpha particle antiparticle antiproton baryon boson electron hadron Higgs particle hyperon J/psi particle lepton magnetic monopole meson muon neutrino neutron photon positron proton quark quasiparticle subatomic particle tau thermal neutron W particle Z particle <i>other:</i> Bose-Einstein statistics bremsstrahlung	Cherenkov radiation Compton effect de Broglie wave electron diffraction electron optics electroweak theory Fermi-Dirac statistics flavour gluon Millikan oil-drop experiment neutron optics quantum chromodynamics quantum electrodynamics radiation renormalization standard model Stern-Gerlach experiment strong nuclear force synchrotron radiation unified field theory wave function weak nuclear force
---	--	---	--

Biographies

See Section 10/32 of Part Ten

INDEX: See entries under all of the terms above

Division II. Energy, Radiation, and the States and Transformation of Matter

[For Part One headnote see page 21.]

Division I deals with modern advances in subatomic and atomic physics.

The outlines in the first three sections of Division II treat, respectively, chemical elements, chemical compounds, and chemical reactions. The last five sections of this division are concerned with heat, thermodynamics, and the nonsolid states of matter; with the solid state of matter; with the mechanics of particles, rigid bodies, and deformable bodies; with electricity and magnetism; and with waves and wave motion.

- Section 121. Chemical Elements: Periodic Variation in Their Properties 27
122. Chemical Compounds: Molecular Structure and Chemical Bonding 29
123. Chemical Reactions 34
124. Heat, Thermodynamics, and the Nonsolid States of Matter 37
125. The Solid State of Matter 40
126. Mechanics of Particles, Rigid Bodies, and Deformable Bodies: Elasticity, Vibrations, and Flow 43
127. Electricity and Magnetism 45
128. Waves and Wave Motion 48

Section 121. Chemical Elements: Periodic Variation in Their Properties

- A. The systematic classification of the elements on the basis of their chemical and physical properties and atomic structures: the periodic law of the elements
- B. The groups of the chemical elements in the long form of the periodic table: their occurrence, history, physical and chemical properties, principal compounds, production, and uses
1. Hydrogen, its forms, isotopes, and compounds: water, its structure, forms, and physical and chemical properties
 2. The alkali metals, or the Group Ia elements of the periodic table: lithium, sodium, potassium, rubidium, cesium, francium
 3. The alkaline-earth metals, or the Group IIa elements of the periodic table: beryllium, magnesium, calcium, strontium, barium, radium
 4. The boron group of the elements, or the Group IIIa elements of the periodic table: boron, aluminum, gallium, indium, thallium
 5. The carbon group of the elements, or the Group IVa elements of the periodic table: carbon, silicon, germanium, tin, lead
 6. The nitrogen group of the elements, or the Group Va elements of the periodic table: nitrogen, phosphorus, arsenic, antimony, bismuth
 7. The oxygen group of the elements, or the Group VIa elements of the periodic table: oxygen, sulfur, selenium, tellurium, polonium
 8. The halogen elements, or the Group VIIa elements of the periodic table: fluorine, chlorine, bromine, iodine, astatine
 9. The noble gases, or the Group 0 elements of the periodic table, formerly called the inert gases: helium, neon, argon, krypton, xenon, radon
 10. The zinc group elements, or the Group IIb elements of the periodic table: zinc, cadmium, mercury
 11. The transition elements: elements with partly filled *d* or *f* orbitals occupying the middle portion of the periodic table
 - a. Individual elements of the first transition series: titanium, vanadium, chromium, manganese, iron, cobalt, nickel, copper
 - b. Individual elements of the second and third transition series: zirconium and hafnium, niobium and tantalum, molybdenum and tungsten, technetium and rhenium, ruthenium and osmium, rhodium and iridium, palladium and platinum, silver and gold

- c. The lanthanide elements
[see B.12., below]
 - d. The actinide elements
[see B.13., below]
 - 12. The rare-earth, or lanthanide, elements of the periodic table: scandium, yttrium, lanthanum, cerium, praseodymium, neodymium, promethium, samarium, europium, gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium, lutetium
[see also 724.C.3.u.]
 - 13. The actinide elements of the periodic table: actinium, thorium, protactinium, uranium, neptunium, plutonium, americium, curium, berkelium, californium, einsteinium, fermium, mendelevium, nobelium, lawrencium
 - 14. The transactinide elements of the periodic table: unnilquadium (or rutherfordium), unnilpentium (or hahnium), unnilhexium, unnilseptium, unniloctium, unnilennium; heavier elements which have yet to be discovered but whose existence is extrapolated based on the periodic law
- C. Other classifications of the elements or groups of them
- 1. Metals; semimetals, or metalloids; nonmetals
 - 2. Stable and radioactive elements
 - 3. Native and combined elements
 - 4. Noble metals, including the platinum group of metals
 - 5. Synthetic elements: transuranium elements
 - 6. Biologically active or essential elements
[see 335.A.3.]
 - 7. Technologically significant elements
[see 724.C.3.]
- D. The origin of the elements and their relative abundances in nature
- 1. On Earth
 - a. In the crust
[see also 214.C.]
 - b. In the hydrosphere
[see also 222.B. and C.]
 - c. In the atmosphere
[see also 221.A.1.]
 - d. In the biosphere
 - 2. In the solar system
[see also 133.A.]
 - 3. In the stars
[see also 132.D.7.b.]
 - 4. In the rest of the universe
[see also 131.A.1.a.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with chemical elements: periodic variation in their properties

Chemical Compounds

Chemical Elements

MICROPAEDIA: Selected entries of reference information

General subjects

<i>actinide elements:</i>	fermium	thorium	rubidium
actinide	lawrencium	uranium	sodium
actinium	mendelevium	<i>alkali metals:</i>	<i>alkaline-earth metals:</i>
americium	neptunium	alkali metal	alkaline-earth
berkelium	nobelium	cesium	metal
californium	plutonium	francium	barium
cerium	protactinium	lithium	beryllium
einsteinium		potassium	calcium

magnesium	nitrogen group	ytterbium	nickel
radium	element	yttrium	niobium
strontium	phosphorus	<i>synthetic elements,</i>	osmium
<i>boron group:</i>	<i>noble gases:</i>	<i>including the</i>	palladium
aluminum	argon	<i>transuranium</i>	platinum
boron	helium	<i>elements:</i>	rhenium
boron group	krypton	americium	rhodium
element	neon	berkelium	ruthenium
gallium	noble gas	californium	silver
indium	radon	curium	tantalum
thallium	xenon	einsteinium	technetium
<i>carbon group:</i>	<i>oxygen group:</i>	fermium	titanium
carbon	oxygen	lawrencium	transition element
carbon group	oxygen group	mendelevium	tungsten
element	element	neptunium	vanadium
germanium	polonium	nobelium	zirconium
lead	selenium	plutonium	<i>zinc group:</i>
silicon	sulfur	promethium	cadmium
tin	tellurium	technetium	mercury
<i>halogen elements:</i>	<i>rare-earth elements:</i>	transuranium	zinc
astatine	cerium	element	zinc group
bromine	dysprosium	unnilennium	element
chlorine	erbium	unnihexium	<i>other:</i>
fluorine	europium	unniloctium	allotropy
halogen	gadolinium	unnilpentium	Aufbau principle
iodine	holmium	unnilquadium	chemical element
<i>hydrogen and its</i>	lanthanum	unnilseptium	chemical symbol
<i>isotopes:</i>	lutetium	<i>transition elements:</i>	group
deuterium	neodymium	chromium	lanthanide
hydrogen	praseodymium	cobalt	contraction
tritium	promethium	copper	metal
<i>nitrogen group:</i>	rare-earth metal	gold	metalloid
antimony	samarium	hafnium	nonmetal
arsenic	scandium	iridium	nucleosynthesis
bismuth	terbium	iron	periodic law
nitrogen	thulium	manganese	
		molybdenum	

Biographies

See Section 10/32 of Part Ten

INDEX: See entries under all of the terms above

Section 122. Chemical Compounds: Molecular Structure and Chemical Bonding

- A. The theory of molecular structure: its history and development
 1. Early concepts of molecular structure
 2. Quantum mechanical and electrostatic approaches to the theory of molecular structure
 3. Molecular bonds and shapes
 - a. Spatial arrangement of atoms: chains, rings, chelates, polymers
 - b. Isomers: structural isomers, stereoisomers
 4. Time-dependency properties of molecules
 5. Molecular structure and its relation to the properties of bulk matter
 - a. The physical properties of matter as affected by molecular size, shape, and interactions, and interactions of molecules with radiations and fields
 - b. The chemical behaviour of matter as determined by the nature of molecular bonds
 - c. The chemical, physical, and biochemical properties of a substance inferred from its known or postulated molecular structure

- B. Experimental and theoretical procedures for the determination of molecular structures
1. The separation, isolation, and purification of chemical substances based on chemical equilibria and rate phenomena
 - a. By volatility differences: distillation, sublimation, evaporation
 - b. By chromatography: liquid phase, gas phase, thin layer
 - c. By solubility differences: precipitation, crystallization, zone melting, solvent extraction
 - d. By ion-exchange reactions
 - e. By electrophoresis and electrolytic methods
 - f. By mechanical methods: filtration, sedimentation, sieving, flotation, centrifugation
 2. Classical methods of qualitative and quantitative analysis
 3. Instrumental methods used to identify functional groups, molecular sub-units, and structural features
 - a. Spectrochemical methods: microwave, infrared, ultraviolet, Raman spectroscopy, colorimetry, atomic absorption spectroscopy
 - b. Mass spectrometry
 - c. Magnetic resonance spectrometry
 - d. Thermometric methods: thermogravimetry, calorimetry, cryoscopy
 - e. Radiochemical methods: radiometric analysis, activation analysis, isotopic dilution
 - f. Electrochemical methods: potentiometry, polarography, electrodeposition, oscillometry
 4. Diffraction methods for determining molecular structures: electron, X-ray, and neutron beam diffraction
 5. Physical methods used to determine optical activity, magnetic susceptibility, calorific values, heat of combustion, activation energy, and reaction rates
 6. The synthesis and characterization of derivatives, or specifically modified molecules
 7. The determination of molecular weight based on thermodynamic theory, on transport phenomena, and on known spatial arrangements of atoms in the solid state
 8. The principles of conformational analysis as related to molecular structure
 9. The scattering of molecular beams and its usefulness in the study of molecular interactions
- C. Spectra of molecules
1. The theory of molecular spectra
 2. Types of molecular spectra: microwave, infrared, Raman, visible, and ultraviolet spectra
 3. The interpretation of molecular band spectra in determining molecular structure
- D. The theory of chemical bonding: its development and experimental bases
1. Nonquantum treatments of chemical bonding
 - a. Early ideas and concepts of chemical bonding: valence
 - b. The early electronic theory of bonding
 - i. The nature of ionic bonds: shell theory, ion pairs
 - ii. The nature of covalent and coordinate bonds: the octet
 - c. Application of the quantum theory to atomic structure
 2. Quantum-mechanical treatment of chemical bonding
 - a. Atomic and molecular orbital concepts
 - b. Bonding in the hydrogen molecule
 - c. Bonding in simple polyatomic molecules
 - d. Quantum-mechanical calculations
 3. Other bonding effects: hydrogen bonding; metallic bonds in metals, intermetallic compounds, and coordination compounds; bonds in crystals, in weak associations, and in electron-deficient compounds
 4. Experimental observation of chemical bonding

5. Anomalous molecular structures, or molecular fragments with apparently anomalous valences: free radicals, carbenes, carbanions, carbonium ions
- E. Systems of classification of chemical compounds or substances
1. By their elemental composition or molecular structure: organic, inorganic, organometallic, and nonstoichiometric compounds
 2. By their bond type: ionic, covalent, and coordination compounds
 3. By their chemical reactivity: acids, bases, and salts; oxidizing and reducing agents
 4. By their physical state: gas, liquid, and solid
 5. By their origin: natural and synthetic
- F. Inorganic compounds
1. Nomenclature of binary, ternary, and coordination compounds
 2. Structural classification of inorganic compounds
 - a. Salts
 - b. Oxides, anhydrides, acids, and bases
 - c. Coordination compounds
 - d. Organometallic compounds
[see G.1.c., below]
 - e. Catenates
 - f. Inorganic polymers
 - g. Special nonmetallic derivatives
 3. Methods of preparation of inorganic compounds
 4. Reactions of inorganic compounds; *e.g.*, acid–base, substitution, isomerization, oxidation–reduction, addition
- G. Organic compounds
1. The major groups of organic compounds: their nomenclature, chemical and physical properties, synthesis, occurrence, reactions, and analysis
 - a. Hydrocarbons: aliphatic and aromatic
 - b. Organic halogen compounds: alkyl, alkenyl, and alkynyl halides; aryl halides
 - c. Organometallic compounds
 - d. Alcohols, phenols, and ethers
 - e. Carboxylic acids and their derivatives
 - f. Aldehydes, ketones, and their derivatives
 - g. Organic nitrogen compounds
 - h. Organic sulfur compounds
 - i. Organic phosphorus compounds
 - j. Organic silicon compounds
 - k. Heterocyclic compounds
 - l. Oils, fats, and waxes
 - m. Carbohydrates
 - n. Amino acids, proteins, and peptides
 - o. Isoprenoids and terpenes
 - p. Steroids and their derivatives
 - q. Nucleotides and nucleosides
 - r. Nucleic acids: DNA and RNA
 - s. Alkaloids
 - t. Dyestuffs and pigments
 - u. Organic polymers

2. Preparation and purification of organic compounds
3. Physical properties of organic compounds
4. Reactions of organic compounds: addition, substitution, displacement, hydrolysis, pyrolysis, condensation, polymerization, molecular rearrangement

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with chemical compounds: molecular structure and chemical bonding

Biochemical Components of Organisms
Chemical Compounds

MICROPAEDIA: Selected entries of reference information

General subjects

<i>alcohols and phenols:</i>	<i>amino acids, proteins, and peptides:</i>	gallic acid	<i>esters:</i>
alcohol	amino acid	lactic acid	ester
amyl alcohol	collagen	maleic acid	ethyl acetoacetate
butyl alcohol	glutamic acid	malonic acid	lactone
cetyl alcohol	glutamine	oxalic acid	<i>polyester ethers:</i>
chlorophenol	gluten	peroxy acid	ether
cresol	histidine	salicylic acid	ethylether
ethyl alcohol	histone	soap	polyether
fusel oil	hydroxyproline	stearic acid	<i>heterocyclic</i>
glycerol	insulin	succinic acid	<i>compounds:</i>
glycol	keratin	tartaric acid	coumarin
methanol	myoglobin	<i>coordination</i>	furan
naphthol	pepsin	<i>compounds:</i>	imidazole
phenol	peptide	chelate	indole
phytol	prolamin	coordination	lactone
picric acid	protein	compound	melamine
propyl alcohol	proteolytic enzyme	coordination	purine
pyrogallol	renin	number	pyran
resorcinol	scleroprotein	effective atomic	pyrazole
<i>aldehydes and ketones:</i>	serotonin	number	pyridine
acetone	transaminase	ligand	pyrimidine
aldehyde	<i>carbides:</i>	ligand field theory	pyrrole
benzaldehyde	carbide	metal carbonyl	quinoline
ethyl acetoacetate	silicon carbide	<i>dyes and pigments:</i>	thiazine
formaldehyde	tungsten carbide	alizarin	thiazole
ketone	<i>carbohydrates:</i>	anthraquinone	thiophene
<i>alkaloids:</i>	carbohydrate	anthraquinone dye	<i>hydrocarbons:</i>
alkaloid	cellulose	auxochrome	acetylene
atropine	disaccharide	azo dye	benzene
caffeine	glucose	carmine	biphenyl
cocaine	glycoside	chlorophyll	butadiene
codeine	monosaccharide	chromophore	butane
curare	pectin	cochineal	butene
ephedrine	polysaccharide	dye	ethane
heroin	starch	flavonoid	ethylene
ibogaine	sugar	indigo	hydrocarbon
mescaline	<i>carboxylic acids:</i>	lake	methane
morphine	acetic acid	melanin	naphthalene
nicotine	benzoic acid	porphyrin	olefin
piperine	butyric acid	Prussian blue	paraffin
quinidine	carboxylic acid	quercitron bark	hydrocarbon
quinine	citric acid	dye	propane
scopolamine	fatty acid	ultramarine	styrene
theophylline	formic acid		

- toluene
 xylene
inorganic acids and oxides:
 acid
 carbon dioxide
 carbon monoxide
 Dry Ice
 hydrogen chloride
 hydrogen cyanide
 hydrogen ion
 nitric acid
 nitric oxide
 nitrous acid
 nitrous oxide
 oxide
 phosphoric acid
 phosphorous acid
 rare-earth metal
 silica gel
 silicic acid
 sulfur oxide
 sulfuric acid
 water glass
inorganic nitrogen compounds:
 ammonia
 ammonium hydroxide
 azide
 hydrazine
 hydroxylamine
isoprenoids and terpenes:
 abietic acid
 camphor
 carotene
 isoprene
 limonene
 menthol
 pinene
 terpene
methods of chemical analysis:
 assaying
 chemical precipitation
 chromatography
 colorimetry
 countercurrent distribution
 differential thermal analysis
 electrophoresis
 gas chromatography
 gel chromatography
 gravimetric analysis
 iodine value
 nephelometry and turbidimetry
 paper chromatography
 polarimetry
 polarography
 qualitative chemical analysis
 quantitative chemical analysis
 spectrochemical analysis
 thin-layer chromatography
 titration
 volumetric analysis
molecular bonds and shapes:
 configuration
 conformation
 diastereoisomer
 enantiomorph
 isomerism
 optical activity
 racemate
 resolution
 strain theory
 tautomerism
nucleic acids and their components:
 adenine
 adenosine triphosphate
 cytosine
 DNA
 guanine
 nuclease
 nucleic acid
 nucleoside
 nucleotide
 RNA
 thymine
 uracil
oils, fats, and waxes:
 babassu palm
 castor oil
 Chinese wax
 cod-liver oil
 cohune oil
 copra
 cottonseed
 essential oil
 fat
 fish oil
 grease
 lard
 linseed
 lipid
 oil
 phospholipid
 pine oil
 sperm oil
 spermaceti
 tallow
 triglyceride
 wax
 whale oil
organic halogen compounds:
 acid halide
 aldrin
 benzene hexachloride
 carbon tetrachloride
 chloral hydrate
 chlordane
 chlorobenzene
 chloroform
 chlorotrifluoroethylene
 cyanogen halide
 DDT
 dichlorobenzene
 ethyl chloride
 ethylene bromide
 ethylene chloride
 Freon
 halocarbon
 halon
 iodoform
 methyl bromide
 methyl chloride
 methylene chloride
 phosgene
 polychlorinated biphenyl
 tear gas
 tetrachloroethane
 tetrachloroethylene
 tetrafluoroethylene
 toxaphene
 trichloroethane
 trichloroethylene
 vinyl chloride
 vinylidene chloride
organic nitrogen, sulfur, or phosphorus compounds:
 amide
 amine
 aniline
 azo compound
 benzidine
 biotin
 choline
 diazonium salt
 dimethoate
 ethanolamine
 isocyanide
 nitrile
 nitro compound
 nitrobenzene
 nitroglycerin
 nitroso compound
 oxime
 parathion
 PETN
 phorate
 picric acid
 polysulfide
 sulfide
 sulfonamide
 sulfonic acid
 sulfoxide
 thiol
 thiourea
 urea
 xanthate
organometallic compounds:
 carborene
 ferrocene
 Grignard reagent
 metal carbonyl
 tetraethyl lead
peroxy compounds:
 hydrogen peroxide
 peroxide
 peroxy acid
petroleum, gasoline, oil, and coal:
 gasoline
 kerosene
 microcrystalline wax
 napalm
 naphtha
 paraffin wax
 petrochemical
 petroleum
polymers and resins:
 balsam
 copal
 copolymer
 dammar
 dragon's blood
 elastomer
 frankincense
 gamboge
 initiator
 latex
 Lucite
 macromolecule
 mastic
 monomer
 neoprene
 polyacrylonitrile
 polychlorotrifluoroethylene

polyester	silver nitrate	resonance,	chemical formula
polyether	soap	theory of	chemical indicator
polyolefin	<i>steroids and their</i>	valence	definite
polystyrene	<i>derivatives:</i>	van der Waals	proportions,
polysulfide	aldosterone	forces	law of
polysulfone	cholesterol	<i>water:</i>	excitation
polytetrafluoro-	corticoid	anomalous water	functional group
ethylene	cortisol	deliquescence	homologous series
polyurethane	cortisone	efflorescence	ion-exchange resin
polyvinyl alcohol	ergosterol	hard water	ketene
polyvinyl chloride	sapogenin	heavy water	lecithin
resin	saponin	hydrate	litmus
rubber	steroid	ice	molecular sieve
silicone	steroid hormone	steam	molecule
turpentine	testosterone	water	multiple
urea-formaldehyde	<i>theory of chemical</i>	<i>other:</i>	proportions,
resin	<i>bonding:</i>	alicyclic compound	law of
vinyl compound	chemical	alkali	nonstoichiometric
<i>salts:</i>	association	anhydride	compound
alum	chemical bonding	base	phenolphthalein
ammonium	covalent bond	carbanion	phosphine
chloride	electronegativity	carbene	quinone
ammonium nitrate	ion	carbon disulfide	radical
lithium carbonate	ion pair	carbonate	
Rochelle salt	ionic bond	carbonium ion	
saltpetre	metallic bond	carbonyl group	
silane	orbital	chemical	
		compound	

Biographies

See Section 10/32 of Part Ten

INDEX: See entries under all of the terms above

Section 123. Chemical Reactions

A. General considerations of chemical reactions

1. Basic concepts involved in the study of chemical reactions: transformation, conservation of mass and energy, law of simple multiple proportions in compounds
2. Growth of major theories concerning chemical reactions
3. Classification and nomenclature of the principal kinds of chemical reactions
 - a. According to the relationship involved between the starting materials and the final products
 - i. Decomposition reactions
 - ii. Polymerization reactions
 - iii. Chain reactions
 - iv. Substitution reactions
 - v. Addition and elimination reactions
 - vi. Oxidation-reduction reactions
[see F., below]
 - vii. Acid-base reactions
[see E., below]
 - b. According to the energy changes involved
[see B.1., below]
 - c. According to the reaction rates or chemical kinetics involved
[see also C., below]
 - d. According to the reaction mechanism involved
[see D.4., below]

B. Energy changes in chemical reactions

1. The classification of chemical reactions according to energy changes involved: exothermic and endothermic
2. The significance of activation energy in chemical reactions
3. Thermodynamic relations in chemical reactions: chemical equilibrium, free energy and entropy changes

C. Rates of chemical reactions

1. Factors that affect the rate or direction of chemical reactions
 - a. Solvents
 - b. Temperature
 - c. Pressure
 - d. Catalysts
 - e. Collisions
 - f. Light
 - g. Isotopic substitution
 - h. Molecular structure
2. Factors that affect the kinetic order of chemical reactions: concentration of reactants, mechanism of reaction, conditions of the reaction
3. Factors that affect the extent of chemical reactions: equilibrium constant
4. Complex reactions: reactions governed by more than one reaction rate
5. Experimental methods for studying chemical kinetics
 - a. Measurement of reaction rates
 - b. Determination of the order of reactions
 - c. Relaxation methods
6. Kinetic studies as a means of elucidating reaction mechanisms

D. Mechanisms of chemical reactions

1. Factors influencing the course of a reaction: reactants, transition state, solvent, catalysts, products, reaction conditions
2. Energy changes through single-stage and multi-stage processes
3. Factors that reveal the mechanisms of a reaction: chemical and stereochemical nature of the reactants, intermediates, and products; kinetics of the reaction
4. Classification of reaction mechanisms based on the nature of electron pairing in the transition state, on the nature of the attacking species, on the nature of catalysis, on the number of components of the transition state
5. Mechanisms of the principal types of reactions: nucleophilic and electrophilic substitution, addition and elimination reactions

E. Acid–base reactions and equilibria

1. General properties of acids and bases
2. Theoretical approaches to acid–base concepts
 - a. The definition of an acid as a substance that gives rise to hydrogen ions and of a base as a substance that gives rise to hydroxyl ions in aqueous solutions
 - b. The Brønsted–Lowry concept defining an acid as a proton donor and a base as a proton acceptor
 - c. The Lewis electronic theory defining an acid as an electron acceptor and a base as an electron donor
3. Acid–base reactions
 - a. Proton-transfer reactions
 - b. Lewis acid reactions
 - c. Acid–base catalysis

4. Quantitative aspects of acid–base equilibria
 - a. Equilibria in aqueous solutions
 - b. Equilibria in nonaqueous solvents
 - c. Equilibria involving Lewis acids
 - d. The effect of molecular structure on acid–base equilibria
 5. The experimental study of acid–base reactions and equilibria
- F. Oxidation–reduction reactions
1. Major classes of oxidation–reduction reactions: oxygen atom transfer, hydrogen atom transfer, electron transfer
 2. Definitions of oxidation and reduction based on the reaction's stoichiometry
 3. Theoretical aspects of oxidation–reduction processes
 - a. The concept of oxidation state
 - b. Half reactions and the determination of redox potentials
 - c. Oxidation–reduction equilibria and reaction rates
 - d. Mechanisms of redox reactions
 4. Electrochemical reactions: chemical changes associated with the passage of an electrical current
 - a. The electrochemical process: types of reactions
 - b. Complex electrochemical reactions
 - c. The Nernst and Butler–Volmer equations
 5. Oxidation–reduction reactions in biological systems
 6. Oxidation–reduction reactions in combustion and flames
- G. Photochemical reactions
1. The photochemical process
 2. Experimental methods used in the study of the photochemical process and photochemical reactions
 3. The application of photochemical processes
- H. Chemical reactions and chemical theory in the synthesis of chemical compounds
1. Factors that affect the choice of a specific synthetic path
 2. Factors that affect the choice of reaction conditions
 3. The separation and purification of reaction products
[see 122.B.1.]
 4. The identification, characterization, and analysis of reaction products
[see 122.B.2. through 9.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with chemical reactions

Chemical Reactions
Physical Sciences, The

MICROPAEDIA: Selected entries of reference information

General subjects

<i>acid–base reactions and equilibria:</i>	Lewis theory	<i>electrochemistry:</i>	electromotive series
acid–base reaction	pH	anodizing	Faraday's laws of electrolysis
Brønsted–Lowry theory	<i>catalysis of reactions:</i>	electrical double layer	<i>kinetics and mechanism:</i>
buffer	acid–base catalysis	electrochemical reaction	activation energy
hydrogen ion	catalysis	electrochemistry	Arrhenius equation
hydroxide	catalyst	electrolysis	chain reaction
	catalyst poison	electrolytic cell	
	Ziegler–Natta catalyst		

chemical equilibrium	<i>oxidation and reduction:</i>	<i>preparative procedures:</i>	<i>others:</i>
chemical intermediate	antioxidant	alkylation	chemical reaction
collision theory	combustion	asymmetric synthesis	equivalent weight
initiator	oxidation-reduction reaction	chemical synthesis	Hess's law of heat summation
inversion	spontaneous combustion	condensation reaction	heterogeneous reaction
isotopic fractionation	<i>photochemistry:</i>	hydrogenation	homogeneous reaction
Markovnikov rule	actinometer	hydrolysis	reaction, heat of
mass action, law of	photochemical equivalence law	ion-exchange reaction	
microscopic reversibility, principle of	photochemical reaction	isomerization	
reaction rate	photolysis	polymerization	
relaxation phenomenon	photosensitization	sulfation	
transition-state theory			

Biographies

See Section 10/32 of Part Ten

INDEX: See entries under all of the terms above

Section 124. Heat, Thermodynamics, and the Nonsolid States of Matter

A. The principles of thermodynamics

1. The description of physical phenomena based on the concepts of system, state of a system, and changes of state
2. The first law of thermodynamics
3. The second law of thermodynamics
4. Stable equilibrium
 - a. Equations relating properties of systems that are in, or are passing through, stable equilibrium states
 - b. Temperature considered as the potential governing the flow of energy between systems
 - c. Heat
 - i. The definition of heat as a form of energy transferred from one body to another under the influence of a difference in temperature
 - ii. Theories of heat: the phlogiston theory, the caloric theory, the kinetic molecular theory
 - iii. Heat transfer in matter: heat conductivity in solids, convection in liquids and gases, heat transfer in boiling liquids, evaporation and condensation
 - iv. Technical applications of heat energy
[see 721.B.7. and 725.A.5.a.]
 - v. Heat and its relation to entropy, work, and change of energy
5. Thermodynamic relations in simple systems
 - a. The Carnot cycle
 - b. Maxwell's equations relating entropy to pressure, volume, and temperature for closed systems that assume only stable equilibrium states
 - c. Phase changes and equilibria
 - d. Simple one-component systems: processes at constant volume and at constant pressure; the equation of state, which relates pressure, volume, and temperature for stable equilibrium states
 - e. Simple multicomponent systems: the Maxwell relations, Dalton's law for mixture of gases, Raoult's law and Henry's law for ideal solutions

- f. Bulk flow
 - g. Equilibrium in chemical reactions
[see 123.B.3.]
 - 6. The third law of thermodynamics
 - 7. The effects of applied force fields on simple systems
 - 8. Steady rate processes; *e.g.*, systems approaching stable equilibrium, flow of a substance through a barrier
 - 9. Statistical thermodynamics
 - a. The laws of thermodynamics that consider the detailed microscopic structure of physical systems and the states of such systems
 - b. Statistics of grand systems
- B. The gaseous state of matter
 - 1. The nature and properties of a gas
 - 2. The thermodynamic approach to gases: the macroscopic view that deals with bulk measurable properties
 - a. The simple gas laws
 - b. The thermal equation of state for perfect gases
 - c. Empirical equations of state for real gases
 - 3. The particle-description approach to gases
 - a. The distribution function
 - b. The Boltzmann transport equation and the single-particle distribution function
 - c. The N-particle distribution function and the thermodynamic-equilibrium properties and transport properties of dense gases
 - d. The behaviour of a gas at the hydrodynamic and thermal relaxation stages
- C. The liquid state of matter
 - 1. The behaviour and properties of liquids at equilibrium
 - 2. The molecular structure of liquids based on distribution functions, which measure the probable distribution of some property of molecules through the liquid
 - 3. Properties of liquids
 - a. Transport properties
 - b. Acoustic properties: propagation of sound waves
 - c. Electrical and magnetic properties
 - d. Thermodynamic properties
 - e. Optical properties
 - f. Surface tension
- D. Solutions and solubility
 - 1. General classes of solutions: electrolytes and nonelectrolytes, solutions of weak electrolytes, endothermic and exothermic solutions
 - 2. Properties of solutions
 - a. Composition ratios: molarity, molality, mole fraction
 - b. Equilibrium properties: correlation of the vapour pressure of a solution to its composition
 - c. Colligative properties: rise in boiling point, decrease in freezing point, osmotic pressure
 - d. Transport properties: viscosity, thermal conductivity, diffusivity
 - 3. Thermodynamic and molecular aspects of solvent and solute interactions
 - a. Energy considerations: entropy, enthalpy, Gibbs free energy
 - b. Effects of molecular structure and weak intermolecular forces
 - c. Effects of chemical interactions; *e.g.*, hydrogen bonding, chemical combinations
 - 4. General theories of solution: the prediction of solubility and solution properties

- a. Solutions of nonelectrolytes: Raoult's law and Henry's law for ideal solutions; theoretical expressions for the excess properties of regular athermal, associated, and solvated solutions
 - b. Solutions of electrolytes: Debye–Hückel theory and modifications, Arrhenius dissociation theory
5. Effects of temperature and pressure on the solubility of solids and gases
- E. Physical effects at surfaces
1. Surface tension and surface energy: cohesion and adhesion
 2. Adsorption on liquid and solid surfaces
 3. Tribological phenomena, the mechanical and physical effects at interfaces: friction, wear, lubrication
 4. Colloids: the kinds of dispersions and their properties and preparation
 - a. Irreversible colloidal systems: lyophobic sols, emulsions, foams, pastes, gels
 - b. Reversible colloidal systems: solutions of polymers and proteins, solutions of soaps and dyes
- F. The plasma state of matter: completely ionized gases interacting with magnetic and electric fields
1. Basic plasma properties and parameters: electrical quasineutrality, electron density, kinetic temperature, particle velocities, magnetic and electric field strengths
 2. Elastic and inelastic collisions of plasma particles
 3. Radiation from plasmas; *e.g.*, X rays, synchrotron radiation, excitation radiation
 4. The formation of plasmas
 5. The behaviour of plasmas in magnetic and electric fields
 6. The determination of plasma variables
 7. Fluidlike behaviour in plasmas
 8. Applications of plasmas; *e.g.*, power production, jet propulsion
[see 112.G.4., 721.B.8.a., and 721.C.3.]
 9. The existence of plasmas in nature: in the extraterrestrial medium, in the Sun and stars, on Earth
- G. The properties of matter at extreme conditions
1. Properties of matter at low temperatures
 - a. Effects of low temperature on entropy, heat capacity, magnetic properties, and conductivity
 - b. Special physical phenomena at very low temperatures: superconductivity, superfluidity
 - c. Special methods for obtaining and characterizing low temperatures: adiabatic cooling, adiabatic dilution
 2. Special properties of matter at high temperatures
 3. Effects of high pressure on the physical, chemical, electronic, and magnetic properties of matter
- H. Transport phenomena
1. The kinetic molecular theory of the transport properties of gases, liquids, suspensions, and polymers
 2. Phenomenological expressions of transport
 3. Hydrodynamic aspects of transport phenomena
 4. Transport phenomena in macrosystems

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with heat, thermodynamics, and the nonsolid states of matter

Matter: Its Properties, States, Varieties, and Behaviour
Physical Sciences, The
Thermodynamics, Principles of

MICROPAEDIA: Selected entries of reference information

General subjects

<i>colloids:</i>	caloric theory	phase rule	heat capacity
aerosol	convection	thermal fusion	internal energy
colloid	heat transfer	vaporization	Lagrangian
dialysis	thermal	<i>solutions and</i>	function
emulsion	conduction	<i>solubility:</i>	Maxwell's demon
foam	<i>liquid state of matter:</i>	amalgam	Rankine cycle
gel	capillarity	Arrhenius theory	reversibility
<i>gaseous state of</i>	detergent	exsolution	specific heat
<i>matter:</i>	diffusion	Henry's law	temperature
Avogadro's law	fluid	ideal solution	thermodynamics
Boyle's law	glass	saturation	<i>other:</i>
Dalton's law	liquid	solid solution	adsorption
degenerate gas	osmosis	solution	cohesion
diffusion	superfluidity	<i>thermodynamics</i>	friction
fluid	surface-active	<i>and statistical</i>	liquid crystal
gas	agent	<i>mechanics:</i>	plasma
kinetic theory of	surface tension	absolute zero	Stefan-
gases	<i>phase changes and</i>	canonical	Boltzmann law
Maxwell-	<i>equilibria:</i>	ensemble	thermal expansion
Boltzmann	boiling point	carnot cycle	transport
distribution law	condensation	energy,	phenomenon
mean free path	critical point	equipartition of	tribology
perfect gas	distillation	enthalpy	wear
van der Waals	eutectic	entropy	
forces	freezing point	free energy	
<i>heat transfer in</i>	latent heat	freedom, degree of	
<i>matter:</i>	melting point	Hamiltonian	
adiabatic	phase	function	
demagnetization	phase diagram	heat	

Biographies

See Section 10/32 of Part Ten

INDEX: See entries under all of the terms above

Section 125. The Solid State of Matter**A. Crystals and crystallography**

1. Patterns of atoms in crystals
 - a. The three-dimensional periodic arrangement of atoms in crystals: crystal planes and their notation
 - b. Symmetry considerations in the classification of crystal systems
2. Diffraction of X rays, electrons, and neutrons by crystal structures
3. Processes of crystal growth
 - a. Theoretical aspects of crystal growth: energy considerations, growth of eutectics, constitutional supercooling, nucleation
 - b. Preparation of crystals: monocomponent and polycomponent crystal growth
4. Imperfections and dislocations in crystalline materials and their effects on the properties of the crystals
5. Effects of temperature, pressure, and alloying on the strength and hardness of crystals

B. The theory of the crystalline solid state

1. The classification of solids according to their electronic structure and bonding: ionic solids, covalent solids, metallic solids, molecular solids, hydrogen-bonded solids

2. The arrangement of atoms in crystalline solids
[see A.1.a., above]
 3. The elastic and plastic properties of solids
 4. The thermal and thermodynamic properties of solids: specific heat, thermal conductivity
 5. The electronic structure of solids
 - a. The nature and mobility of electrons in conductors, insulators, and semiconductors
 - b. Electron emission: thermionic emission, photoelectric emission, field emission
 - c. The nearly free electron approximation
 - d. The energy-band theory of the solid state
 6. The principal types of magnetic behaviour exhibited by solids: paramagnetism, diamagnetism, ferromagnetism
 7. The interaction of light with solids
 - a. The behaviour of solids illuminated with radiation: reflection, absorption, or transmission of photons
 - b. The generation of electromagnetic radiation from the energy supplied to the solid
 - c. The photoelectric effect
- C. Ionic crystals
1. Bonding in ionic crystals
 2. The structure of ionic crystals
 - a. Perfect ionic crystals
 - b. Defects in ionic crystals: Frenkel defect, Schottky defect, colour centres
 3. Properties of ionic crystals
 - a. Vibrational and electronic properties
 - b. Thermal properties
 - c. Polarizing and diffusion properties and the nature of ionic conduction
 - d. Optical properties
- D. Metals
1. Structural aspects of metals and alloys
 2. Elementary description of metals: the use of the free electron model to explain thermal and electrical conductivity of metals
 3. The electronic structure of metals and related effects
 - a. The interaction between the periodic lattice and the conduction electrons: the weak pseudopotential
 - b. Electron motion in a magnetic field and conduction-related effects
 4. Band structure and properties of metal groups: alkali metals, semimetals, noble metals, transition metals
 5. Lattice vibrations: interaction between ions; interaction between electrons, phonons, and dispersion
 6. Metal surface phenomena: thermionic and field emission of electrons, electron tunnelling, photoemission, free carrier absorption and interband transitions
 7. Many-body effects: plasma oscillations, spin waves, Fermi liquid theory, dynamic effects and shake-off electrons
 8. Superconductivity in metals
 - a. Thermal properties of superconductors: transition temperature, specific heat and thermal conductivity, energy gaps
 - b. Magnetic and electromagnetic properties of superconductors: critical field, Meissner effect, phase coherence effects
 9. Magnetic phenomena in metals: diamagnetism, paramagnetism, ferromagnetism, antiferromagnetism, nuclear magnetic resonance

E. Semiconductors and insulators

1. General properties of semiconductors and insulators
2. Mechanisms of conduction: mobility of charged particles and electrons in solids
3. Electrical conduction in semiconductors
 - a. Chemical approach: impurity conduction, hopping process
 - b. Physical approach: energy band and gaps, lattice vibrations, statistical properties
 - c. Extrinsic and intrinsic semiconductors
 - d. Measurement of conductivity and of energy gaps
4. Principles involved in semiconductor applications
 - a. Optical effects: photoelectric effect, photovoltaic effect, luminescence
 - b. Electrical and related effects: hot electron effects, thermoelectric effects
 - c. Junction effects
 - d. Pressure and stress effects

F. The glassy or amorphous state of matter

1. Effects of temperature and composition on glass properties
2. The structure of glass
3. General properties of glasses: mechanical, chemical, optical, and electrical properties

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the solid state of matter

Matter: Its Properties, States, Varieties, and Behaviour
Minerals and Rocks

MICROPAEDIA: Selected entries of reference information

General subjects

<i>crystal systems:</i>	polycrystal	photovoltaic effect	Bragg law
hexagonal system	single crystal	semiconductor	electronic work
isometric system	<i>electric currents and</i>	superconductivity	function
monoclinic system	<i>related effects:</i>	<i>structural features of</i>	exciton
orthorhombic	avalanche effect	<i>crystals:</i>	Fermi level
system	band theory	axis	Fermi surface
point group	BCS theory	Bravais lattice	free-electron model
space group	dopant	colour centre	of metals
tetragonal system	Gunn effect	Miller indices	Laue diffraction
triclinic system	Hall effect	polymorphism	pattern
trigonal system	hole	slip	liquid crystal
<i>crystals:</i>	insulator	Steno's law	magnon
crystal	Josephson effect	symmetry	metal
crystalline rock	Meissner effect	trap	metallography
crystallite	minority carrier	twinning	phonon
epitaxy	injection	vacancy	polaron
nuclation	mobility	<i>other:</i>	quasicrystal
optical	photoconductivity	allotropy	reststrahlen
crystallography	photoelectric effect	anisotropy	

Biographies

See Section 10/32 of Part Ten

INDEX: See entries under all of the terms above

Section 126. Mechanics of Particles, Rigid Bodies, and Deformable Bodies: Elasticity, Vibrations, and Flow

- A. The principles of classical mechanics
 - 1. The fundamental parameters and concepts of classical mechanics: matter, space, motion, time
 - 2. Statics, the equilibrium of systems at rest: force, friction
 - 3. Dynamics: motion of systems
 - a. Kinematics: motion of particles and rigid bodies without consideration of the forces producing the motion
 - i. Velocity and acceleration
 - ii. Rotation about a fixed axis
 - iii. Motion in a circular path
 - iv. Simple harmonic motion
 - v. Relative motion
 - b. Kinetics: motion of bodies under the action of forces upon them
 - i. Newton's laws of motion: the law of inertia, the law of force, the law of action and reaction
 - ii. Motion under a constant force
 - iii. Ballistics: phenomena and laws of projectiles and their propulsion, flight, and impact
 - iv. The motion of the pendulum
 - v. Newton's law of universal gravitation
 - vi. Kepler's laws of planetary motion
 - c. Impulse and momentum
 - d. Work and power
 - e. Energy
 - i. The concepts of energy and energy conservation
 - ii. Forms of energy and examples of energy transformations associated with each energy form
 - iii. The equivalence of mass and energy
 - f. The conservation of momentum
 - 4. Mechanics of nonrigid bodies
 - a. The collision of bodies or particles: centre of mass system, elastic collisions, inelastic collisions
 - b. Stiffness in mechanical vibrations
 - 5. Motion in a rotating frame of reference: inertia forces and Coriolis forces
 - 6. Mechanics of complex systems
 - a. The principle of virtual work
 - b. The rotation of spinning tops and gyroscopes
 - c. The precession and nutation of rotating bodies
 - d. Lagrange's and Hamilton's equations of motion
- B. Celestial mechanics
 - 1. The scope and history of celestial mechanics
 - 2. The two-body problem and perturbations that cause the orbits of planets and satellites to deviate from ellipses
 - 3. The three-body problem
 - 4. The general n -body problem

- C. Relativistic mechanics in inertial systems of reference
 - 1. Mechanical foundations of special relativity
 - 2. Relativistic kinematics
 - 3. The relationship between gravitational mass and inertial mass
- D. The stress dynamics of elastic materials
 - 1. The phenomenon of elasticity: stress-strain relationships
 - 2. Elasticity in viscous and crystalline bodies
 - 3. Elastic constants
 - 4. The theory of elasticity: mathematical expressions defining elastic properties
- E. Vibrations of elastic bodies
 - 1. The nature of vibrations: natural or free vibrations, damped and forced vibrations
 - 2. Vibrators and their sources of energy
 - 3. Types of vibrational waves: their properties and modes of propagation
 - 4. The behaviour of materials undergoing vibration
 - 5. Detection and utilization of vibrations
[see 723.F.6. and 735.K.2.]
- F. Fluid mechanics, including gas dynamics
 - 1. General properties of fluids, ideal and actual: mechanical and thermodynamic properties
 - 2. Fluid statics and equilibrium
 - a. The basic equation of fluid statics
 - b. Fluid forces on plane and curved surfaces: analysis of forces, buoyancy, stability of floating and submerged bodies
 - 3. Fluids in motion: hydrodynamics and aerodynamics
 - a. Frictionless one-dimensional fluid flow
 - b. Flow in pipes and channels: laminar flow, turbulent flow, special types of flow
 - c. General two- and three-dimensional flow: mathematical conditions, vorticity, boundary layers, drag
 - d. Compressible fluid flow: isentropic flow, shock waves
- G. Rheological phenomena: deformation and flow
 - 1. Continuum mechanics
 - a. Kinematics of deformation and flow: strain, shear, compression, elongation
 - b. Dynamics: balance of forces and torques
 - 2. Constitutive equations: stress-deformation relations in different media
 - 3. Yield strength of materials: fracture and fatigue
 - 4. The application of molecular theories to explain rheological phenomena

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the mechanics of particles, rigid bodies, and deformable bodies: elasticity, vibrations, and flow

Energy Conversion

Matter: Its Properties, States, Varieties, and Behaviour

Mechanics: Energy, Forces, and Their Effects

MICROPAEDIA: Selected entries of reference information

General subjects

<i>deformation and elasticity:</i>	deformation and flow	Hooke's law	slip
bulk modulus	elasticity	plasticity	strain
		shear modulus	stress

tensile strength	statics	laminar flow	periodic motion
yield point	velocity	Mach number	reduced mass
Young's modulus	<i>energy</i> :	Magnus effect	resonance
<i>elementary classical</i>	energy	Pascal's principle	simple harmonic
<i>mechanics</i> :	kinetic energy	Reynolds number	motion
acceleration	mechanical energy	terminal velocity	vibration
collision	potential energy	Torricelli's	<i>others</i> :
d'Alembert's	power	theorem	action
principle	work	turbulent flow	ballistics
dynamics	<i>fluid mechanics</i> :	viscosity	celestial mechanics
force	Archimedes'	<i>rotary motion</i> :	chaos
gravity, centre of	principle	angular	density
inertia	austausch	momentum	equilibrium
kinematics	coefficient	angular velocity	equivalence
kinetics	Bernoulli's	centrifugal force	principle
mass	theorem	Coriolis force	escape velocity
mechanics	boundary layer	couple	Kepler's laws of
momentum	capillarity	inertia, moment of	planetary motion
motion	cavitation	precession	pressure
motion,	convergence and	reduced mass	reference frame
equation of	divergence	torque	specific gravity
Newton's law of	eddy	uniform circular	statistical
gravitation	fluid	motion	mechanics
Newton's laws of	fluid mechanics	<i>vibrations</i> :	
motion	Froude number	damping	
position vector	hydraulics	pendulum	

Biographies

See Section 10/32 of Part Ten

INDEX: See entries under all of the terms above

Section 127. Electricity and Magnetism**A. The static electric charge**

1. General phenomena of static electricity
 - a. The basic laws of electrostatics that relate the interaction of charged bodies at rest
 - b. The electrostatic field
 - c. The electric dipole
 - d. Electrostatic energy and force
 - e. Electricity in the atmosphere
[see also 212.C., 221.A.3.b., and 223.B.2.]
2. Electrostatics of dielectrics and capacitors: polarization
3. Electrostatic potential
 - a. High-voltage phenomena
 - b. Electric fields and potential distributions in two and three dimensions
4. Measurement of electrostatic forces and fields
[see 723.D.1.e.]

B. Moving charges and electric currents

1. Direct electric current: current that flows in one direction
 - a. General phenomena of moving electric charges: definitions of electric quantities and their units
 - b. Electromotive force
 - c. Behaviour of direct currents in electric circuits: Ohm's law; Kirchhoff's laws; the principles of devices that measure or indicate the presence of current, potential difference, and resistance

2. The conduction of electricity
 - a. The motion of charged particles in an electric field
 - b. The mechanisms of the conduction of electricity: in a vacuum, in gases, in liquids and solids, in metals and semiconductors
 - c. Thermoelectric effects: phenomena in which electric energy is transformed into thermal energy or vice versa
 - d. Electron emission: thermionic emission, secondary emission, photoelectric emission
 3. Alternating electric currents: current that reverses itself with uniform frequency
 - a. Faraday's law of electromagnetic induction
 - b. The mathematical and graphical representation of alternating currents
 - c. Basic laws of alternating current circuits
 - d. The detection and measurement of alternating currents and voltages
[see 723.D.1.c.]
 - e. Parallel resonant circuits
 - f. Alternating current bridges for determining impedance
 - g. Propagation of electric waves in cables
 - h. Filters that select signals
 - i. Transient phenomena of alternating circuits
 - j. Eddy currents and skin, or surface, effects
 - k. Principles of generation and transmission of ac single- and multiphase power
 4. Primary effects and properties of electric fields and currents
 - a. Magnetic effects of steady electric currents
[see C.2., below]
 - b. Magnetic effects of changing currents
[see C.4., below]
 - c. Force, energy, and power associated with electromagnetic fields
 - d. The generation of electromagnetic radiation by the changing of currents in circuits
 5. Effects of electricity on matter
 - a. Piezoelectricity and applications of the phenomenon
 - b. Optical effects: electroluminescence, Kerr effect, Stark effect
 - c. Thermal effect: resistance heating
 - d. Chemical effects: electrolysis, electro-osmosis, electrophoresis
 - e. Bioelectric effects: effects associated with nerve, brain, and muscle action in which potential differences occur and can be influenced by applied potential
- C. Magnetism
1. General phenomena of magnetic systems
 2. Magnetic effects of steady electric currents
 - a. The magnetic field of steady currents: Ampère's law, the law of Biot and Savart
 - b. The magnetic moment of a current loop
 - c. The magnetic field of a solenoid
 3. Motion of charged particles in magnetic and electric fields
 - a. The force on a moving charge
 - b. Motion of charges in uniform flux density
 - c. Motion of charges in combined electric and magnetic fields
 - d. Magnetic dipole moments: atomic moments, nuclear moments, magnetic resonance
 4. Magnetic effects of varying currents
 - a. The laws of electromagnetic induction
 - b. Inductance and magnetic energy

5. Properties of magnetic materials
 - a. The classification of magnetic substances
 - b. Induced and permanent atomic magnetic dipoles
 - c. Magnetism of matter
 - i. Diamagnetism
 - ii. Paramagnetism
 - iii. Ferromagnetism
 - iv. Antiferromagnetism
 - v. Ferrimagnetism
 - vi. Terrestrial magnetism
[see also 212.B.]
 - d. Atomic structure and magnetism
- D. The theory of fields in physics
 1. The definition of a field in physics: the scope of field theory
 2. Mathematical treatment of fields
 3. Classification of fields: material and nonmaterial fields; scalar, vector, and tensor fields
 4. Examples of scalar, vector, and tensor fields in ordinary space
 5. Fields with distributions in more than three dimensions
- E. The electromagnetic field and the theory of electromagnetic radiation
 1. The classical theory of radiation
 - a. The development of concepts and theories concerning the nature of light
 - b. Semiquantitative treatment of electromagnetic radiation: Maxwell's equations for the electromagnetic nature of light
 - c. The electromagnetic spectrum
 2. The quantum theory of radiation
 - a. Evidences of the particle nature of electromagnetic radiation: Compton effect, photoelectric effect, Raman effect
 - b. The wave-particle duality of the photon
 - c. The interaction of electromagnetic radiation with atomic and molecular structures: absorption, emission, and scattering processes
 - d. The relation of electromagnetic radiation to quantum theory and relativity
 3. The mathematical formulation of electromagnetic theory
 - a. Maxwell's equations for electromagnetic fields and radiation
 - b. Transmission of radiation in free space
 - c. Wave equations in space bounded by conductors
 - d. Scattering of electromagnetic waves
 - e. Electromagnetic waves in material media
 - f. The functions of antennas
- F. Relativistic electrodynamics
 1. Electrodynamics in four-dimensional notation
 2. Applications of relativistic principles in the treatment of electromagnetic and nuclear force fields of relativistic particles

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with electricity and magnetism

Electricity and Magnetism
Electromagnetic Radiation

Energy Conversion

MICROPAEDIA: Selected entries of reference information

General subjects

<i>stationary electric charges and related phenomena:</i>	electricity	ether	<i>magnetism of matter:</i>
capacitance	electromotive force	infrared radiation	antiferromagnetism
Coulomb force	Faraday's law of induction	Maxwell's equations	Barkhausen effect
dielectric	inductance	Michelson–Morley experiment	Curie point
dielectric constant	Joule's law	Planck's radiation law	diamagnetism
electret	Kirchhoff's circuit rules	polarization	ferrimagnetism
electric charge	Lenz's law	Poynting vector	ferromagnetism
electric dipole	Ohm's law	radiation	hysteresis
electric displacement	Peltier effect	Raman effect	magnet
electric field	reactance	Stefan–Boltzmann law	magnetic dipole
electric polarization	resistance	thermal radiation	magnetic permeability
electric potential	resistivity	ultraviolet radiation	magnetic pole
electric susceptibility	Seebeck effect		magnetic susceptibility
electrostatic induction	Thomson effect	<i>magnetic effects of electric currents:</i>	magnetostriction
Stark effect	<i>electricity in the atmosphere:</i>	Ampère's law	paramagnetism
<i>electric currents and related phenomena:</i>	ball lightning	Biot-Savart law	<i>other:</i>
alternating current	lightning	displacement current	electrostriction
cathode ray	Saint Elmo's fire	magnetic circuit	ferroelectricity
charge carrier	<i>electromagnetic fields and the theory of electromagnetic radiation:</i>	magnetic field	Leyden jar
direct current	electromagnetic field	magnetic force	permittivity
electric current	electromagnetic radiation	magnetism	piezoelectricity
electrical impedance		magnetometer	Zeeman effect

Biographies

See Section 10/32 of Part Ten

INDEX: See entries under all of the terms above

Section 128. Waves and Wave Motion**A. General wave phenomena and the theory of wave motion**

1. General properties of waves: frequency, amplitude, wavelength, phase
2. Classification of waves
 - a. Waves classified by the medium supporting the transmission of wave motion: water waves, sound waves, electromagnetic waves
 - b. Waves classified by the motion of particles in a wave: transverse, longitudinal, torsional, and cylindrical waves
 - c. Other classifications: bow waves and shock waves
3. The theory of waves
 - a. General characteristics of vibratory motion: periodicity, group velocity, energy content
 - b. The velocity of waves
 - c. The wave equation: the space–time description of wave motion
 - d. Transport of energy and momentum
4. The principle of superposition of waves
 - a. Standing waves: waves with stationary nodes

- b. Modulation of waves
 - c. Pulse and wave trains
 5. The behaviour of waves at boundaries or interfaces: reflection, transmission, refraction
 6. The diffraction and interference of waves
 7. The interaction of waves with matter: absorption, dispersion
- B. Electromagnetic waves
1. Properties and behaviour of electromagnetic waves
 2. Waves of the electromagnetic spectrum and their properties
 - a. Radio waves
 - b. Microwaves
 - c. Infrared radiation
 - d. Visible light
[see C., below]
 - e. Ultraviolet waves
 - f. X rays
[see III.D.]
 - g. Gamma rays
 3. Sources of incoherent electromagnetic waves
 - a. Sources of radio waves: oscillators, antennas, cosmic objects
 - b. Sources of microwaves: klystrons, magnetrons, Gunn diodes, tunnel diodes, cosmic sources
 - c. Sources of infrared, visible, and ultraviolet waves
 - i. Blackbody radiation
 - ii. Luminescence, fluorescence, phosphorescence
 - iii. The passage of electrical current through a resisting medium
 - d. Sources of X rays: X-ray tubes (bremsstrahlung), synchrotron radiation
 - e. Sources of gamma rays: radioactive nuclei
 4. Sources of coherent electromagnetic waves: lasers and masers
 5. The transmission of electromagnetic waves: through matter, through space, by wave guides and transmission lines
- C. Light waves
1. Light as a wave motion: the wave theory of light
 - a. The properties of light consistent with the wave theory: diffraction, interference, polarization, dispersion
 - b. The spectrum of light: the description of colour in terms of wavelengths
 2. The velocity of light and its measurement
 3. Interference of light
 4. Diffraction phenomena
 5. Polarization
 - a. Superposition of polarized beams: plane, circularly, or elliptically polarized light
 - b. Double refraction: waves in anisotropic media
 - c. Characterization of polarized light by Stokes's parameters and Poincaré sphere
 6. Properties and behaviour of light waves based on Maxwell's equations of electromagnetic theory
 7. The interaction of light with matter
 - a. Reflection and refraction

- b. Dispersion and scattering
- c. Absorption: mechanical and chemical effects of light
- 8. The quantum theory of light: the photon
 - a. Observed photon phenomena: photoelectric effect, Compton scattering, Rayleigh scattering
 - b. The uncertainty principle in relation to the study of the phenomena of light
 - c. The detection and counting of photons
- 9. The separation of light into its constituent wavelengths, the analysis of light spectra
- 10. Sources of light
- 11. The biological effects of light, including photosynthesis
[see 322.A. and 335.B.]
- D. The focusing and imaging of light waves
 - 1. Geometrical optics: the geometry of light rays and their image-forming properties through optical systems
 - a. Theoretical considerations: law of reflection, law of refraction, Lagrange theorem, Gauss theory of lenses
 - b. Optical systems: components, applications, lens aberrations, brightness of image formed
 - 2. Optics and information theory
 - a. Optical data processing
 - b. Holography: a two-step image-forming process using coherent light
- E. Sound waves
 - 1. The nature and properties of sound waves
 - 2. Shock waves and their characteristics
 - 3. Sources of sound waves
 - 4. The reception of sound
 - 5. Applications of acoustics
 - a. Recording and reproduction
[see 735.F.]
 - b. Architectural and acoustical design
[see 733.A.8.]
 - c. Speech and music
[see 514.D.1. and 624.B.]
 - d. Military acoustical detectors
[see 735.J.2.]
 - e. Noise control
[see 733.A.8.]
 - 6. Physical aspects of musical sound
 - a. The special properties of musical sound: pitch, timbre, loudness; fundamentals and overtones
 - b. The production of sound waves by musical instruments

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with waves and wave motion

Colour	Optics, Principles of
Electromagnetic Radiation	Sound
Light	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>behaviour and</i>	amplitude	diffraction	double refraction
<i>properties of waves:</i>	beat	dispersion	Faraday effect
absorption	Brewster's law	Doppler effect	Fermat's principle

frequency	infrared radiation	lens	whistler
Huygens' principle	light	light modulator	white noise
interference	luminescence	magnification	<i>other:</i>
longitudinal wave	phosphor	mirror	aureole
moiré pattern	phosphorescence	optical image	Cellini's halo
Newton's rings	radiation	optics	halo
phase	rainbow	periscope	Michelson–Morley
Rayleigh scattering	spectrum	prism	experiment
reflection	thermoluminescence	projection screen	mirage
refraction	ultraviolet	projector	Mössbauer effect
Snell's law	radiation	pupil	Munsell colour
standing wave	X ray	relative aperture	system
transverse wave	<i>lasers and masers:</i>	spectroscopy	photoelasticity
wave front	laser	stereoscopy	pleochroism
wave motion	maser	<i>sound waves:</i>	Poynting vector
wave number	optical pumping	combination tone	Stokes lines
wave velocity	stimulated	loudness	wave-particle
wavelength	emission	overtone	duality
Young's	<i>manipulation of light</i>	pitch	
experiment	<i>waves:</i>	resonance	
<i>electromagnetic</i>	aberration	resonator	
<i>waves:</i>	aperture	shock wave	
chemiluminescence	collimator	siren	
colour	critical angle	sound	
electroluminescence	diffraction grating	sound barrier	
electromagnetic	diopter	sound intensity	
radiation	fibre optics	timbre	
ether	Fresnel lens	tone	
gamma ray	holography		

Biographies

See Section 10/32 of Part Ten

INDEX: See entries under all of the terms above

Division III. The Universe: Galaxies, Stars, the Solar System

[For Part One headnote see page 21.]

The outlines in the three sections of Division III deal with the subject matter of cosmology and cosmogony, of astronomy, and of astrophysics.

Accounts of the complex instrumentation involved in these disciplines are set forth in Section 723 of Part Seven. Historical and analytical studies of the nature and scope of astronomy and astrophysics are set forth in Section 10/32 of Part Ten.

- Section 131. The Cosmos 51
 132. Galaxies and Stars 53
 133. The Solar System 56

Section 131. The Cosmos

A. The structure and properties of the universe

1. Basic data for the universe
 - a. The estimated chemical composition of the universe
[see also 121.D.]
 - b. The large-scale structure and behaviour of the universe: evidence that the universe is expanding, Hubble's law and the theory of the red shift
 - c. The age of the universe
 - d. The clustering of galaxies
 - e. *Cosmic microwave background radiation*

- f. The missing mass problem
 - g. Space–time: a four-dimensional continuum used to describe the universe
- 2. Cosmological models: theoretical representations of the original behaviour of the universe [see E.1., below]
- 3. The known and postulated components of the universe
 - a. Distant galaxies [see 132.A.]
 - b. The Local Group of galaxies [see 132.A.1.c.]
 - c. Quasars and related objects, including such hypothetical phenomena as supermassive black holes at the centres of galaxies
 - d. Nebulae
 - e. Stars and stellar groups [see 132.C. and 132.D.]
 - f. Planetary systems: solar and extrasolar systems [see also 133.A.]
- B. Gravitation: a universal force of mutual attraction that is postulated as acting between all matter
 - 1. Development of gravitational theory
 - a. Early concepts: the Aristotelian viewpoint, contributions of Kepler and Galileo
 - b. Newton’s law of gravity [see also 126.A.3.b.v.]
 - 2. Interpretation of gravity measurements
 - a. Potential theory: mathematical representation of the gravitational fields of irregular mass distributions [see also 10/22.D.2.c.]
 - b. Effects of local mass differences: measurement of small gravity anomalies
 - 3. Modern gravitational theory and its relation to other aspects of physical theory
 - a. Field theories of gravity and their general properties and predictions
 - b. Gravitational fields and the general theory of relativity: principles and consequences [see D.2., below]
 - 4. Acceleration of gravity on the Earth’s surface [see 212.A.]
 - 5. The gravitational constant, G : methods of measurement, possible variation in time and space
- C. Celestial mechanics [see 126.B.]
- D. Properties of the space–time continuum: the astronomical implications of relativity theory
 - 1. The special theory of relativity
 - a. Historical background: the search for the ether
 - b. Relativity of space and time
 - c. Consequences of the special theory
 - 2. The general theory of relativity
 - a. Use of relativity to interpret gravitational phenomena
 - b. Experimental confirmation of the theory
 - c. Implications of general relativity
- E. The origin and development of the universe
 - 1. The development of the universe as a whole
 - a. Big-bang versus steady-state models of the universe

- b. Primordial nucleosynthesis
- c. The early universe: extrapolations backward in time to the beginning of the universe
2. The formation and development of components of the universe: galaxies, stars, the solar system [see also 132.B., 132.D., and 133.A.]
 - a. The origin and development of galaxies: protogalaxies
 - b. The formation and development of stars
 - c. The origin of the solar system
3. Time scale of the universe: dating of significant events in the history of the universe
4. Theories of the possible fate of the universe

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the cosmos

Analysis and Measurement, Physical and Chemical
Cosmos, The
Gravitation
Physical Sciences, The
Relativity

MICROPAEDIA: Selected entries of reference information

General subjects

<i>cosmology</i> :	<i>element synthesis</i> :	free-fall	Lorentz-
big-bang model	carbon cycle	gravitation	FitzGerald
cosmology	nucleosynthesis	gravitational radius	contraction
cosmos	proton-proton	Newton's law of	relativistic mass
expanding universe	cycle	gravitation	relativity
Great Attractor	<i>extraterrestrial life</i> :	weight	time dilation
Hubble's constant	Green Bank	weightlessness	<i>other</i> :
Mach's principle	equation	<i>relativity</i> :	cosmic ray
Olbers' paradox	Ozma, Project	Einstein's mass-	ephemeris
quasar	<i>gravitation</i> :	energy relation	Scorpius X-1
steady-state	Cavendish	equivalence	supernova
theory	experiment	principle	

Biographies

See Section 10/32 of Part Ten

INDEX: See entries under all of the terms above

Section 132. Galaxies and Stars

A. Galaxies in general

1. Statistical properties
 - a. Classification of galaxies
 - b. Observational methods of determining the distances to galaxies
 - c. Distribution of galaxies
2. Physical properties: size, mass, luminosity, age, composition
3. Structural features
4. Clusters of galaxies
 - a. Types and distribution
 - b. Interactions between cluster members

5. Extragalactic radio and X-ray sources
 - a. Radio galaxies
 - b. X-ray galaxies
 - c. Quasars
 6. The origin and evolution of the galaxies
[see also 131.E.2.]
- B. The Galaxy: the Milky Way system
1. Distance determinations in the Galaxy
 2. Stellar velocities: the motions of stars with respect to the Sun, the motion of the Sun with respect to the Local Standard of Rest (LSR)
 3. The stars and star clusters nearest the Sun
 4. The classification of stars according to the Hertzsprung–Russell diagram
 5. The galactic composition
 - a. The stellar populations
 - b. Emission nebulae: composition and physical characteristics of H II regions
 - c. Planetary nebulae
 - d. Supernova remnants
 - e. Dust clouds
 - f. The general interstellar medium: principal components and their distribution throughout the various galactic regions
 - i. Grains of interstellar dust
 - ii. Interstellar clouds of neutral hydrogen (H I regions)
 - iii. Interstellar molecules and radicals
 - g. Primary cosmic rays
 - h. Interstellar magnetic fields
 6. Structure and dynamics of the Galaxy
 - a. The spatial structure of the Galaxy: the dimensions of the Galaxy
 - b. Regions of the Galaxy: the nucleus, the central bulge, the disk, the spiral arms, the spherical component, the massive halo
 - c. The magnetic field of the Galaxy: its origin and its effects on cosmic rays, radio waves, and light
 - d. The rotation of the Galaxy: the differential rotation of stars, gas about the galactic centre
 7. The evolution of the Galaxy
[see also 131.E.2.]
 - a. Hydromagnetic and gravitational theories of the formation of spiral structure
 - b. Chemical evolution: the problem of the distribution of heavy elements
 - c. Star formation: theories concerning the gravitational condensation of galactic dust and gas clouds
- C. Star clusters and stellar associations
1. Globular clusters: systems containing many thousands to a million old stars in a symmetrical, roughly spherical form
 2. Open clusters: systems containing about a dozen to hundreds of stars, usually in an unsymmetrical arrangement
 3. Stellar associations: loose groupings containing dozens to a few hundred stars of similar spectral type and common origin
 4. Relationship of clusters to the Galaxy: the formation and dispersion of clusters and their locations in the Galaxy
 5. Clusters in external galaxies

D. Stars

1. The identification and nomenclature of the stars
 - a. The celestial sphere and celestial coordinate systems
 - b. The constellations and other sky divisions
 - c. Star names and designations
 - d. Modern star maps and catalogs
2. Observable stellar characteristics
 - a. Stellar positions and motions
 - b. The apparent brightness or apparent luminosity of the stars: the *UBV* and other systems
 - c. Stellar spectra
[see also 111.C.]
3. Derived, or calculated, stellar characteristics
 - a. Intrinsic stellar brightness: absolute magnitudes, total luminosities
 - b. Stellar masses
 - c. Stellar diameters
 - d. Stellar temperatures
 - e. The average characteristics of main-sequence, or dwarf, stars
4. Stellar variability
 - a. Geometric variables; *e.g.*, eclipsing binaries
 - b. Intrinsic variables
 - i. Pulsating stars; *e.g.*, Cepheid, RR Lyrae, and Beta Canis Majoris variables
 - ii. Explosive variables; *e.g.*, novae, supernovae, and novalike variables
5. Statistics of stars
 - a. Correlations between luminosity, spectrum, mass, and radius: the Hertzsprung–Russell diagram and other relations
 - b. Statistics of binary star systems
 - c. Statistics of special types of stars
6. Stellar structure
 - a. Stellar atmospheres
 - b. Internal structure of stars
7. Stellar evolution
[see also 131.E.2.]
 - a. The life history of a typical star
 - i. Formation of a protostar by gravitational contraction
 - ii. Attainment of the main sequence
 - iii. Evolution away from the main sequence
 - iv. Estimates of stellar ages
 - b. Formation of chemical elements in stars
 - c. Probable fates of stars: white dwarfs, neutron stars, black holes

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with galaxies and stars

Cosmos, The
Galaxies
Nebula
Physical Sciences, The
Stars and Star Clusters

MICROPAEDIA: Selected entries of reference information

General subjects

<i>astronomical catalogs and instruments:</i>	<i>galaxies:</i>	21-centimetre radiation	nucleosynthesis
AG catalog	Andromeda Galaxy	<i>star pairs and groups:</i>	Populations I and II
Almagest	Cygnus A galaxy	binary star	proton-proton cycle
armillary sphere	Maffei I and II	eclipsing variable star	white dwarf star
astronomical map	Magellanic Cloud	Pleiades	<i>variable stars:</i>
Carte du ciel	Milky Way Galaxy	star cluster	Cepheid variable
celestial globe	Seyfert galaxy	stellar association	eclipsing variable star
Henry Draper Catalogue	Virgo A	<i>stars:</i>	flare star
Hertzsprung– Russell diagram	<i>nebulae:</i>	Algol	light curve
Messier catalog	Crab Nebula	Alpha Centauri	long-period variable star
New General Catalogue of Nebulae and Clusters of Stars	Cygnus Loop	Barnard's star	nova
star catalog	Horsehead Nebula	Betelgeuse	supernova
<i>constellations:</i>	Lagoon Nebula	Bethlehem, Star of	T Tauri star
Aquarius	nebula	Bethlehem, Star of	U Geminorum star
Aries	North American Nebula	colour index	variable star
Cancer	Orion Nebula	Eta Carinae	<i>other:</i>
Capricornus	Ring Nebula	Fomalhaut	degenerate gas
constellation	Strömgren sphere	Harvard	galactic coordinate
Cruz	30 Doradus	classification	H I region
Gemini	Trifid Nebula	system	H II region
Leo	<i>radio and X-ray emission:</i>	Kepler's Nova	infrared source
Orion	cosmic ray	magnitude	interstellar medium
Pisces	forbidden lines	Mira Ceti	light-year
Sagittarius	pulsar	Sirius	limb darkening
Scorpius	radio source	star	parallax
Taurus	red shift	Sun	parsec
Ursa Major	Sagittarius A	Tycho's Nova	
Virgo	Scorpius X-1	<i>stellar evolution:</i>	
	synchrotron radiation	black hole	
		carbon cycle	
		Chandrasekhar limit	
		giant star	
		neutron star	

Biographies

See Section 10/32 of Part Ten

INDEX: See entries under all of the terms above

Section 133. The Solar System**A. A survey of the solar system**

1. The Sun
[see B., below]
2. The major planets of the solar system, their surfaces and atmospheres, their satellites
[see C., D., and E., below]
3. Other constituents of the solar system
 - a. Minor planets, or asteroids
 - b. Comets
 - c. Meteoroids, meteors, and meteorites
 - d. The interplanetary medium
4. Regularities of the solar system: the distances of the planets from the Sun, the distribution of natural satellites

5. Interactions among various bodies in the solar system: gravitational perturbations, actual physical encounters
6. Theories of the origin of the solar system: origin by an orderly process, origin by catastrophe [see also 131.E.2.c.]

B. The Sun

1. The Sun's surface layers and their features: the quiet Sun
 - a. Solar data derived from observations of the photosphere, the visible luminous surface of the Sun
 - b. The chromosphere, the relatively transparent layer that forms a transition zone between the Sun's photosphere and corona: the flash spectrum, spicules, supergranulation
 - c. The corona, the luminous, high-temperature, rarefied gas envelope of the Sun: form, structure, physical properties; the solar wind
2. Solar features that occur with increased frequency during the active phase of the solar cycle: the active Sun
 - a. Centres of activity: areas of localized strong magnetic fields at the Sun's surface
 - b. Sunspots: their physical nature, the sunspot cycle of about 11 years
 - c. Other features; *e.g.*, faculae, prominences, flares, coronal condensations
3. The solar interior: energy generation, the evolution of the Sun [see also 132.D.7.]
4. Solar radiation, including light, radio waves, and particles
5. Solar-terrestrial relationships and interactions

C. The planets and their satellites

1. The terrestrial planets
 - a. Mercury
 - b. Venus
 - c. Earth [see D., below]
 - d. Mars
2. The minor planets, or asteroids [see A.3.a., above]
3. The giant planets and Pluto
 - a. Jupiter
 - b. Saturn
 - c. Uranus
 - d. Neptune
 - e. Pluto

D. The Earth as a planet

1. The distance of the Earth from the Sun: the astronomical unit and solar parallax
2. The orbital motion of the Earth around the Sun and the rotation of the Earth on its axis: the year, the day, the precession of the equinoxes [see also E.7.a., below]
3. Effects of the Earth's orbital position and speed on astronomical observations
 - a. Astronomical parallax
 - b. Aberration of light
4. The Earth's magnetism, temperature, and other physical properties [see 212]
5. The structure and composition of the Earth's interior [see 213]
6. The origin of the Earth, its atmosphere, hydrosphere, and surface features [see 232 and 241]

E. The Moon

1. The shape, radius, mean density, and varying brightness of the Moon
2. The motion of the Moon
 - a. The apparent motion: the month, or sidereal and synodic periods of the Moon; optical and physical librations
[see 7.a.iii., below]
 - b. The actual motion
3. The mass and gravitational field of the Moon
 - a. Underlying theory: basic gravitational properties of the Moon
 - b. Discovery of lunar mascons: gravity anomalies on the Moon
4. The physical nature of the Moon
 - a. Observations from Earth and from space vehicles: results of remote lunar photography, manned lunar landings, and close-up photography
[see also 738.C.]
 - b. The lunar surface features: craters, lineaments (*e.g.*, mare ridges, the lunar grid system, rilles), temporary or transient features
 - c. Theories of origin of the Moon's surface features: the volcanic and impact theories
5. The origin and evolution of the Moon
 - a. Probable development of the Moon's orbit
 - b. Evidence from the composition and physical properties of the Moon
6. The chemical nature of the Moon
 - a. Surface composition: findings of the chemical analysis of lunar rock samples
 - b. Possible zonal variations of the interior
7. The Sun–Earth–Moon system
 - a. Relative motions of the Sun, Earth, and Moon
 - i. The geometry of the Sun–Earth–Moon system: the celestial equator, the apparent motion of the Sun along the ecliptic, the inclination of the Earth's axis to its orbit
 - ii. Motions of the Sun–Earth–Moon system as the astronomical basis of chronology: the day, month, and year; the Sothic cycle, Metonic cycle, and other complex cycles
 - b. Eclipses of the Sun and Moon
 - c. Tides in the Earth and in the Moon
[see also 222.G.3.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the solar system. See also Section 211 of Part Two

Calendar
 Earth, The: Its Properties, Composition, and Structure
 Eclipse, Occultation, and Transit
 Physical Sciences, The
 Solar System, The

MICROPAEDIA: Selected entries of reference information

General subjects

<i>calendars:</i>	Dionysian period	Gregorian calendar	Julian calendar
Aztec calendar	Egyptian calendar	intercalation	Julian period
calendar	French republican	international date	leap year
Chinese calendar	calendar	line	lunar calendar
day	Greek calendar	Jewish calendar	Mayan calendar

month	Icarus	eclipse	heliopause
Muslim calendar	Pallas	ecliptic	limb darkening
perpetual calendar	Ra-Shalom	equinox	photosphere
Roman republican calendar	Trojan planets	equinoxes,	solar cycle
solar calendar	<i>Moon:</i>	precession of the	solar energy
Tibetan calendar	Cassini's laws	heliocentric system	solar flare
week	Copernicus	nutation	solar nebula
year	libration	occultation	solar
<i>comets:</i>	Linné	orbit	prominence
Arend-Roland,	Mare Orientale	orbital velocity	solar radiation
Comet	Moon	parallax	solar wind
comet	Tycho	phase	Sun
Encke's Comet	<i>Neptune:</i>	Ptolemaic system	sunspot
Halley's Comet	Neptune	retrograde motion	<i>Uranus:</i>
<i>Jupiter:</i>	Nereid	solstice	Ariel
Amalthea	Triton	synodic period	Miranda
Callisto	<i>objects of</i>	tidal friction	Oberon
Europa	<i>extraterrestrial</i>	tide	Titania
Ganymede	<i>origin:</i>	Tychonic system	Umbriel
Great Red Spot	achondrite	zodiac	Uranus
Io	carbonaceous	<i>Pluto:</i>	<i>Venus:</i>
Jupiter	chondrite	Charon	Venus
<i>Mars:</i>	chondrite	Pluto	<i>other:</i>
Chryse Planitia	chondrule	<i>Saturn:</i>	albedo
Deimos	meteor	Dione	Bode's law
Mars	meteor shower	Enceladus	celestial mechanics
Olympus Mons	meteorite	Iapetus	Forbush effect
Phobos	meteoritics	Mimas	gegenschein
Syrtis Major	meteoroid	Phoebe	interplanetary
Tharsis	Orgueil meteorite	Rhea	medium
Utopia Planitia	tektite	Saturn	mare
<i>Mercury:</i>	Tunguska event	Tethys	planet
Caloris	<i>planetary motion:</i>	Titan	Planet X
Mercury	aberration,	<i>Sun:</i>	planetesimal
<i>minor planets:</i>	constant of	chromosphere	quadrature
asteroid	anomaly	corona	rille
Eros	conjunction	facula	satellite
	Copernican system	flash spectrum	solar system

Biographies

See Section 10/32 of Part Ten

INDEX: See entries under all of the terms above

Introduction to Part Two:

The Great Globe Itself

by Peter J. Wyllie

We all have a sense of awareness and appreciation of the Earth; we all admire the scenery. One of the rewards of studying and understanding the Earth is the development of this sense to a greater extent. This development brings us closer to nature, closer to an awareness of some transcendental power, closer to God if we choose to define God in these terms. To “commune with nature” is to seek peace, but of course the Earth is not always peaceful and benevolent; sometimes it is powerful and savage. Even cities, the culmination of man’s domination of the landscape, are not immune to the ravages of nature. They have been devastated by floods, wracked and ripped by tornadoes and hurricanes, ruined by ash or lava from volcanoes, and demolished by earthquakes. These events, too, we wish to understand.

Man’s appreciation of the Earth begins with physical contact. This immediate experience of the senses is followed by the spiritual desire and need to understand where the Earth and its human observers came from, and why. The third stage of appreciation comes from scientific analysis and interpretation. Before we examine the relationship between man and the Earth in more detail, we should consider our position in the solar system and the universe.

Human civilization has developed and flourished in a small niche in space. Our home is perched on the surface of a sphere, enormous to us but tiny compared to the universe, that spins around its axis once each day while moving at a fantastic speed around the Sun, completing an orbit once each year. Although normally unaware of it, we too are spinning and moving at the same speed as the Earth, but we are held securely on the surface by the gravitational attraction of the mass of rocks beneath us.

The Sun, a huge globe of burning gas, provides the energy that fuels the activities and processes of our immediate environment, the boundary layer between the rocky surface of the Earth and the fluid envelope of air and water that separates the Earth from the starkness of space. The air and water nurture life and simultaneously protect it from the potentially damaging radiation and particles that approach the Earth from other parts of the solar system and beyond.

A view of the Earth from space differs markedly from what we see from within our own restricted environment at the Earth’s surface. From where we stand, it appears that the Sun, the Moon, and the stars are moving in great arcs around the Earth, and it was once believed that this was the way of the universe. Man on his world was surely the centre of all things. But we know now that this is only a relative picture; although the Moon does orbit the Earth, the Earth–Moon system moves around the Sun, which is itself speeding through the universe.

We exist because the Earth exists, and we claim the Earth as our own by referring to it as Mother Earth, the universal provider. The Earth provides all of our material

needs and satisfies some of our spiritual needs: “I will lift up mine eyes unto the hills, from whence cometh my help.” A day in the mountains, at the seashore, or in the countryside sharpens that sense of awareness of the Earth which was compared above with an awareness of God.

Since he first appeared on Earth, man has wondered at nature’s awesome beauty and trembled at its indomitable power. The dread engendered by the physical experience of nature on the rampage, in storms, floods, or earthquakes, has shaped the development of primitive religions. Mystical or sacred attributes were assigned to natural objects and phenomena, and ceremonies were devised to honour and placate the unknown powers. Modern man has become increasingly insulated from his natural surroundings, partly because he is separated from them by masses of concrete, partly because scientific investigation tends to dispel the mystery of nature. This is not to imply that no problems remain to be solved, but we have learned enough to be reasonably sure that all are ultimately explicable in terms of rational science. Therefore, we no longer feel the need to populate the sky, mountains, trees, and winds with gods, spirits, and souls. But we can still enjoy the sensuous and spiritual appreciation of the Earth and retain or rediscover the intimacy with our natural surroundings that was experienced by primitive man.

One of the appealing aspects of Earth study is that wherever we go, our favourite subject is right there with us. There is always something new to be seen, to be admired, or to be examined in detail. While traveling in a commercial airliner, a meteorologist can examine the upper portions of the clouds as a change from his normal ground-based view and can track the flight right through the fronts and the high- and low-pressure regions charted on the newspaper weather map in his lap. An oceanographer flying over the coastline can see at a glance the large-scale patterns in the waves rolling shoreward and the effect of coastal prominences on these patterns. A geologist peering through the plane window can examine the distribution of hills and valleys laid out below him, gaining a bird’s-eye view to supplement the pattern of features that he had previously seen only on maps. These pleasures are not reserved for the professional Earth scientist. Anyone can observe the Earth and Earth processes in action, almost anywhere.

Man is a curious species; he needs to know how and why things happen. The simple, visual pictures of nature are beautiful, awe-inspiring, and on occasion terrifying, but they can be more satisfying if they invoke a series of additional images. Just as one’s appreciation of any work of art is enhanced by knowing something of the artist and his position in art history, so one’s appreciation of nature’s pictures is enhanced by knowing something about natural history. For a full appreciation of the splendour of mountain peaks rising abruptly from the plains, reaching

for the puffs of cloud that ride above them, we need to know something of the processes that raise mountains—or were they always there? We need to know something of the winds that carry moisture from the oceans to the skies, because we see that the clouds come, change their shapes, and then disappear. We can gain a great deal by learning a little about the scientific approach to appreciation of the Earth. And it is not at all difficult for the nonprofessional to read about and to understand many of the necessary concepts.

Two of the most troublesome concepts are time and size—dimensions that distinguish the Earth sciences from any other Earth-bound subject. It is very difficult for us to grasp the meaning of the statement that the Earth formed 4,600,000,000 years ago. Similarly, the enormous volume of water in the oceans or the volume of rocks in a mountain range almost defy comprehension. We have been considering the Earth and scenery as it is exposed to us at the present. But when we study the Earth, we realize that the present scenery is merely a transient feature in the immense span of geological time. Early students of the Earth were hampered by the belief that the Earth was only a few thousand years old. Many of them were seeking answers to two recurrent questions that we find throughout human history. How and when was the Earth formed? How and when was man formed? Attempts to answer these questions are responsible for many myths and religions in various cultures, both ancient and modern.

In the early part of the 19th century the study and interpretation of rocks led geologists to conclude that the Earth must be of far greater antiquity than the age implied by a literal interpretation of the Bible. They realized that the layers of rock now exposed at the surface contain records of the history of the Earth during the times that each layer was formed. One major branch of the Earth sciences is devoted to the discovery, translation, and interpretation of the “record of the rocks.” Many rock layers enclose fossils, and these remnants of animals and plants serve as illustrations in the historical book of nature, making it possible to trace the development and changes of species through time.

Fossil hunting has been a popular pastime for many generations. With a little experience and a little knowledge, an amateur fossil hunter can add interpretation to his discoveries. From a few fossil shells and corals in a limestone, he can reconstruct in his mind’s eye the whole flourishing community of life that once existed on a coral reef, now frozen into the rock record. A piece of coal, with fossil imprints of leaves, ferns, and other plant remains from which the coal was formed, can conjure up a picture of a luxuriant swamp of 300,000,000 years ago, populated by strange beasts long since vanished from the Earth. The history of the Earth, the evolution of life, and the origin of man, at least in part, are preserved in the rocks. It is here that fundamentalists still supporting “creationism” will find much evidence for the evolution of life forms, if they care to examine it. This aspect of Earth study has almost universal appeal. Earth history and human history overlap in archaeology, and the records of early civilizations exposed in excavation sites always excite public curiosity.

The scientific approach to the appreciation of nature informs us that the key to interpretation of the past history

of the Earth from the record of the rocks lies in processes occurring at the present time. These processes have been grouped into great cycles. Two of the most important are the hydrologic cycle, concerned with the circulation of water, and the mountain-building cycle.

The oceans constitute a vast reservoir for the hydrologic cycle. The atmosphere and the oceans are in constant motion, driven by the energy from the Sun and the rotation of the Earth. Masses of humid air, carrying water that has evaporated from sun-drenched tropical oceans, migrate to cooler latitudes, where the water is precipitated as rain or snow and thus returned to the ocean reservoir either directly or indirectly, over or through the ground. The moving air masses and ocean currents bring to the continental masses rain or drought, heat or cold, making them hospitable, habitable, or uninhabitable for human colonies. Minor changes in atmospheric circulation have converted fertile plains to barren deserts and caused major changes in the development of ancient civilizations.

The hydrologic cycle shapes our local environment. The features that we know collectively as scenery are produced mainly by flowing water, although ice, wind, and solar energy also contribute. The force of gravity and the rivers together carry the products of weathering downhill to the ocean reservoir. The average rate at which the surface of the land is being worn down and the land dispersed into the oceans is a trivial 1.5 inches per 1,000 years, but the dimensions of geological time gives significance to small numbers. At this rate, all of the continents would be worn down to sea level within 20,000,000 years. This means that during the 4,600,000,000 years since the Earth was formed, the continents could have been worn down to sea level at least 200 times. By now there should be no land rising above sea level, but we still see high mountains.

The mountains exist and persist because the effects of the hydrologic cycle are offset by the mountain-building cycle. Forces within the Earth cause large regions of the surface to rise very slowly, imperceptibly in human terms. Imperceptible, that is, until an earthquake signals an abrupt movement in the continuing process of mountain building. While some parts of the Earth rise, other regions sink. This slow rhythm has been termed “the pulse of the Earth.” Although we do not understand the details of what is happening within the Earth, we are now confident that internal forces are responsible for shaping the major features of the Earth’s surface, such as the distinction between continents and ocean basins and the persistence of mountain ranges on the land and beneath the ocean. The detailed sculpture of the surface results from the conflict between the mountain-building cycle and the hydrologic cycle.

The internal forces do more than cause the land surface to rise and fall; they cause the land to move sideways as well. It is now generally believed by most scientists that the continents drift. There is persuasive evidence that the surface of the Earth is covered by a small number of very large shell-like plates, about 60 miles thick, across which the continents are scattered rather like logs frozen into the ice on a lake. The rigid shells of rock slide over the Earth’s interior, carrying the continents with them and grinding against each other along their edges like ice floes. The plate boundaries are sites of geological activity: earthquakes and

volcanoes are concentrated along them. Because of these movements, supercontinents have been rifted apart, and ocean basins have opened, expanded, and closed again as continents collided. Collisions of continents have thrust up great mountain ranges such as the Himalayas. The continents are still drifting at rates of an inch or two per year: the Atlantic Ocean is increasing in size, and the Pacific Ocean is becoming smaller. Most people are fascinated by the theory of continental drift. The theory is not only aesthetically pleasing but also has practical applications.

What stokes the subterranean fires that drive the Earth's engine, causing continental drift, mountain building, volcanic eruptions, and earthquakes? We have no satisfactory answer to this question, but we do know that an enormous amount of energy is involved in the activity along the plate margins. One major earthquake releases more energy than a hydrogen bomb. Modern man is a powerful animal, thanks largely to his exploitation of the Earth for material and energy, and he dominates the landscape like no species before him. He feels reasonably secure in his command of the environment while contemplating the urban scene, because the landscape is largely a product of

his industry, and it is clearly subservient to his wishes and his computer-operated control panels. But when the Earth releases a minute fraction of its internal energy in a major earthquake, man becomes helpless. All control is lost while the surface of the Earth rises and falls in solid waves.

Man cannot live in harmony with his environment during an earthquake. It has become clear, however, that he must learn to do so at other times if he is to avoid the dire predictions of those who evaluate such factors as projected world populations, the material and energy resources of the Earth, projected rates of consumption of these resources, and the volume and toxicity of waste materials discarded. We live in a restricted environment with finite space and resources, and we have become a force producing major modifications in the environment at rates very rapid compared with normal rates of Earth evolution. Social decisions about the continued exploitation of the Earth should be made with full information about the problems, and social decisions are based on votes, in theory at least. This alone is sufficient reason for any intelligent person to inform himself about the Earth, quite apart from the fascination of the subject, because his future depends upon it.

Part Two. The Earth

Several points about the relations of this part to other parts should be noted. The consideration here of the Earth's physicochemical properties presupposes the physical and chemical knowledge and theories set forth in Part One. Knowledge of the Earth is in turn presupposed by Parts Three, Four, and Five, which are Life on Earth, Human Life, and Human Society, respectively. The several Earth sciences have themselves been the objects of historical and analytical studies concerned with their nature, scope, methods, and interrelations. These studies are set forth in Section 10/33 of Part Ten. The instrumentation used in the Earth sciences is dealt with in Section 723 of Part Seven.

- Division I. The Earth's Properties, Structure, and Composition 65
 - II. The Earth's Envelope: Its Atmosphere and Hydrosphere 73
 - III. The Earth's Surface Features 79
 - IV. The Earth's History 85

Division I. The Earth's Properties, Structure, and Composition

The outlines in the four sections of Division I treat the Earth as a planet; the Earth's physical properties; the structure and composition of the Earth's interior; and the Earth's constituent minerals and rocks.

- Section 211. The Planet Earth 65
 - 212. The Earth's Physical Properties 66
 - 213. The Structure and Composition of the Earth's Interior 68
 - 214. The Earth's Constituent Minerals and Rocks 69

Section 211. The Planet Earth

- A. The orbital motions of the Earth
 - 1. The revolution of the Earth about the Sun, the rotation of the Earth on its axis
 - 2. Forces and dynamic effects related to the rotation of the Earth
 - a. The Coriolis force
 - b. The effects of centrifugal force
 - c. Tidal friction
- B. The figure of the Earth
 - 1. The conventional definition of the figure of the Earth: the geoid
 - 2. The development of improved approximations to the Earth's size and shape
 - 3. The world geodetic system: the measurement of geodetic parameters
 - a. The astrogravimetric method
 - b. Satellite measurements
 - c. Correlation of data from different methods
 - 4. International reference systems: standard reference figures, precision measurements and their implications concerning global structure and processes

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the planet Earth

Earth, The: Its Properties, Composition, and Structure
Solar System, The

MICROPAEDIA: Selected entries of reference information

General subjects

atmosphere	Earth tide	latitude and	sea level
biosphere	equator	longitude	seafloor spreading
continent	geoid	North Pole	hypothesis
continental drift	hydrosphere	ocean	South Pole
Coriolis force	isostasy	orbit	tide
Earth	landform	plate tectonics	

Biographies

See Section 10/33 of Part Ten

INDEX: See entries under all of the terms above

Section 212. The Earth's Physical Properties**A. The Earth's gravitational field**

[see also 131.B.]

1. Characteristics of the terrestrial field
2. Measurement of gravitational acceleration
[see also 723.D.2.d.]
3. Interpretation of gravity data: inferences about the Earth's interior
 - a. Isostasy: the approximate balance between the elevation of the Earth's surface and the density of the rocks below
 - b. Gravity anomalies

B. The Earth's magnetic field

1. Measurement and representation of magnetic fields
2. Sources and characteristics of the Earth's main magnetic field
3. Variations in the main magnetic field, including polarity reversals, magnetic storms, magnetospheric substorms, and magnetic pulsations

C. The Earth's electrical properties

[see also 127.B.]

1. Currents produced by the motion of charged particles in the Earth's ionosphere
[see also 221.A.3.b]
2. Electrical conductivity and dielectric behaviour of the Earth's rocks and minerals
3. Currents induced by magnetic-field variations, currents generated by the Earth's core

D. The Earth's thermal properties

[see also 124.A.4.c.]

1. Sources of the Earth's heat
[see also 112.C.5.]
2. Transmission of heat from the Earth's interior to its surface: thermal conductivity and gradients, heat flow data
3. Geologic aspects of heat flow: convection currents within the Earth, rock metamorphism, and mountain building
4. Surface manifestations of heat flow: volcanoes, hot springs, geysers, and related phenomena

E. The mechanical properties of the Earth

1. The fundamental mechanical properties of the Earth's body and the indirect evidence used to determine them
2. Nature of deformable media: stress and strain, models of the stress-strain behaviour of materials, seismic waves
[see also 126.D.]
3. The basic internal mechanical properties of the Earth
4. The Earth's departures from spherical symmetry: oblateness, lateral variations associated with crustal structure, isostasy and its effects
[see also 211.A.2.b.]
5. Anelasticity in the Earth
6. Response of the Earth to stresses of long duration

F. Physical properties of Earth materials

1. Volumetric properties: rock density and porosity
2. Mechanical properties
[see also 126.D., E., and G.]
3. Thermal properties: specific heat and thermal conductivity, thermal expansion and rock melting
4. Magnetic and electrical properties
[see also C.2., above]
5. Hydraulic properties: porosity and permeability, the capacity to store and transmit fluids
6. Optical properties: colour, lustre

G. The deformation of materials in the Earth's crust

1. Stress and strain of rocks
 - a. Response to stress
 - b. Elastic and plastic deformation
2. Folding of rocks
 - a. Tectonic folding
 - b. Foliation, lineation
 - c. Nappes (large rock sheets thrust over other rock formations)
 - d. Salt domes and other diapiric structures
[see also 724.B.1.b.]
 - e. Nontectonic folding; *e.g.*, slumping of recently deposited sediments
3. Fracture in rocks: joints, faults
4. Structural interference: the superposition of strains produced by the tectonic events of different ages
5. The deformation of ice in sheets and glaciers
[see also 222.A.3.a.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the Earth's physical properties

Earth, The: Its Properties, Composition, and Structure
Minerals and Rocks
Volcanism

MICROPAEDIA: Selected entries of reference information

General subjects

continental drift	dynamo theory	Earth tide	fault
dipolar hypothesis	Earth	earthquake	fold

geosyncline
gravitation
isostasy
orogeny

plate tectonics
polar wandering
remanent
magnetism

seafloor spreading
hypothesis
telluric current
volcanism

Biographies

See Section 10/33 of Part Ten

INDEX: See entries under all of the terms above

Section 213. The Structure and Composition of the Earth's Interior

A. The Earth's concentric layers

1. Physical properties and zonal structure of the Earth
[see also 212]
2. The basic divisions of the solid Earth
 - a. The crust: the Earth's outer layer, which is differentiated into continental and oceanic crust
 - b. The Mohorovičić discontinuity: the zone that separates crust from mantle
 - c. The mantle: the layer between crust and core that comprises the bulk of the Earth's volume
 - d. The core: the Earth's innermost region, thought to be molten liquid except for a solid inner portion
3. The development of the Earth's structure and composition
[see 241.A.]

B. Earthquakes: sources of seismic waves within the Earth

1. Causes of earthquakes
2. Distribution of earthquakes
3. Magnitude, motion, and energy of earthquakes
[see also 126.D. and 128.A.]
4. Seismic measurements and their interpretation
[see also 723.F.6.]

C. Distribution of elements in the Earth's core, mantle, and crust [see 214.C.]

D. The indirect geophysical and geochemical evidence used to infer the structure and composition of the Earth's interior

1. Geophysical evidence, mainly from earthquake analyses
[see also 212.E.]
 - a. Seismic wave velocities
 - b. Density distribution
2. Geochemical evidence
 - a. Investigations of geochemical equilibria at high temperatures and pressures: phase transitions in the Earth's interior
 - b. The composition and mineralogy of meteorites that may correspond to rocks forming the Earth's interior
 - c. Evidence from crustal igneous rocks that are derived from the upper mantle; *e.g.*, andesite lava flows, peridotite and eclogite inclusions in lava flows and some igneous rocks

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the structure and composition of the Earth's interior
Earth, The: Its Properties, Composition, and Structure
Earthquakes

MICROPAEDIA: Selected entries of reference information

General subjects

Earth
 earthquake
 Richter scale
 seismic belt
 seismic wave

Biographies

See Section 10/33 of Part Ten

INDEX: See entries under all of the terms above

Section 214. The Earth's Constituent Minerals and Rocks

A. The mineral constituents of the Earth

1. The chemical composition, internal structure, and morphology of minerals
2. The physical properties of minerals: cleavage; hardness; tenacity; specific gravity; magnetic, optical, and radioactive properties
3. Classification of minerals in terms of crystal structure and chemical composition
 - a. The principal nonsilicate minerals
 - i. Native elements
 - ii. Sulfides and sulfarsenides
 - iii. Sulfosalts
 - iv. Oxides and hydroxides
 - v. Halides
 - vi. Carbonates
 - vii. Nitrates and iodates
 - viii. Borates
 - ix. Sulfates
 - x. Phosphates, arsenates, and vanadates
 - xi. Molybdates, tungstates, and chromates
 - b. The silicate minerals
 - i. Silicate structure and composition: the basic structural unit, the silicon-oxygen tetrahedron
 - ii. Isolated and double tetrahedral group silicates
 - iii. Ring silicates
 - iv. Chain silicates
 - v. Sheet silicates
 - vi. Framework silicates
4. The occurrence of minerals in nature
 - a. The major rock-forming mineral groups
 - i. The olivines; *e.g.*, forsterite, fayalite
 - ii. The pyroxenes; *e.g.*, augite, jadeite
 - iii. The amphiboles; *e.g.*, hornblende, actinolite
 - iv. The micas; *e.g.*, muscovite, biotite
 - v. The feldspars; *e.g.*, orthoclase, albite
 - vi. The feldspathoids; *e.g.*, nepheline, leucite
 - vii. The silica minerals; *e.g.*, quartz, tridymite
 - viii. The clay minerals; *e.g.*, kaolinite, illite

- ix. The carbonates; *e.g.*, calcite, dolomite
[see A.3.a.vi., above]
 - x. The garnets; *e.g.*, almandine, pyrope
 - xi. Other major rock-forming minerals; *e.g.*, magnetite, pyrite
 - b. The occurrence of mineral associations and phase equilibrium
 - i. In igneous and metamorphic rocks
 - ii. In sedimentary rocks and precipitates
 - iii. In the Moon, planets, and meteorites
[see also 133.C., 133.E.6.]
 - c. Ore deposits: concentrations of metals and metalliferous minerals
[see also 724.C.3.]
 - d. Minerals of gem quality
- B. Rocks and other constituents of the Earth's crust**
- 1. Igneous rocks
 - a. Properties of igneous rocks: composition, texture, and structure
 - b. Classification of igneous rocks
 - c. Formation of igneous rocks: magmas
[see also 212.D.4.]
 - d. Distribution and abundance of igneous rocks
 - e. Principal families of igneous rocks
 - i. The intrusive igneous rocks that result when magma cools and solidifies below the surface of the Earth; *e.g.*, granite, gabbro, diorite
 - ii. The extrusive igneous rocks that form from magma that erupts at the surface of the Earth; *e.g.*, basalt, rhyolite, andesite
 - iii. The pyroclastic igneous rocks that form from deposits of explosive volcanic eruptions; *e.g.*, pumice, tuff, scoria
 - 2. Sedimentary rocks
 - a. Properties of sedimentary rocks: texture and mineralogical and geochemical composition
 - b. Classification systems: clastic, nonclastic
 - c. Sedimentary structures
 - d. Sedimentary environments: marine, nonmarine
 - e. Principal types of sedimentary rocks
 - i. Conglomerates, breccias, and other heterogeneous clastic rocks (*e.g.*, tillites)
 - ii. Sandstones: arenites and wackes
 - iii. Mudrocks, including shales
 - iv. Limestones and dolomites
 - v. Siliceous rocks
 - vi. Phosphorites
 - vii. Evaporites
[see also 724.B.1.b.]
 - viii. Iron-rich sedimentary rocks
 - ix. Organic-rich sedimentary rocks
[see 5., below]
 - f. Distribution of sedimentary rocks through time
 - 3. Metamorphic rocks
 - a. Metamorphic variables: temperature, pressure, and rock composition
 - b. Textural and structural features
 - c. Origin of metamorphic rocks

- d. Rocks of the principal facies
- e. Distribution of metamorphic rocks
- 4. The rock associations formed in different environments of the Earth's crust
 - a. In the oceanic regions: basaltic lavas, reef limestones, abyssal sediments of the deep oceans
 - b. In the stable continental regions: conglomerates, sandstones, evaporites, coal measures
 - c. In the continental borderlands: sandstones, shales, limestones
 - d. In the island arcs: andesite and spilite lavas, ultrabasic intrusive rocks, graywackes, shales
 - e. In the major mountain ranges: regionally metamorphosed rocks, granitic batholiths, early-stage basalts and peridotites, late-stage andesite lavas
 - f. In the piedmont regions that are adjacent to mountain ranges: gabbros, basalts, arkoses
- 5. Fossil fuels
 - a. Coals
[see also 724.B.1.b. and C.2.]
 - b. Petroleum
[see also 122.G.1.a. and 724.B.2. and C.1.]
 - c. Tar sands and oil shales
[see also 724.B.2. and C.1.]
 - d. Natural gas
[see also 122.G.1.a. and 724.B.2.]
- C. Occurrence of the elements in the Earth and its envelope
[see also 121.D.1.]
 - 1. Core
 - 2. Mantle (depleted and undepleted)
 - 3. Crust: igneous, sedimentary, and metamorphic rocks; soils
 - 4. Hydrosphere
[see 222.B. and C.]
 - 5. Atmosphere
[see 221.A.]
 - 6. Biosphere: selective concentration of elements by plants and animals
 - 7. The geochemical cycle: the primary geochemical differentiation of the Earth; the migration of elements throughout the atmosphere, hydrosphere, and solid Earth

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the Earth's constituent minerals and rocks

Chemical Elements
 Earth, The: Its Properties, Composition, and Structure
 Fuels, Fossil
 Minerals and Rocks
 Volcanism

MICROPAEDIA: Selected entries of reference information

General subjects

<i>borate minerals:</i>	malachite	analcime	nepheline
borate mineral	nahcolite	anorthite	orthoclase
borax	rhodochrosite	aventurine	peristerite
ulexite	siderite	celsian	perthite
<i>carbonate minerals:</i>	<i>feldspar and</i>	feldspar	plagioclase
aragonite	<i>feldspathoid</i>	feldspathoid	sanidine
bastnaesite	<i>minerals:</i>	labradorite	scapolite
calcite	adularia	leucite	sodalite
carbonate mineral	albite	microcline	wairakite
magnesite	alkali feldspar	micropegmatite	

<i>halide minerals:</i>	charnockite	industrial	geode
calomel	eclogite	diamond	gravel
cerargyrite	epidote-amphibolite	native element	graywacke
fluorite	facies	<i>oxide and hydroxide</i>	hällflinta
halide mineral	glaucophane schist	<i>minerals:</i>	limestone
halite	facies	anatase	lithification
<i>igneous rocks and</i>	gneiss	bauxite	loess
<i>formations:</i>	granitization	boehmite	lutite
acid and basic	granulite facies	cassiterite	marl
rocks	greenschist facies	chromite	molasse
amygdale	hornfels facies	chrysoberyl	nodule
andesite	induration	columbite	oölite
anorthosite	marble	corundum	phosphorite
aplite	metamorphic	cuprite	porcellanite
basalt	rock	emery	quartzite
basanite	metamorphism	gibbsite	sand
batholith	metatexis	goethite	sandstone
dacite	migmatite	gossan	sedimentary facies
diabase	phyllite	hematite	sedimentary rock
dike	sanidinite facies	ilmenite	shale
diorite	schist	limonite	siliceous rock
dunite	skarn	magnetite	silt
felsic rock	slate	oxide mineral	siltstone
gabbro	zeolitic facies	pitchblende	stratification
granite	<i>mineral fuels and</i>	pyrochlore	stylolite
granodiorite	<i>deposits:</i>	pyrolusite	subgraywacke
greisen	anthracite	ruby	tillite
igneous rock	asphalt	ruby spinel	<i>silica minerals:</i>
kimberlite	asphaltite	rutile	agate
laccolith	bitumen	sapphire	amethyst
lamprophyre	bituminous coal	spinel	aventurine
latite	brown coal	thorianite	carnelian
leucitite	cannel coal	uraninite	chalcidony
mafic rock	coal	<i>phosphate minerals:</i>	chert and flint
magma	crude oil	amblygonite	chrysotile
monzonite	gas reservoir	apatite	citrine
myrmekite	lignite	arsenale mineral	coesite
nephelinesyenite	maceral	carnotite	crystalite
nephelinite	natural gas	desclozite	fulgurite
obsidian	oil shale	erythrite	jasper
pegmatite	ozokerite	fluorapatite	lechatelierite
peridotite	peat	lazulite	moss agate
perlite	petroleum	mimetite	onyx
phonolite	petroleum trap	phosphate mineral	opal
picrite	pitch lake	pyromorphite	phillipsite
pitchstone	pyrobitumen	scorodite	quartz
pumice	shale oil	triphylite	rock crystal
pyroxenite	subbituminous	turquoise	rose quartz
rhyolite	coal	vanadate mineral	sard and sardonox
roof pendant	tar sand	variscite	sepiolite
sill	wet gas	<i>sedimentary rocks</i>	serpentine
spilite	<i>molybdate and</i>	<i>and their formation:</i>	silica
syenite	<i>tungstate minerals:</i>	arkose	silica mineral
tachylite	molybdate	banded-iron	smoky quartz
teschenite	and tungstate	formation	tridymite
trachyte	minerals	black shale	<i>silicate minerals:</i>
tuff	scheelite	breccia	actinolite
volcanic glass	wolframite	cementation	aegirine
xenolith	wulfenite	conglomerate	almandine
<i>metamorphic rocks</i>	<i>native elements:</i>	diagenesis	amphibole
<i>and their formation:</i>	diamond	diatomaceous earth	andalusite
amphibolite facies	electrum	dolomite	andradite
anatexis	graphite	evaporite	augite
cataclastite		flysch	beryl

biotite	pyroxene	stibnite	hydraulic
chlorite	rhodonite	sulfide mineral	equivalence
chrysotile	riebeckite	sulfosalt	hydrothermal ore
clay mineral	serpentine	tetrahedrite	deposit
cordierite	silicate mineral	<i>zeolite minerals:</i>	iridescence
diopside	staurolite	apophyllite	kaolin
emerald	talc	chabazite	lapis lazuli
enstatite	topaz	clinoptilolite	lustre
epidote	tourmaline	epistilbite	metallogenic
forsterite-fayalite	vermiculite	erionite	province
series	vesuvianite	faujasite	metasomatic
garnet	wollastonite	heulandite	replacement
glauconite	zircon	laumontite	mineral
glaucophanes	zoisite	mordenite	Mohs hardness
grossular	<i>sulfate minerals:</i>	natrolite	nitrate and iodate
hornblende	alunite	zeolite	minerals
humite	anhydrite	<i>other:</i>	nuée ardente
jadeite	barite	accessory mineral	ore
kaolinite	celestite	amphibolite	paragenesis
kyanite	gypsum	bentonite	phase diagram
lepidolite	halotrichite	chromate mineral	phase rule
melilite	sulfate mineral	clay mineralogy	placer deposit
mica	<i>sulfide minerals:</i>	cleavage	pleochroic halo
monticellite	antimonide	colour index	polymorphism
montmorillonite	argentite	crocoite	primary mineral
muscovite	arsenide	devitrification	pseudomorph
nephrite	arsenopyrite	Eh-pH diagram	pyroelectricity
olivine	galena	filter-pressing	Riecke's principle
orthopyroxene	marcasite	foliation	rock
peridot	orpiment	fracture	sinter
phenakite	pyrite	fuller's earth	streak
phlogopite	pyrrhotite	gemstone	vein
pyrophyllite	sphalerite	grade scale	

INDEX: See entries under all of the terms above

Division II. The Earth's Envelope: Its Atmosphere and Hydrosphere

[For Part Two headnote see page 65.]

The outlines in the three sections of Division II treat the Earth's atmosphere, its hydrosphere, and weather and climate.

Section 221. The Atmosphere 73

222. The Hydrosphere: the Oceans, Freshwater Bodies, and Ice Masses 75

223. Weather and Climate 77

Section 221. The Atmosphere

A. The composition, structure, and features of the atmosphere

[see also 241.B. and 723.G.5.]

1. Division of the atmosphere by composition

a. The homosphere

i. Water cycle

[see also 222.D.3. and 223.A.1.]

ii. Carbon budget

iii. Nitrogen budget

iv. Sulfur budget

b. The heterosphere

i. Oxygen dissociation

- ii. Escape of helium and hydrogen from the upper atmosphere
- 2. Thermal structure
 - a. The troposphere
 - b. The stratosphere
 - c. The mesosphere
 - d. The thermosphere
- 3. Regions and phenomena of the upper atmosphere
 - a. The ozonosphere
 - i. Absorption of ultraviolet radiation of wavelengths harmful to plant and animal life
 - ii. Heating of the upper atmosphere
 - b. The ionosphere
 - i. Ionospheric variations and disturbances of atmospheric origin
 - ii. Ionospheric variations and disturbances of solar origin: auroras and magnetic storms
[see also 212.B.]
 - iii. The effects of the ionosphere on radio waves
[see also 735.1.5.]
 - c. The exosphere
 - i. Effects of low particle density on the properties of the exosphere
 - ii. Determination of the critical zone, the layer above which the number of particle collisions is negligible
 - iii. The Van Allen radiation belts
[see also 133.B. and 212.B.]
- B. The large-scale motions of the atmosphere
[see also 223]
 - 1. The general nature and relative scales of atmospheric motions: the resolution of winds into zonal (east-west), meridional (north-south), and vertical components
 - 2. The relation of wind to pressure and temperature: the cause of winds, the effect of Coriolis force, idealized winds derived from simplified models—the geostrophic and thermal winds
[see also 211.A.2.a.]
 - 3. Jet streams
 - 4. The westerlies of the mid-latitudes
 - a. Standing waves of the mid-latitude westerlies and related systems
 - b. Mid-latitude traveling disturbances: cyclones, anticyclones
[see 223.B.1.]
 - 5. Tropical wind systems
 - a. Trade winds
 - b. Tropical disturbances: noncyclonic storms, hurricanes and typhoons
[see 223.B.4.]
 - c. Monsoons
 - 6. Stratospheric and mesospheric wind systems
 - a. Polar-night westerlies
 - b. Summer easterlies of the mesosphere and stratosphere
 - 7. The mean meridional circulations of the atmosphere
 - 8. The driving mechanism of the atmosphere: the energy balance and the transport of heat and momentum

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major article dealing with the atmosphere
Atmosphere

MICROPAEDIA: Selected entries of reference information

General subjects

<i>atmospheric motion</i>	Siberian	exosphere	greenhouse effect
<i>and disturbances:</i>	anticyclone	F region	lapse rate
anticyclone	thunderstorm	ionosphere	magnetic storm
atmospheric	tricellular theory	magnetosphere	solar wind
circulation	tropical cyclone	mesosphere	temperature
atmospheric	updraft and	ozonosphere	inversion
turbulence	downdraft	protonosphere	whistler
cyclone	wind	stratosphere	
cyclostrophic	<i>atmospheric optical</i>	thermosphere	
wind	<i>phenomena:</i>	troposphere	
doldrums	airglow	Van Allen	
eddy	atmospheric	radiation belt	
Ferrel cell	corona	<i>other:</i>	
geostrophic motion	aureole	air	
gradient wind	aurora	air mass	
Hadley cell	halo	atmosphere	
jet stream	<i>regions and zones of</i>	atmospheric	
monsoon	<i>the atmosphere:</i>	pressure	
polar anticyclone	D region		
Rossby wave	E region		

Biographies

See Section 10/33 of Part Ten

INDEX: See entries under all of the terms above

Section 222. The Hydrosphere: the Oceans, Freshwater Bodies, and Ice Masses

- A. The distribution of water in the hydrosphere
 1. Saltwater bodies
 - a. Oceans and marginal seas
 - b. Gulfs and bays
 2. Freshwater bodies
 - a. Rivers, lakes, and marginal bodies such as estuaries and swamps
[see 232.C.1., 2., and 3.]
 - b. Groundwater contained within the pores of rocks
 3. Ice
 - a. Ice sheets and glaciers
[see also 212.G.5. and 232.C.6.]
 - b. Icebergs and pack ice
 - c. River ice and lake ice
 4. Water in the biosphere
[see 351]
- B. The physical and chemical properties of seawater
[see also 241.C.]
- C. The physical and chemical properties of freshwater
- D. The hydrologic cycle
 1. The general nature of the hydrologic cycle: the types of processes involved and their complex interaction, scales of magnitude of the interrelated components of the global hydrologic system, influences of climate and other factors

2. The roles of evaporation and transpiration in the hydrologic cycle
[see also 336.B.4.]
 3. The role of water vapour in the hydrologic cycle: condensation, precipitation
[see also 223.A. and E.1.c.]
 4. Runoff and subsurface water in the hydrologic cycle
[see also 232.A.4.]
 5. The role of ice in the hydrologic cycle
[see also A.3., above]
 6. Water resources and supply
[see also 737.A.1.]
- E. Ocean-atmosphere interactions
1. Radiation, heat, and water budgets
 2. Oceanic waters as an important sink for carbon dioxide
 3. Impact of ocean-atmosphere interactions on climate and weather
 - a. Link between ocean surface temperature and climate anomalies
 - b. El Niño/Southern Oscillation (ENSO)
 - c. Moderating effects of the Gulf Stream system on climate
- F. Effects of human activities on the hydrosphere: *e.g.*, cultural eutrophication; acidification of precipitation resulting from the emission of sulfur dioxide and nitrogen oxides; potential disruption of the water balance due to greenhouse warming induced by carbon dioxide buildup
- G. Waves in the hydrosphere
[see also 126.F., 128.A., and 232]
1. Surface waves: simple waves, ocean waves, tsunamis
 2. Internal waves
 3. Tides
[see also 133.E.7.c.]
- H. Ocean currents
1. The distribution of ocean currents
 2. The forces that cause and affect ocean currents: pressure gradients, Coriolis force, frictional forces
[see also 211.A.2.a.]
 3. The general surface circulation
 4. Subsurface ocean currents
 - a. The general deep-sea circulation
 - b. Tidal currents: periodic currents associated with tides in the sea
 - c. Density currents down continental slopes, produced by differences in temperature, salinity, or sediment concentration
[see also 231.C.3.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the hydrosphere: the oceans, freshwater bodies, and ice masses

Earth, The: Its Properties, Composition, and Structure	Lakes
Hydrosphere, The	Oceans
Ice and Ice Formations	Rivers

MICROPAEDIA: Selected entries of reference information

General subjects

<i>freshwater resources:</i>	groundwater	lake	river
aquifer	ice	reservoir	spring

water resource	<i>motions of the sea:</i>	<i>ocean zones:</i>	<i>other:</i>
well	density current	bottom water	acid rain
<i>ice masses:</i>	ocean current	halocline	air-sea interface
firn	rip current	thermocline	bore
glacier	seiche	<i>saltwater bodies:</i>	eutrophication
ice formation	tide	bay	fetch
ice shelf	tsunami	estuary	greenhouse effect
iceberg	undertow	gulf	hydrologic cycle
pack ice	wave	lagoon	hydrosphere
permafrost	whirlpool	ocean	sea level
polynya			water mass

Biographies

See Section 10/33 of Part Ten

INDEX: See entries under all of the terms above

Section 223. Weather and Climate

- A. Condensation of water in the atmosphere producing clouds, fogs, and precipitation
 1. Moisture in the atmosphere
[see also 221.A.1.a. and 723.G.5.]
 - a. Humidity indices: absolute, specific, and relative humidity; dew-point temperature
 - b. Climatic aspects of atmospheric humidity
[see E.1.c., below]
 - c. Effects of atmospheric humidity on the life and health of humans and other life-forms
[see E.4., below]
 2. Condensation of atmospheric water vapour
 - a. Convection, air-mass convergence, and other processes that lead to condensation
[see also 221.B.]
 - b. Condensation nuclei: atmospheric ions, salt and dust particles
 - c. Dew
 - d. Frost
 3. Clouds and fogs
 - a. Formation and growth of clouds
 - b. Description and classification of clouds
 - c. Clouds and weather
 - d. Fog
 - e. Artificial modification of clouds and fogs
 4. Precipitation
[see also 222.D. and 723.G.5.]
 - a. Origin of precipitation in clouds, mechanisms of precipitation release
[see also A.3.a., above]
 - b. Types of precipitation: drizzle, rain, freezing rain; snow; sleet, hail
 - c. The world distribution of rainfall
 - d. Effects of precipitation
- B. Winds and storms
[see also 221.B.]
 1. Development and distribution of cyclones and anticyclones
 2. Lightning and thunderstorms
[see also 127.A. and B.]
 3. Tornadoes, hail, and other severe phenomena associated with organized storms or squall lines
 4. Tropical cyclones: hurricanes and typhoons

C. Weather forecasting

1. Synoptic weather data: the collection and correlation of meteorological observations
2. Numerical weather prediction and numerical climate modeling
3. Short-range forecasting
 - a. Nowcasting: predictions based on computer analyses of radar and satellite observations of local atmospheric conditions
 - b. Model Output Statistics: extrapolation of weather conditions, using statistical relations between numerical model forecasts and past weather phenomena
4. Long-range forecasting
 - a. Enhancing the reliability of extended-range prediction through systematic studies of atmosphere-ocean interactions; *e.g.*, El Niño/Southern Oscillation (ENSO)
 - b. Limits to predictability

D. Weather lore

E. Climate: the aggregate of weather

[see also 133.B.5., 221, and 723.G.5.]

1. Factors that generate climate
 - a. Solar radiation
 - i. Variability of incident radiation; the solar constant
 - ii. Effects of the atmosphere: absorption by dust and gases, including the trapping of solar radiation of infrared wavelength (the so-called greenhouse effect)
 - iii. Variations in the Earth's albedo due to clouds and ice
 - b. Temperature
 - c. Atmospheric pressure
 - d. The world's oceans
 - e. The moisture cycle
2. Climatic variation
 - a. Seasonal changes resulting from the north-south migration of belts of cyclonic activity and other cyclic processes
 - b. Local effects: modification of climate by local terrain and surface conditions
 - c. Effects of human activities on global climate; *e.g.*, greenhouse warming induced by high concentrations of carbon dioxide (from the burning of fossil fuels) and other trace gases in the atmosphere
[see also 241.B.5. and 737.C.1.]
3. Climatic types: the Köppen classification system, world climates and their distribution
4. Influences of climate on terrestrial life
5. Microclimates
[see also 351.B.]
6. Climatic change
 - a. Evidence: *e.g.*, landscape features associated with glaciations; fluctuations of lake and sea levels; pollen stratigraphy; archaeological and historical data
 - b. Identified causes of certain forms of climatic variation: variations in the tilt of the Earth's axis and orbital motion; variations in atmospheric composition; volcanic dust loading of the atmosphere; and changes in the distribution of land and sea due to plate-tectonic activity

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major article dealing with weather and climate

Climate and Weather

MICROPAEDIA: Selected entries of reference information

General subjects

<i>atmospheric humidity and precipitation:</i>	cyclostrophic wind	<i>climate and climatic variation:</i>	windchill
aerosol	etesian wind	autumn	World Weather Watch
cloud	foehn	climate	<i>weather disturbances and related phenomena:</i>
condensation	geostrophic motion	drought	atmospheric
nucleus	gradient wind	Indian summer	turbulence
dew	gregale	microclimate	blizzard
fog	haboob	pluvial regime	lightning
frost	Hadley cell	season	storm
hail	harmattan	snow line	thunder
hoarfrost	horse latitude	spring	thunderstorm
humidity	jet stream	summer	tornado
precipitation	katabatic wind	timberline	tropical cyclone
rain	khamsin	urban climate	<i>weather lore:</i>
rime	lee wave	winter	Groundhog Day
snow	levanter	<i>meteorological measurement and weather forecasting:</i>	Saint Swithin's Day
<i>atmospheric pressure and wind:</i>	microburst	Beaufort scale	<i>other:</i>
anticyclone	mistral	hygrometer	almanac
atmospheric circulation	monsoon	isentropic chart	El Niño
atmospheric pressure	polar anticyclone	isobar	front
bora	Siberian anticyclone	isotherm	greenhouse effect
breeze	sirocco	psychrometer	smog
Buy's Ballot's law	subtropical high	temperature–humidity index	sunlight
convergence and divergence	surge	weather bureau	weather
cyclone	tricellular theory	weather forecasting	modification
	updraft and downdraft	weather map	
	wind		

Biographies

See Section 10/33 of Part Ten

INDEX: See entries under all of the terms above

Division III. The Earth's Surface Features

[For Part Two headnote see page 65.]

The outlines in the two sections of Division III deal with the basic physical features of the Earth's surface and with the features produced by geomorphic processes acting on the Earth's surface.

Section 231. Physical Features of the Earth's Surface 79

232. Features Produced by Geomorphic Processes Acting on the Earth's Surface 81

Section 231. Physical Features of the Earth's Surface**A. Vertical relief of the Earth's surface**

1. Hypsography of the Earth's surface: distribution of land and sea, elevation of the continents, coastlines
2. Physiography of the continents: Europe, Asia, Africa, Australia, North America, South America, Antarctica
3. The oceanic regions
 - a. Principal oceanic features: continental margins, oceanic ridges, deep-sea trenches, and abyssal hills and plains

[see C., D., and G., below, and 723.G.3.]

- b. Oceanic physiography
- B. The stable platform regions of the continents
 - 1. The continental shield areas and their age, structure, and constituent rocks
[see also 214.B.4.b.]
 - 2. Uplift, downwarp, and fracture of continental platforms
 - a. Plateaus and basins
 - b. Rift valleys
 - c. Water bodies occupying fault-bounded structural depressions: lakes and landlocked seas; inland seas with outlets to the oceans; elongated seas formed by crustal separation
- C. The continental shelf, slope, and rise
 - 1. Composition: evidence from bottom samples, geophysical techniques
 - 2. Structure and origin
 - 3. Submarine canyons incising the continental terrace
- D. The oceanic deeps
 - 1. Components of ocean basins
 - a. The oceanic crust
 - b. Major features of the deep-ocean floor: oceanic ridges, aseismic ridges, trenches, fracture zones, and transform faults; seamounts and guyots; abyssal hills and plains; sediments of the ocean floor
[see also G., below]
 - 2. The origin of ocean basins
[see also 241.F.]
- E. Coral islands, coral reefs, and atolls
[see also 354.B.2.]
- F. The major mountain ranges and fracture zones of the Earth's crust on the continents and beneath the oceans
 - 1. Types of mountains; *e.g.*, volcanic, block-fault, folded
 - 2. The worldwide system of mountain ranges, fracture zones, and volcanic island arcs
 - a. The Circum-Pacific System
 - b. The Tethyan System
 - c. Subsidiary mountain ranges
 - d. The volcanic island arc systems
 - e. The rock types constituting the folded mountain ranges and island arcs
[see 212.G. and 214.B.4.]
- G. Oceanic ridges
 - 1. Classification of ridges
 - a. The global oceanic ridge system: spreading-centre zones and associated phenomena
 - b. Aseismic ridges
 - 2. Origin and growth of ridges
 - a. General geophysical properties
 - b. Oceanic ridges as manifestations of divergent lithospheric plate boundaries
[see also 241.F.]
 - 3. Occurrence and distribution of ridges in the Atlantic, Pacific, and Indian oceans

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the physical features of the Earth's surface

Continental Landforms
Earth, The: Its Properties,
Composition, and Structure

Oceans
Plate Tectonics
Volcanism

MICROPAEDIA: Selected entries of reference information

General subjects

<i>continental shelf and slope:</i>	continental shield	volcanic dome	oceanic ridge
continental shelf	cuesta	volcano	oceanic trough
continental slope	dome	<i>oceanic structures</i>	seamount
submarine canyon	drumlin	<i>and features:</i>	submarine gap
submarine fan	esker	abyssal hill	<i>other:</i>
submarine slump	meteorite crater	abyssal plain	continent
<i>landforms and surface features:</i>	mountain	archipelagic apron	density current
alluvial fan	pediment	atoll	landform
basin	plain	cay	lake
beach	plateau	coral reef	marine sediment
canyon	playa	deep-sea trench	ocean
cave	rift valley	guyot	ooze
cinder cone	saline flat	island	
	salt dome	island arc	
	sand dune	oceanic plateau	

Biographies

See Section 10/33 of Part Ten

INDEX: See entries under all of the terms above

Section 232. Features Produced by Geomorphic Processes Acting on the Earth's Surface

- A. The action of the hydrosphere and atmosphere on the Earth's surface features
 1. The process of weathering: the disintegration and alteration of rocks at or near the Earth's surface
 2. Soil formation as a result of weathering
 - a. Processes and factors in soil formation
[see also 354.A.2.b.]
 - b. Classification and distribution of soils
 - c. Soil crusts
 - d. Soil erosion and deterioration
 3. Gravitational processes: earth movements on slopes
 4. Fluvial processes
[see also 126.F.3.]
 - a. Entrainment and transport of materials
 - b. Erosion, deposition
 - c. The sediment yield of drainage systems
 - d. The formation of hillslopes
 5. Eolian processes
 - a. Transportation of rock debris by wind
 - b. Effects of wind transport
 - c. Deposition by wind: formation and migration of dunes, the role of vegetation
 - d. Wind action and the works of humankind
 6. Marine processes
 - a. Erosion and deposition of coastal materials by waves and currents
 - b. Transport of sediment by density flows
 7. Glacial processes: erosion, transport, deposition, glacial loading and unloading, periglacial processes
[see also C.6., below]
 8. Lacustrine processes
 - a. Erosion and deposition by waves and currents

- b. Sedimentation in lakes
 - c. Effects of flora and fauna on lakes and lake systems
[see 354.B.3.a.]
- B. The actions of the biosphere, exosphere, and lithosphere upon the Earth's surface features
- 1. Biological processes
[see also 351]
 - a. Effects of plants and organisms on rock weathering and soil formation
[see A.1. and A.2.a., above]
 - b. Effects of vegetation type and density on sediment yield
[see A.4.c., above]
 - c. Effects of humankind on the Earth's surface features; *e.g.*, land cultivation, mining, construction of artificial channels and dams
[see also 355, 731, 733.B., 734, 736, and 737]
 - 2. Extraterrestrial processes: the occurrence of meteorite craters
[see also 133.A.3.c.]
 - 3. Volcanic-tectonic processes
[see also 212.D.4., 212.G., 231.F., and 241.E.]
- C. The characteristic features of the Earth's major environments
- 1. The fluvial environment
[see also 354.B.3.b.]
 - a. Distribution of rivers in nature
 - b. Drainage patterns
 - c. The geometry of river systems
 - d. Streamflow and fluvial landforms: peak discharge and flooding, river floodplains and terraces, river deltas, ephemeral streams, waterfalls
 - e. The evolution of river systems through geologic time
 - 2. The lacustrine environment
[see also 354.B.3.a.]
 - a. Lake basins
 - b. Lake hydraulics: lake currents, surface waves, seiches, effects of wave and current action
[see also 222.G.1.]
 - c. Lakes in arid regions
[see C.5., below]
 - d. Glacial lakes
[see C.6., below]
 - e. Swamps, marshes, and bogs
 - 3. The estuarine environment
 - a. The formation and destruction of estuaries
 - b. Hydrologic features of estuaries
 - 4. The marine environment
[see also 354.B.4.]
 - a. Coastal features resulting from depositional processes
 - i. Beaches: materials, morphological features, physical processes
 - ii. Sand dunes and sandbars
 - iii. River deltas
[see C.1.d., above]
 - iv. Coral reefs
[see 231.E.]
 - v. Lagoons
 - vi. Marshes
[see C.2.e., above]
 - b. Coastal features resulting from erosional processes: sea cliffs and related landforms

- c. Coastal features dependent on bedrock type, bedrock structure, or local topography: grottoes, spouting holes, fjords, peninsulas, islands
 - d. Submerged coastal features: the continental shelf and slope, submarine canyons
[see 231.C.]
5. The desert environment
[see also 354.A.1.c.]
- a. Geomorphic processes that shape desert landforms
 - b. Surficial features of deserts
 - i. Mountains, plateaus, pinnacles, and similar features
 - ii. Alluvial fans: fan-shaped sedimentary deposits bordering highlands from which the sediment was derived
 - iii. Pediments: bedrock surfaces fringing desert highlands
 - iv. Desert plains, basins, depressions
 - v. Playas, pans, saline flats
 - vi. Sand sheets and sand dunes
 - c. Desert boundaries: expansion and contraction of desert areas
[see also 223.E.6.]
6. The glacial environment
[see also 354.A.1.d.]
- a. Processes of glaciation
[see A.7., above]
 - b. Landforms produced by glacial erosion
 - i. Rock polish, striations, grooves, and other small-scale features
 - ii. Glaciated valleys, cirques, arêtes, horns, fjords
 - iii. Glacially eroded rock basins in non-mountainous regions
 - c. Landforms produced by glacial deposition
 - i. Glacial till, moraines, drumlins, and other landforms of nonstratified drift
 - ii. Ice-contact deposits, kames, eskers, and other landforms of stratified drift
 - iii. Glaciolacustrine sediments and associated landforms
 - d. Landforms produced by periglacial processes
 - i. Permafrost
 - ii. Talus, rock glaciers, block fields
 - iii. Patterned ground, including stone nets, stripes, and polygons, and features related to the melting of buried ice masses
7. The polar environment
[see C.6., above, and 354.A.1.d.]
8. The tropical environment: jungles, rain forests
[see also 354.A.1.c.]
9. The temperate environment: woodlands and grasslands
[see also 354.A.1.c.]
10. The subterranean environment: *e.g.*, caves and cave systems
[see also 354.A.1.d.]
11. Karst topography
- D. Basic concepts in the theory of landform evolution
- 1. The concept of uniformitarianism
[see also 242.A.2.a.]
 - 2. The concept of the cycle of erosion
 - 3. The concept of morphogenetic regions
 - 4. The concept of dynamic equilibrium
 - 5. The concept of entropy
[see also 124.A.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the features produced by geomorphic processes acting on the Earth's surface

Continental Landforms	Lakes
Earth, The: Its Properties, Composition, and Structure	Oceans
Geomorphic Processes	Rivers
Ice and Ice Formations	Soils
	Volcanism

MICROPAEDIA: Selected entries of reference information

General subjects

<i>effects of fluvial processes:</i>	drumlin	<i>physiographic effects of eolian processes:</i>	geyser
alluvial fan	esker	barchan	hot spring
arroyo	estuary	desert varnish	lava cave
badland	fjord	playa	mud volcano
bajada	glacial stage	saline flat	volcanic dome
delta	glacial valley	sand dune	volcano
desert pavement	ice cave	seif	<i>other:</i>
drainage basin	kettle	<i>soil formation and major soil types:</i>	astrobleme
floodplain	moraine	alfisol	meteorite crater
fluvial process	moulin	aridisol	morphogenetic region
inselberg	outwash	chernozem	peneplain
meander	roche moutonnée	clay	permafrost
oxbow lake	till	entisol	pingo
river	<i>gravitational processes on hillslopes:</i>	histosol	polder
river terrace	avalanche	humus	residual landform
streambed	creep	inceptisol	thermokarst
valley	landslide	kaolisol	
waterfall	mass movement	laterite	
<i>effects of weathering:</i>	mudflow	mollisol	
calcrete	rock glacier	oxisol	
cave	<i>marine features produced by wave action:</i>	podzol	
duricrust	beach	podzolic soil	
exfoliation	beach cusp	soil	
ferricrete	chenier	spodosol	
pediment	lagoon	ultisol	
pepino hill	sandbar	vertisol	
sinkhole	sea cave	<i>volcanic structures and related phenomena:</i>	
weathering	wave-cut	cinder cone	
<i>glacial features and landforms:</i>	platform	fumarole	
chatter mark			
cirque			

Biographies

See Section 10/33 of Part Ten

INDEX: See entries under all of the terms above

Division IV. The Earth's History

[For Part Two headnote see page 65.]

The outlines in the three sections of Division IV deal with the origin and development of the Earth and its envelopes; the interpretation of the geologic record; and the eras and periods of geologic time.

Section 241. Origin and Development of the Earth and Its Envelopes 85

242. The Interpretation of the Geologic Record 86

243. The Eras and Periods of Geologic Time 88

Section 241. Origin and Development of the Earth and Its Envelopes

- A. The origin and evolution of the lithosphere
[see also 213.A.]
 - 1. Theories of the origin of the Earth
 - 2. The development of crust from mantle: processes involved in the geochemical differentiation of the Earth's outer layers
- B. The origin and evolution of the atmosphere
[see also 221.A.]
 - 1. The relation of the development of the Earth's atmosphere to the origin of the solar system and the development of other planetary atmospheres
 - 2. The original atmosphere of the Earth
 - 3. Development of the present terrestrial atmosphere
[see also 335.B.]
 - 4. The present atmosphere
[see 221.A.]
 - 5. Effects of human activities and their ramifications; *e.g.*, acid rain resulting from the emission of sulfur dioxide; ozone depletion caused by the release of chlorofluorocarbons; greenhouse warming induced by the buildup of carbon dioxide
[see also 223.E.2.c.]
- C. The origin and evolution of the hydrosphere
 - 1. The early oceans
 - 2. The chemical view of the modern oceans
 - 3. The present hydrosphere
[see 222]
- D. The formation and growth of the continents
 - 1. The Earth's crust and upper mantle
[see also 212.D.3., 213.A., 214.B.1.c., and 232]
 - 2. Endogenic regimes of the continents: geosynclines, platforms, rifts, continental margins
[see also 231]
 - 3. The relation between endogenic regimes and deep-seated Earth processes
- E. The formation and growth of mountain ranges and belts
 - 1. The distribution of mountain belts in relation to global tectonics
 - 2. The tectonic mountain belts
[see also 212.G., 214.B., and 231.F.]
 - 3. The geosynclinal hypothesis of mountain building
 - 4. The development of mountain systems
- F. The theory of plate tectonics
 - 1. Early speculations about the existence of a single supercontinent and its fragmentation into the present-day landmasses

2. Wegener's concept of continental drift
3. Hess' seafloor spreading model
4. Plate tectonics as a unifying theory
 - a. Lithospheric plate boundaries as sites of volcanism, seismicity, and orogeny
 - b. The impact of continental drift on the evolution of life-forms

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the origin and development of the Earth and its envelopes

Atmosphere
 Earth, The: Its Properties, Composition, and Structure
 Plate Tectonics
 Volcanism

MICROPAEDIA: Selected entries of reference information

General subjects

<i>atmosphere and</i>	<i>landmasses and</i>	plate tectonics	orogeny
<i>hydrosphere:</i>	<i>ocean basins:</i>	seafloor spreading	sedimentation
atmosphere	continental drift	hypothesis	subsidence
Earth	Gondwanaland	<i>evolution of the</i>	uplift
hydrosphere	Laurasia	<i>Earth's crust:</i>	volcanism
ocean	Pangaea	epeirogeny	weathering
		erosion	

Biographies

See Section 10/33 of Part Ten

INDEX: See entries under all of the terms above

Section 242. The Interpretation of the Geologic Record

- A. The stratigraphic interpretation of the geologic record
 1. The layered rocks of the Earth's crust and their depositional environments: the nature of the rock record
 [see also 214.B.2.]
 - a. Clastic sedimentary rocks
 - b. Carbonate rocks
 - c. Volcanic rocks
 - d. Cyclic deposits: cyclothems, varved deposits
 2. Stratigraphic classifications and their historical development: criteria for the correlation of layered deposits
 - a. The principle of uniformitarianism
 - b. The principle of superposition of strata
 - c. The idea of a fossil succession
 - d. The facies concept
 - e. The stage concept
 - f. The recognition of zones
 - g. Radiometric dating
 [see D.2., below]
 3. Stratigraphic nomenclature in theory and practice
 - a. Stratigraphic terminology and its standardization

- b. Stratigraphic boundary problems
 - c. Special stratigraphic terminologies and divisions
- B. The paleontological interpretation of the geologic record
- 1. The nature of fossils and fossilization processes
 - 2. The fossil record
 - a. Precambrian life: the Proterozoic fossil record
 - i. The origin of life
[see 312.A.]
 - ii. Precambrian protists, plants, and animals: the Gunflint Chert deposits, Ediacara fauna, and other remains
 - b. Post-Precambrian life: the Phanerozoic fossil record
[see also 243 and 313]
 - i. Fossil plants
 - ii. Fossil protists
 - iii. Fossil sponges
 - iv. Fossil cnidarians (*e.g.*, corals)
 - v. Fossil mollusks (*e.g.*, ammonoids)
 - vi. Conodonts
 - vii. Bryozoans
 - viii. Brachiopods
 - ix. Fossil arthropods (*e.g.*, trilobites)
 - x. Fossil echinoderms (*e.g.*, sea lilies)
 - xi. Graptolites
 - xii. Fossil fish
 - xiii. Fossil amphibians
 - xiv. Dinosaurs and other fossil reptiles
 - xv. Fossil birds
 - xvi. Fossil mammals
 - 3. The appearance and disappearance (mass extinctions and background extinctions) of species revealed in the fossil record
[see also 312.B.]
 - 4. The paleontological criteria for the correlation of layered rocks
 - a. Index fossils
 - b. Faunal and floral assemblages
 - c. Organic microfossils: pollen, spores, tests
- C. Relative age dating
- 1. Application to geologic problems: stratigraphic correlation and the relative geologic time scale
[see also 243]
 - 2. Application to archaeological problems
[see 10/41.B.2.b.]
- D. Absolute dating
- 1. General considerations: the meaning of absolute age, requirements for absolute dating, the rate of record accumulation
 - 2. Radiometric dating
[see also 723.G.8.]
 - a. Radioactivity and radioactive decay
[see 112.C.]
 - b. Principles of radiometric dating

- c. Definition of time zero, sources of error in radiometric dating
- d. Dating methods
- 3. Non-radiometric dating: biological and geologic processes as absolute chronometers
- 4. Applications of absolute dating
 - a. The absolute geologic time scale
 - b. Determination of the age of the Earth and the ages of rocks and meteorites
 - c. Determination of the rates of seafloor spreading
- E. The paleogeographical interpretation of the geologic record
- F. The reconstruction of the geologic history of the Earth based on the global correlation of the accumulated evidence from the rock record
[see 241 and 243]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the interpretation of the geologic record

Earth, The: Its Properties, Composition, and Structure

Geochronology: The Interpretation and Dating of the Geologic Record

MICROPAEDIA: Selected entries of reference information

General subjects

carbon-14 dating	helium dating	potassium-argon dating	uniformitarianism
dating	horizon	protactinium-231–thorium-230 dating	uranium-thorium-lead dating
dendrochronology	index fossil	radiation-damage dating	varved deposit
Earth	ionium-thorium dating	sedimentary facies	
faunal succession, law of	lead-210 dating	tephrochronology	
fission-track dating	paleogeography		
fossil	polychaete		
geochronology	hypothesis		

Biographies

See Section 10/33 of Part Ten

INDEX: See entries under all of the terms above

Section 243. The Eras and Periods of Geologic Time

- A. Precambrian time: from the time of formation of the oldest rocks to 540 million years ago
- B. The Paleozoic Era: from 540 to 245 million years ago
 - 1. The Cambrian Period
 - 2. The Ordovician Period
 - 3. The Silurian Period
 - 4. The Devonian Period
 - 5. The Carboniferous Period
 - 6. The Permian Period
- C. The Mesozoic Era: from 245 to 66.4 million years ago
 - 1. The Triassic Period
 - 2. The Jurassic Period
 - 3. The Cretaceous Period

D. The Cenozoic Era: from 66.4 million years ago to the present

1. The Tertiary Period
2. The Quaternary Period
[see also 411.C.]
 - a. The Pleistocene Epoch
[see also 223.E.6. and 232.C.6.]
 - b. The Holocene, or Recent, Epoch

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the eras and periods of geologic time

Earth, The: Its Properties, Composition, and Structure
 Geochronology: The Interpretation and Dating of the Geologic Record
 Volcanism

MICROPAEDIA: Selected entries of reference information

General subjects

<i>Cenozoic:</i>	Sub-Atlantic	Catskill Delta	Wenlock Series
Allerød	Climatic Interval	Chesterian Series	Williston Basin
Blytt-Sernander system	Sub-Boreal	Cincinnati Arch	<i>Precambrian:</i>
Boreal Climatic Interval	Climatic Interval	Cincinnati Series	Animikie Series
Bronze Age	Tertiary Period	Coal Measures	Belt Series
Cenozoic Era	Trinil faunal zone	Conemaugh Series	Bitter Springs microfossils
Eocene Epoch	<i>Mesozoic:</i>	Dalradian Series	Bruce Series
Florissant Formation	Clarence Series	Devonian Period	Coutchiching Series
Great Drought	Coniacian Stage	Lipalian interval	Grand Canyon Series
Holocene Epoch	Cretaceous Period	Llandeilan Series	Gunflint microfossils
Hypsithermal Climatic Interval	Gulf Series	Llandovery Series	Katangan Complex
Iron Age	Hell Creek Formation	Llanvirn Series	Lewisian Complex
Laurentide Ice Sheet	Jurassic Period	Ludlow Series	Longmyndian
London Clay	Lance Formation	Mississippian Period	Onverwacht Series
Mauer	Mesozoic Era	Nashville Dome	Precambrian time
Mesolithic Period	Niobrara	Niagaran Series	Proterozoic Eon
Miocene Epoch	Limestone	Old Red Sandstone	Seine Series
Neogene Period	Pierre Shale	Ordovician Period	Sturtian Series
Neolithic Period	Purbeck Beds	Paleozoic Era	<i>other:</i>
Oligocene Epoch	Solnhofen Limestone	Paradoxides Series	ice age
Paleocene Epoch	Stormberg Series	Pennsylvanian Period	Phanerozoic Eon
Paleogene Period	Taitai Series	Permian Basin	
Paleolithic Period	Triassic Period	Permian Period	
Pleistocene Epoch	<i>Paleozoic:</i>	Pottsville Series	
Pliocene Epoch	Alberta Basin	Queenston Delta	
Quaternary Period	Arenig Series	Salado Formation	
Salpausselkä ridges	Ashgill Series	Silurian Period	
Scandinavian Ice Sheet	Beaufort Series	Virgilian Series	
	Cambrian Period		
	Caradoc Series		
	Carboniferous Period		

Biographies

See Section 10/33 of Part Ten

INDEX: See entries under all of the terms above

Introduction to Part Three: The Mysteries of Life

By René Dubos

We take for granted the existence of life on Earth. Yet, as far as we now know, life exists nowhere else in the solar system, its origin is still a mystery, and its effects on our planet have been little short of miraculous. Without life the surface of the Earth and its atmosphere would be very different from what they are now. We are both spectators and actors in a continuing performance where life is both author and producer, and for which the Earth serves as an ever-changing stage.

Cataclysms give us now and then a glimpse of what our planet would look like without life. In 1883, a series of stupendous volcanic eruptions destroyed two-thirds of Krakatoa Island in the Malay archipelago and covered what was left of it with a thick layer of lava. All living things were killed, not only on Krakatoa itself, but also on the neighbouring islands that were in the path of the tidal wave generated by the explosion and of the volcanic fallout. What had once been a luscious tropical forest suddenly became a gray and lifeless landscape, as desolate as the surface of the Moon.

Pictures taken of Krakatoa in the months following the disaster help us to realize that what we regard as the surface of the Earth is less a geological structure than a living mantle. Our planet would be drab and dusty, an insignificant object in space, if it were not for the myriad of living forms that have generated its atmosphere and its soil out of gases and rocks. In fact, the phrase "life on Earth" is somewhat misleading because the surface of the Earth as we experience it, with its entrancing diversity and colourful warmth, is literally a product of biological activities—a creation of life.

Krakatoa remained a desolate landscape for a long time after the 1883 volcanic explosion. But progressively the wind and the sea brought back to its sterilized surface a multiplicity of living things, some of which managed to establish a permanent foothold on the lava. Today, the island harbours once more a rich flora and fauna, not very different from that of the native forest of the Malay archipelago.

There is a paradox in the marvelous resiliency of nature. On the one hand, all individual forms of life are extremely delicate. And yet life itself has been capable of prevailing over brute physical forces for several billion years, and has generated immensely diversified ecosystems that have remained viable even under the most inhospitable conditions. Life probably emerged from inanimate matter, but it is now more powerful than inanimate matter.

All biological phenomena are of practical importance because they determine the characteristics of the Earth's surface and therefore affect the quality of human life. Men have always been concerned with the contributions that living things make to their immediate environment and to the global economy; they have wondered how the flora

and fauna become more or less stabilized under normal conditions, and manage to reestablish stable ecosystems after cataclysms; in our times they worry to what extent living things can be disturbed or eliminated by urbanization and industrialization without thereby threatening human welfare.

But the phrase "life on Earth" also raises other questions of a more philosophical character, questions that have been in the minds of humble, uneducated people even before they became the preoccupation of scholars. In the universe at large, lifelessness is the rule, life the puzzling exception. How do living things differ from inanimate matter? How did they originate? And can life be created *de novo*? Is man qualitatively different from the rest of the living world or merely a higher, or the highest, specimen in its evolution, the paragon of animals?

It is clear from the geological record that life has been at home on the Earth for immense periods of time. The types of fossils found in rock formations indicate that all major groups of animals and plants were already represented by recognizable ancestors some 400,000,000 years ago. Furthermore, microscopic structures closely related to the present forms of blue-green algae have been found in geologic formations that are even very much older—some 3,000,000,000 years old. Since these fossils of algae-like organisms have a complex cellular organization, it can be assumed that they had been preceded by simpler forms, and that the origin of life is more ancient than the oldest traces of it which have been detected. In fact, there is no way to know when life first appeared on Earth, because its earliest manifestations were certainly so minute, fragile, and undifferentiated that none of them have survived as fossils.

There is a peculiar fascination to the phrase "the origin of life" because it means different things to different men, and reaches into the deepest layers of their beliefs. For the religious man, it implies the mysteries of divine creation—whether expressed as biological species in their final forms, or as the potentialities posited by Aristotelian philosophers and medieval theologians. For the student of myths, it evokes Aphrodite emerging fully developed from the foam of the sea. The myth may have a factual basis if it is true, as it is commonly believed, that the cradle of life was to be found in the primitive oceans. For the modern scientist the phrase "origin of life" refers to the kind of chemical reactions that first generated complex organic molecules and assembled them in such a manner that they could duplicate themselves—thus converting inanimate matter into living substance.

Whatever the mystical or rational basis of a person's beliefs, there is a universal poetic quality in the thought that life once arose from matter, and has been perpetuating itself ever since. But the only real clue to the origin of life is

that all its forms—at least all the living things we know—have many physicochemical characteristics in common. In particular, they all transfer their hereditary endowment from one generation to the next through the agency of a peculiar kind of molecule known as nucleic acid, the now famous DNA. This uniformity of fundamental structure holds true irrespective of the size, shape, and complexity of the organism—whether it be microbe, plant, animal, or man. Indeed, the similarity in structure of the genetic apparatus throughout the living world is so perfect that it cannot possibly be a matter of chance. The conclusion seems inescapable that all the living forms that now exist have had a common origin.

The simplest hypothesis to account for the origin and evolution of life is that all biological phenomena are caused by the physicochemical forces that govern the inanimate world. Some scientists believe, indeed, that there is nothing very unusual in the emergence of a living molecule from matter. According to them, it is probable that life repeatedly emerged *de novo* on Earth and that it is still emerging today somewhere in the cosmos. By making the reasonable assumption that one of the living forms that appeared on Earth proved more vigorous than the others, it is easy to account for the single origin of all surviving species. If an entirely new genetic form of life were to appear today on Earth, it would have no chance of success, because it could not compete with the established form and all its variations.

The hypothesis that life is nothing more than a special manifestation of ordinary physicochemical forces has the merit of being economical of thought; in addition, it is supported by the fact that all biological phenomena go hand in hand with the kind of reactions observed in the inanimate world. But even if we grant that living phenomena always obey physicochemical laws, this does not constitute decisive evidence that life is merely an expression of these laws. Other theories are conceivable. One of them, rarely voiced because it is not scientifically fashionable, is that some unknown principle runs like a continuous thread through all living forms and governs the organizations of their physicochemical processes. The illustrious Danish physicist Niels Bohr, for example, suggested that “the very existence of life must be considered an elementary fact, just as in atomic physics the existence of a quantum of action has to be taken as a basic fact that cannot be derived from ordinary mechanical physics.”

Uncertainties concerning the fundamental nature of life and its origin would disappear if it were possible to generate at will self-reproducing molecules from inert material. Some experimental findings have recently been quoted as evidence of this possibility.

A fully developed virus, which had been naturally produced by a living organism, was separated into its component parts by chemical procedures. When these separate parts were tested for biological activity, they were found to be inert, that is, they were unable to multiply in a susceptible organism. This biological activity was restored, however, when the parts of the virus were chemically reassembled in the test tube under the proper conditions. Spectacular as this achievement is from the chemical point of view, it does not constitute—as has been claimed—the production of life *de novo*. Since the virus first had to be

produced by a living organism, and since its reassembled parts showed activity only when introduced into a living susceptible organism, all the biological machinery essential for its reproduction had to be provided by preexisting life.

In a completely unrelated kind of experiment, several complex molecules similar to those found in living things have been produced in the laboratory by exposing simple chemicals to the kind of radiation that probably existed in the primitive atmosphere. But this chemical feat does not constitute production of life *de novo* because the molecules so produced have not been assembled—*organized*—in a way enabling them to duplicate themselves and to develop. An organic molecule, however complex and similar to the kind found in living things, still belongs to the realm of inanimate matter if it cannot reproduce and evolve.

To become “living,” an assembly of biogenic molecules must contain the information needed for its further development and must be able to transmit this information to its progeny. Even in its simplest manifestations, life is historical; it embodies the past and carries instructions for the future.

More than a century ago, the French physiologist Claude Bernard gave a clear formulation of the now classical view that the earmark of a living thing is not the chemical composition of its parts but their organization. He wrote: “Admitting that vital phenomena rest upon physicochemical activities, which is the truth, the essence of the problem is not thereby cleared up; for it is no chance encounter of physico-chemical phenomena which constructs each being according to a preexisting plan, and produces the admirable subordination and the harmonious concert of organic activity.

“There is an arrangement in the living being, a kind of regulated activity, which must never be neglected, because it is in truth the most striking characteristic of living beings. . . .”

In this celebrated passage, Bernard used the word “arrangement” to denote the interdependence and integration of the structures and properties of any given living organism. But biological organization applies also to the ecological system of which the organism is a part. All living things, without exception, depend on other living things for their survival and development. Furthermore, the higher the organism is on the evolutionary scale, the more exacting is its dependence on a complex web of life.

One of the major trends of evolution has thus been the emergence of more and more complex ecosystems, exhibiting high degrees of integration. But, paradoxically, an opposite trend can also be detected as one ascends the evolutionary scale—namely, a trend toward freedom or at least toward increasing independence of the individual organism within the constraints of the ecosystem. Freedom becomes more and more apparent as one proceeds from the protoplasmic jelly of biological beginnings to warm-blooded animals roaming in the wild, and finally to man who modifies his environment according to his views of the future. In a real way, evolutionary development is associated with the gradual insertion of more and more freedom into matter and into individual lives.

In the *Outline of Knowledge*, Part Three, concerned with life on Earth, is placed between Parts Two and Four, concerned, respectively, with the Earth itself and

with human life. This positioning is reasonable enough, but one could read into it an assumption that reaches far deeper than the logical ordering of concepts and facts. The tacit assumption is that human life has emerged from the inanimate matter of the Earth through the same kind of evolutionary continuum that links all the other living forms in a great chain of being. In reality, however, the theory of evolution does not provide decisive evidence for this assumption. What is *known* of biological evolution applies only to the anatomical structures and physiological functions of organisms that have lived in the past or are living now. The successive steps from matter to life, and from life to consciousness, have not yet been shown to have taken place through the kind of mechanisms that account for the evolutionary changes of anatomical structures of physiological functions. There exists a continuum from one form of life to another, but extending this continuum to inanimate matter on the one hand, and to human consciousness on the other, is a matter of faith rather than of scientific knowledge.

Even the most cursory observation of nature reveals that all living forms are conditioned by environmental forces, and that reciprocally they shape the environment, thereby contributing to the triumph of life. But it must be realized that the word "life" encompasses different kinds of relations to nature. At its lowest level, "life" implies,

as mentioned above, the deterministic and blind chemical reactions through which an organism—simple or complex as it may be—transmits its distinctive characteristics to its descendants and reacts adaptively to its environment. At its highest, "life" involves man's consciousness and free will and refers to the deep reality of the world within and the affirmation of the individual self, irrespective of the external world.

There is no way at present to link these two extreme and apparently incompatible manifestations of life—biological determinism and human freedom. Yet both are real, and both have been immensely influential in giving the present characteristics to our planet.

The surface of the Earth reflects the activities of countless living things. Even though these operate chiefly through blind, deterministic mechanisms, life introduces on Earth a degree of order, organization, and diversity not found anywhere else in the cosmos, not even in the movement of the celestial bodies. Man emerged, not on the bare planet, but in this orderly and diversified biological world. As soon as he achieved his identity as *Homo sapiens*, he began to insert his free will into ecological determinism. For good or evil, he has now become the most powerful influence in changing the face of the globe. His conscious choices will determine not only his own fate, but also the fate of life on Earth.

Part Three. Life on Earth

Several points about the relations of Part Three to other parts should be noted. The separation of Part Three from Part One, on matter and energy, and from Part Two, on the Earth, reflects a traditional division of labour among the natural sciences. However, the separation is not rigid. The borderline disciplines of biophysics and biochemistry appear throughout Part Three, especially in Division II, concerned with the molecular basis of vital processes. The effects of the Earth's atmosphere and hydrosphere on living things are reflected throughout Part Three, especially in Division V, which is concerned with the biosphere and with ecosystems.

Some fundamental biological knowledge of humans is involved in the treatment throughout Part Three of what is common to all life and to all animals. And Section 355, the last section of Part Three, deals with mankind's place and activities in the biosphere. However, what is specific to human life, human health, and human behaviour is separately dealt with in Part Four, on human life.

The biological sciences have themselves been the object of historical and analytical studies. Such studies are dealt with in Section 10/34 in Part Ten, which treats the historical development of the biological sciences; the methodology, scope, and conceptual structure of biology as a whole; and the several component disciplines at the different levels of biological research.

The design and operation of observational and experimental instruments are important in the development of the biological sciences. Such scientific instrumentation is dealt with in Section 723 of Part Seven.

- Division I. The Nature and Diversity of Living Things 95
 - II. The Molecular Basis of Vital Processes 112
 - III. The Structures and Functions of Organisms 117
 - IV. Behavioral Responses of Organisms 130
 - V. The Biosphere: the World of Living Things 132

Division I. The Nature and Diversity of Living Things

The outlines in the three sections of Division I deal with the nature, the origin and evolution, and the classification of living things.

- Section 311. Characteristics of Living Things 95
 - 312. The Origin of Life and the Evolution of Living Things 96
 - 313. The Classification of Living Things 98

Section 311. Characteristics of Living Things

- A. The concept of life on Earth
 - 1. Properties of life
 - a. Order and form
 - b. Metabolism: catabolism and anabolism
 - c. Sensory reception
 - d. Reproduction, growth, and development
 - e. Interaction with the environment
 - 2. Levels of biotic organization
 - a. Molecular: polymers, carbohydrates, lipids, proteins, and nucleic acids
 - b. Cellular: procaryotic cells and eucaryotic cells
 - c. Organ: tissues, tissue systems, and the whole organism
 - d. Population: species and communities

B. Life beyond the Earth

1. The concept of extraterrestrial life and its chemistry
2. The significance of the search for life beyond Earth
3. Exobiological survey of the solar system: physical environments and biological prospects

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the characteristics of living things

Animals	Growth and Development, Biological
Bacteria and Other Monerans	Life
Behaviour, Animal	Metabolism
Biological Sciences, The	Mimicry
Biosphere, The	Photosynthesis
Cells: Their Structures and Functions	Plants
Coloration, Biological	Protists
Evolution, The Theory of	Reproduction and Reproductive Systems
Fungi	Sensory Reception
Genetics and Heredity, The Principles of	

MICROPAEDIA: Selected entries of reference information

General subjects

apoptosis	evolution	life	metabolism
cell	homeostasis	life cycle	

Biographies

See Section 10/34 of Part Ten

INDEX: See entries under all of the terms above

Section 312. The Origin of Life and the Evolution of Living Things**A. Stages in the emergence of life**

1. Hypotheses about the origin of life
2. Steps in the production of chemical precursors of life
 - a. Formation of the Earth's primitive reducing atmosphere
 - b. Production of simple organic molecules
 - c. Production of long-chain molecules consisting of repeating units
 - d. Origin of the genetic code
3. The earliest living systems
 - a. Evolution of enzymatic reaction chains
 - b. Origin of procaryotic and eucaryotic cells
 - c. Evolution of photosynthesis
4. The antiquity of life: evidence of biological activity in the geological record
[see also 242 and 243]

B. The theory of evolution

1. The history of evolutionary theory
 - a. Lamarck's contribution
 - b. Darwin's theory of natural selection
 - c. Mendel's theory of heredity
 - d. The synthetic theory of evolution
 - e. Molecular and genetic studies

2. The evidence for evolution
 - a. The fossil record of gradual change
 - b. Structural similarities (homologies) of different species
 - c. Vestiges of ancestral forms in embryonic development
 - d. Molecular clues to evolutionary history
- C. The process of evolution
 1. Genetic variation through gene or chromosomal mutation
 2. Changes in gene frequencies within a population through gene mutation, gene migration, and genetic drift
 3. Natural selection
 - a. Adaptation and fitness
 - b. Aspects of the process of natural selection; coloration; mimicry; polymorphism
 - c. Natural selection in the process of genetic change
 - d. Types of selection: stabilizing, directional, diversifying, sexual, and kin
- D. The origin of species and the process of speciation
 1. The distinctiveness of species
 2. The criterion of reproductive isolation
 3. The properties of species
 4. Modes of speciation (*e.g.*, geographic speciation, adaptive radiation, quantum speciation)
 5. Genetic differentiation during speciation
 6. Patterns and rates of species evolution
 - a. The topology (or configuration) of phylogenies
 - b. The rate of morphological change: gradual or punctuational evolution
 - c. Molecular evolution
 7. The relationship between species and other taxonomic categories: family, order, class, phylum

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and a biography dealing with the origin of life and the evolution of living things

Coloration, Biological
 Darwin
 Evolution, Human
 Evolution, The Theory of
 Mimicry

MICROPAEDIA: Selected entries of reference information

General subjects

adaptation	coloration	homology	orthogenesis
aggressive mimicry	concealing	Lamarckism	phylogeny
analogy	coloration	mimicry	polymorphism
auxochrome	Darwinism	mosaic evolution	selection
biopoiesis	dialectic	Müllerian mimicry	species
carotene	evolution	mutation	spontaneous
chromophore	founder principle	natural selection	generation
clone	genetic drift	Origin of Species	

Biographies

See Section 10/34 of Part Ten

INDEX: See entries under all of the terms above

Section 313. The Classification of Living Things

- A. Viruses
- B. Monerans: bacteria and other prokaryotes
- C. Protists
 - 1. Algae
 - 2. Protozoans
 - 3. Slime molds
- D. Fungi
- E. Plants
 - 1. Bryophytes
 - a. Mosses
 - b. Liverworts
 - c. Hornworts
 - 2. Psilotophytes, or whisk ferns
 - 3. Lycophytes (club mosses and allies)
 - 4. Sphenophytes, or horsetails
 - 5. Filicophytes, or ferns
 - a. Ophioglossopsids
 - b. Marattiopsids
 - c. Filicopsids
 - 6. Conifers
 - 7. Ginkgos
 - 8. Cycads
 - 9. Gnetophytes
 - 10. Angiosperms (magnoliophytes), or flowering plants
 - a. Magnoliopsids, or dicots
 - b. Liliopsids, or monocots
- F. Animals
 - 1. Placozoans
 - 2. Porifera, or sponges
 - a. Calcispongiaens
 - b. Hyalospongiaens
 - c. Demospongiaens
 - 3. Mesozoans
 - a. Dicyemids
 - b. Orthonectids
 - 4. Cnidarians, or coelenterates
 - a. Anthozoans (corals; sea anemones; sea fans and sea whips; sea pens and sea pansies)
 - b. Scyphozoans (jellyfish)
 - c. Hydrozoans (hydra)
 - d. Cubozoans (box jellyfishes)
 - 5. Ctenophores, or comb jellies
 - 6. Platyhelminthes, or flatworms
 - a. Turbellarians

- b. Monogeneans
- c. Aspidocotyleans
- d. Trematodes, or flukes
- e. Cestodes, or tapeworms
7. Nemerteans, or ribbon worms
8. Acanthocephalans, or spiny-headed worms
9. Aschelminthes
 - a. Rotifers, or wheel animacules
 - b. Gastrotrichs
 - c. Kinorhynchates
 - d. Nematodes, or roundworms
 - e. Nematomorphs, or horsehair worms
10. Priapulids
11. Annelid worms
 - a. Polychaetes, or marine worms
 - b. Oligochaetes, or terrestrial worms
 - c. Hirudineans, or leeches
12. Tardigrades, or water bears
13. Onychophorans, or velvet worms
14. Arthropods
 - a. Crustaceans
 - b. Uniramians (millipedes, centipedes, pauropods, symphylans, and insects)
 - c. Chelicerates (sea spiders, horseshoe crabs, and arachnids)
15. Mollusks
 - a. Tryblids, or neopilinids
 - b. Solenogastres, or narrow-footed gliders
 - c. Caudofoveatans, or mudmoles
 - d. Placophorans, or chitons
 - e. Pelecypods, or bivalves (clams, mussels, oysters, scallops, and cockles)
 - f. Scaphopods, or tusk shells
 - g. Gastropods (limpets, snails, and slugs)
 - h. Cephalopods (nautilus; cuttlefishes, squids, and octopuses)
16. Bryozoans, or moss animals
 - a. Phylactolaemates
 - b. Stenolaemates
 - c. Gymnolaemates
17. Phoronids, or horseshoe worms
18. Brachiopods, or lamp shells
 - a. Inarticulates
 - b. Articulates
19. Sipunculid worms, or peanutworms
20. Chaetognaths, or arrowworms
21. Echiurids, or spoonworms
22. Echinoderms
 - a. Crinozoans, or sea lilies
 - b. Echinozoans (sea urchins, heart urchins, and sand dollars; sea cucumbers)
 - c. Asterozoans (starfish, brittle stars, and sea daisies)

- 23. Hemichordates
 - a. Enteropneusts, or acorn worms
 - b. Pterobranchs
- 24. Pogonophors, or beardworms
- 25. Chordates
 - a. Tunicates (sea squirts, appendicularians, and thaliaceans)
 - b. Cephalochordates, or lancelets
 - c. Vertebrates (hagfishes and lampreys; placoderms; sharks, skates, and rays; bony fishes; amphibians; reptiles; birds; mammals)

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the classification of living things

Algae	Birds	Flatworms:	Moss Animals:
Amphibians	Bryophytes	Phylum	Phylum Bryozoa
Angiosperms: The	Chordates	Platyhelminthes	Plants
Flowering Plants	Cnidarians	Fungi	Protists
Animals	Crustaceans	Gymnosperms	Protozoa
Annelids	Dinosaurs	Insects	Reptiles
Arachnids	Echinoderms	Lamp Shells:	Sponges: Phylum
Arthropods	Ferns and Other	Phylum	Porifera
Aschelminths	Lower Vascular	Brachiopoda	Viruses
Bacteria and Other	Plants	Mammals	
Monerans	Fishes	Mollusks	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>amphibians:</i>	<i>angiosperms—beech</i>	gray birch	chin cactus
amphibian	<i>order:</i>	hop-hornbeam	cholla
amphiurna	beech	hornbeam	Christmas cactus
arrow-poison frog	Betulaceae	paper birch	Easter cactus
axolotl	black oak	river birch	fishhook cactus
bullfrog	bur oak	sweet birch	hedgehog cactus
Cacops	chestnut	white birch	leaf cactus
caecilian	chestnut oak	yellow birch	living-rock cactus
clawed frog	chinquapin	<i>angiosperms—</i>	mammillaria
Diadectes	English oak	<i>buttercup order:</i>	melon cactus
Eryops	Fagales	anemone	night-blooming
fire-bellied toad	live oak	baneberry	cereus
frog	oak	barberry	old-man cactus
green frog	pin oak	Berberidaceae	Opuntia
hellbender	red oak	bugbane	organ-pipe cactus
Ichthyostega	tanbark oak	buttercup	peyote
labyrinthodont	white oak	Christmas rose	pin cushion cactus
leopard frog	willow oak	Clematis	prickly pear
Leptodactylidae	<i>angiosperms—</i>	columbine	Rhipsalis
midwife toad	<i>bellflower order:</i>	globeflower	saguaro
mud puppy	balloonflower	hellebore	Schlumbergera
Myobatrachidae	bellflower	hepatica	sea-urchin cactus
narrow-mouthed	Campanulales	larkspur	<i>angiosperms—caper</i>
toad	harebell	mayapple	<i>order:</i>
newt	Lobeliaceae	meadow rue	Brassicaceae
salamander	rampion	monkshood	broccoli
Seymouria	tuftycell	Oregon grape	Brussels sprouts
siren	<i>angiosperms—birch</i>	Ranunculaceae	cabbage
spadefoot toad	<i>order:</i>	Ranunculales	candytuft
Surinam toad	alder	<i>angiosperms—cactus</i>	Capparales
tadpole	Balanopales	<i>order:</i>	cauliflower
toad	birch	barrel cactus	charlock
tree frog	filbert	cactus	Chinese cabbage

collard	ebony	<i>angiosperms</i> —	love grass
cress	persimmon	<i>gentian order:</i>	millet
kale	pimpernel	Apocynaceae	muhly
Kerguelen cabbage	primrose	Asclepiadaceae	needlegrass
kohlrabi	Primulales	bedstraw	oat grass
marsh cress	sapodilla	buckbean	oats
mustard	storax	carrión flower	panicum
peppergrass	<i>angiosperms</i> —	coffee	Paspalum
radish	<i>euphorbia order:</i>	Gentianales	Pennisetum
rape	boxwood	Indian hemp	Poaceae
rock cress	Buxaceae	Loganiaceae	quack grass
rocket	cassava	madder	reed
spiderflower	castor-oil plant	oleander	Restionales
stock	copperleaf	partridgeberry	rice
toothwort	croton	periwinkle	rye
turnip	crown of thorns	Rubiaceae	ryegrass
wallflower	Euphorbiaceae	<i>angiosperms</i> —	sorghum
whitlow grass	Euphorbiales	<i>geranium order:</i>	sugarcane
<i>angiosperms</i> —	jatropha	Barbados cherry	wheat
<i>composite order:</i>	jojoba	flax	wild rice
artichoke	manchineel	Geraniales	<i>angiosperms—heath</i>
Asteraceae	mercury	geranium	<i>order:</i>
basket-flower	Omphalea	Impatiens	Arbutus
boneset	Phyllanthus	lignum vitae	azalea
chamomile	poinsettia	nasturtium	bilberry
Chrysanthemum	redbird cactus	Oxalis	blueberry
cineraria	sandbox tree	shamrock	Clethra
coneflower	spurge	wood sorrel	cranberry
dandelion	tung tree	<i>angiosperms—ginger</i>	crowberry
endive	<i>angiosperms—figwort</i>	<i>order:</i>	Ericales
fleabane	<i>order:</i>	abaca	Gaultheria
goldenrod	Acanthaceae	arrowroot	heath
groundsel	ash	banana	heather
guayule	belladonna	bird-of-paradise	huckleberry
Jerusalem	Bignoniaceae	flower	Indian pipe
artichoke	bladderwort	Cannaceae	kalmia
lettuce	broomrape	ginger	kiwi
marigold	eggplant	ginger lily	Labrador
pussy-toes	figwort	Marantaceae	tea
safflower	forsythia	Musaceae	leatherleaf
sunflower	foxglove	plantain	Lyonia
thistle	Gesneriaceae	prayer plant	Pieris
zinnia	henbane	Strelitziaceae	pipsissewa
<i>angiosperms</i> —	Indian paint brush	Zingiberaceae	rhododendron
<i>dogwood order:</i>	jacaranda	Zingiberales	Vaccinium
angelica	jasmine	<i>angiosperms—grass</i>	wintergreen
anise	lilac	<i>families:</i>	<i>angiosperms—laurel</i>
Apiaceae	mullein	agrostology	<i>order:</i>
Araliaceae	nightshade	Arundinaria	avocado
carrot	Oleaceae	bamboo	California laurel
Cornales	olive	barley	greenheart
cow parsnip	petunia	beach grass	lambkill
dogwood	potato	bent grass	Laurales
fatsia	privet	bluegrass	laurel
ivy	sausage tree	bluestem	sassafras
parsnip	Scrophulariales	bromegrass	sweet shrub
poison hemlock	Solanaceae	cordgrass	<i>angiosperms—lily</i>
schefflera	tea olive	corn	<i>and iris orders:</i>
tupelo	toadflax	crabgrass	Agavaceae
<i>angiosperms—ebony</i>	tobacco	esparto	Alliaceae
<i>and primrose orders:</i>	tomato	fescue	Amarylloidaceae
Bumelia	witchweed	foxtail	Asparagus
Ebenales		grass	

asphodel	Malvaceae	ramie	locust
bear grass	Malvales	Ulmaceae	logwood
bellwort	okra	Urticaceae	lupine
blue-eyed grass	roselle	Urticales	mesquite
cantala	sisal	<i>angiosperms—orchid</i>	mimosa
chive	Sterculiaceae	<i>order:</i>	narra
Colchicum	Tiliaceae	bucket orchid	pagoda tree
Crocus	urena	cattleya	palo verde
Dioscoreaceae	<i>angiosperms—mint</i>	Dendrobium	pea
Dracaena	<i>order:</i>	Epidendrum	peanut
elephant's-foot	balm	greenhood	redbud
Erythronium	Coleus	helleborine	rosewood
fritillary	dittany	jewel orchid	senna
garlic	dragonhead	ladies' tresses	sensitive plant
Gladiolus	glory-bower	lady's slipper	smoke tree
henequen	Lamiaceae	Odontoglossum	soybean
Iridaceae	Lamiales	Oncidium	sunflower
Iris	Lantana	Ophrys	vetch
leek	lavender	orchid	Wisteria
Liliaceae	lemon verbena	Orchis	<i>angiosperms—pepper</i>
Liliales	Mentha	Pogonia	<i>and birthwort</i>
lily	peppermint	twayblade	<i>orders:</i>
mariposa lily	rosemary	Vanda	birthwort
Mauritius hemp	Salvia	vanilla	Peperomia
narcissus	spearmint	<i>angiosperms—palm</i>	Piperaceae
onion	teak	<i>and related orders:</i>	Piperales
phormium	Verbenaceae	Anthurium	wild ginger
pickerelweed	<i>angiosperms—myrtle</i>	Arales	<i>angiosperms—phlox</i>
Sansevieria	<i>order:</i>	Arecidae	<i>order:</i>
Smilax	allspice	Arisaema	alkanet
ti	cannonball tree	Arum	bindweed
tulip	Cuphea	babassu palm	borage
water hyacinth	Epilobium	calla	Boraginaceae
yam	Eucalyptus	coco de mer	bugloss
<i>angiosperms—</i>	Eugenia	coconut palm	Convolvulaceae
<i>magnolia order:</i>	fejjoa	Cyclanthales	dodder
Annonaceae	fireweed	date palm	forget-me-not
champac	Fuchsia	dumb cane	Hydrophyllaceae
cherimoya	guava	oil palm	Ipomoea
lancewood	jaboticaba	palm	Lennoaceae
magnolia	Leptospermum	Pandanales	Loasaceae
Magnoliaceae	loosestrife	Philodendron	Mertensia
Magnoliales	mangrove	skunk cabbage	phlox
Myristicaceae	mare's-tail	Typhales	Polemoniaceae
pawpaw	Myrtales	<i>angiosperms—pea</i>	Rivea
tulip tree	myrtle	<i>order:</i>	sweet potato
Winteraceae	Onagraceae	acacia	waterleaf
ylang-ylang	paperbark tree	Albizia	<i>angiosperms—</i>
<i>angiosperms—</i>	pomegranate	bean	<i>pineapple and</i>
<i>mallow order:</i>	water chestnut	bluebonnet	<i>related orders:</i>
Abutilon	<i>angiosperms—nettle</i>	broom	Aechmea
balsa	<i>order:</i>	chick-pea	Bromeliales
baobab	Cannabis	Clianthus	Commelinales
Bombacaceae	elm	clover	Cryptanthus
cacao	Ficus	cowpea	Dyckia
cotton	fig	crown vetch	Eriocaulales
durian	hackberry	Fabales	Juncuales
hibiscus	hemp	honey locust	papyrus
jute	India rubber plant	indigo	pineapple
kapok	jackfruit	kudzu vine	Puya
kenaf	Moraceae	laburnum	Spanish moss
linden	mulberry	lentil	spiderwort
mallow	Osage orange	lespedeza	Tillandsia
	Pilea	locoweed	

- umbrella plant
 Zebрина
angiosperms—pink order:
 Amaranthaceae
 baby's breath
 beet
 Bougainvillea
 cactus
 campion
 carnation
 Caryophyllaceae
 Caryophyllales
 Celosia
 chard
 chickweed
 goosefoot
 Halogeton
 Lychnis
 Nyctaginaceae
 pigweed
 pink
 poke
 Portulacaceae
 purslane
 spinach
 sugar beet
angiosperms—poppy order:
 bleeding heart
 bloodroot
 bush poppy
 California poppy
 celandine
 Corydalis
 Fumariaceae
 fumitory
 horned poppy
 Hypecoaceae
 Papaveraceae
 Papaverales
 poppy
 prickly poppy
angiosperms—rose order:
 almond
 Amelanchier
 apple
 apricot
 Astilbe
 blackberry
 boysenberry
 cherry
 chokecherry
 cinquefoil
 Connaraceae
 cotoneaster
 crab apple
 currant
 Echeveria
 firethorn
 gooseberry
 hawthorn
- houseleek
 hydrangea
 kalanchoe
 loganberry
 loquat
 medlar
 nectarine
 peach
 pear
 Pittosporaceae
 plum
 quince
 raspberry
 Ribes
 Rosales
 rose
 Saxifragaceae
 saxifrage
 sedum
 spirea
 strawberry
 sweetbrier
angiosperms—sandalwood order:
 Australian
 Christmas tree
 Balanophoraceae
 bastard toadflax
 dwarf mistletoe
 Loranthaceae
 mistletoe
 sandalwood
 Santalaceae
 Santalales
 Viscaceae
angiosperms—soapberry order:
 Aceraceae
 akee
 Anacardiaceae
 bel fruit
 box elder
 buckeye
 Burseraceae
 cashew
 citron
 grapefruit
 guarana
 horse chestnut
 kumquat
 lemon
 lime
 litchi
 mahogany
 mango
 maple
 Meliaceae
 orange
 pili nut
 Pistacia
 poison ivy
 red maple
- Rhus
 Rutaceae
 Sapindales
 shaddock
 silver maple
 Simaroubaceae
 sugar maple
 sumac
 tree of heaven
angiosperms—staff-tree and buckthorn orders:
 alder buckthorn
 bittersweet
 buckthorn
 Ceanothus
 Celastraceae
 Celastrales
 Euonymus
 holly
 jujube
 Rhamnales
 Vitaceae
angiosperms—tamarisk order:
 boojum tree
 ocotillo
 Tamaricales
 tamarisk
angiosperms—tea order:
 Camellia
 Clusiaceae
 Dipterocarpaceae
 Elatinaceae
 franklinia
 gordonia
 mammee apple
 mangosteen
 Ochnaceae
 Saint-John's-wort
 stewartia
 Theaceae
 Theales
angiosperms—teasel order:
 Caprifoliaceae
 Dipsacales
 elder
 feverwort
 honeysuckle
 scabious
 snowberry
 teasel
 Valerianaceae
 viburnum
angiosperms—violet and related orders:
 begonia
 bottle gourd
 bryony
- cucumber
 Cucurbitaceae
 dishcloth gourd
 Flacourtiaceae
 gourd
 melon
 pansy
 papaya
 Passifloraceae
 passion-flower
 pumpkin
 rock rose
 squash
 sun rose
 Viola
 Violales
 watermelon
angiosperms—walnut order:
 butternut
 hickory
 Juglandales
 pecan
 walnut
angiosperms—water lily order:
 fanwort
 Nelumbonaceae
 Nymphaeales
 water lily
 water shield
angiosperms—water-plantain and related orders:
 Alismatales
 arrowhead
 Elodea
 Hydrocharitales
 Najadales
 pondweed
 water plantain
angiosperms—witch-hazel and related orders:
 Casuarinales
 Didymelales
 Eucommiales
 Fothergilla
 Hamamelidaceae
 Hamamelidae
 Hamamelidales
 katsura tree
 Myricales
 plane tree
 sweet gum
 Trochodendrales
 winter hazel
 witch hazel
angiosperms—other:
 Alismatidae
 aspen
 Barbeya
 buckwheat

- buffalo berry
 burning bush
 carnivorous plant
 cobra plant
 Commelinidae
 Cyperaceae
 Cyperales
 Daphne
 Diapensiaceae
 dicotyledon
 Dilleniaceae
 Dilleniidae
 everlasting
 Haloragales
 hardwood
 Illiciaceae
 Leitneriales
 lotus
 macadamia
 Magnoliidae
 monocotyledon
 Nepenthes
 Nepenthes
 Paeoniaceae
 peony
 pitcher plant
 Plumbaginales
 Podostemales
 Polygalales
 Polygonales
 poplar
 Proteales
 Rafflesiales
 rhubarb
 Rosidae
 Salicales
 Sarraceniaceae
 Solanales
 sundew
 taro
 Theligonales
 Thymelaeales
 Triuridales
 Venus's-flytrap
 wild flower
 willow
arthropods—
arachnids:
 arachnid
 black widow
 brown spider
 chigger
 crab spider
 daddy longlegs
 false scorpion
 funnel weaver
 funnel-web spider
 garden spider
 jumping spider
 mite
 nursery-web spider
 red spider
 scorpion
- silk spider
 spider
 sunspider
 tarantula
 tick
 trap-door spider
 whip scorpion
 wolf spider
arthropods—
crustaceans:
 amphipod
 barnacle
 blue crab
 branchiopod
 brine shrimp
 clam shrimp
 copepod
 crab
 crayfish
 crustacean
 crustacean louse
 decapod
 Dungeness crab
 fiddler crab
 fish louse
 gammarid
 ghost crab
 gribble
 hermit crab
 hooded shrimp
 horseshoe shrimp
 isopod
 krill
 land crab
 lobster
 malacostracan
 mantis shrimp
 mussel shrimp
 mustache shrimp
 opossum shrimp
 pea crab
 pill bug
 robber crab
 sand flea
 scampi
 shrimp
 skeleton shrimp
 sow bug
 spider crab
 tadpole shrimp
 tanaid
 water flea
arthropods—other:
 arthropod
 centipede
 eurypterid
 giant water
 scorpion
 horseshoe crab
 insect
 millipede
 myriapod
 Paradoxides
- pauropod
 sea spider
 symphylan
 trilobite
bacteria:
 actinomycete
 archaeobacterium
 bacillus
 bacterium
 blue-green algae
 Clostridium
 denitrifying
 bacteria
 episome
 eubacterium
 gliding bacterium
 gram stain
 Haemophilus
 Lactobacillus
 Micrococcus
 mycoplasma
 Pasteurella
 pneumococcus
 pseudomonad
 rickettsia
 Salmonella
 sheathed bacteria
 Spirillum
 spirochete
 Staphylococcus
 streptococcus
 Streptomyces
 sulfur bacterium
 vibrio
birds—anseriform
order:
 Anatidae
 anseriform
 black duck
 bufflehead
 Canada goose
 canvasback
 dabbling duck
 diving duck
 duck
 eider
 gadwall
 goldeneye
 goose
 magpie goose
 mallard
 merganser
 nene
 perching duck
 pintail
 pochard
 redhead
 ring-necked duck
 scaup
 scoter
 screamer
 sheldgoose
 shelduck
- shoveler
 snow goose
 stiftail
 swan
 teal
 whistling duck
 white-fronted goose
 wigeon
 wood duck
birds—caprimulgidiform
and apodiform orders:
 apodiform
 caprimulgidiform
 chuck-will's-widow
 crested swift
 frogmouth
 hummingbird
 nighthawk
 nightjar
 oilbird
 owlet frogmouth
 poorwill
 potoo
 swift
 swiftlet
 whippoorwill
birds—charadriiform
order:
 auk
 auklet
 avocet
 charadriiform
 courser
 curlew
 dotterel
 dowitcher
 godwit
 great auk
 greenshank
 guillemot
 gull
 jacana
 jaeger
 killdeer
 knot
 lapwing
 murre
 murrelet
 oystercatcher
 painted snipe
 phalarope
 plover
 pratincole
 puffin
 redshank
 ruff
 sandpiper
 seedsnipe
 sheathbill
 skimmer
 skua
 snipe
 stilt
 surfbird

tattler	<i>birds—extinct:</i>	<i>birds—passeriform</i>	jay
tern	Aepyornis	<i>order:</i>	kingbird
thickknee	Archaeopteryx	accentor	kinglet
turnstone	Diatryma	Aegithalidae	kiskadee
willet	Hesperornis	antbird	lark
woodcock	Ichthyornis	becard	laughing thrush
yellowlegs	<i>birds—falconiform</i>	bell-magpie	Leiothrix
<i>birds—columbiform</i>	<i>order:</i>	bellbird	lyrebird
<i>and psittaciform</i>	accipiter	bird-of-paradise	magpie
<i>orders:</i>	bald eagle	bishop	magpie-robin
bristlehead	bateleur	blackbird	manakin
cockatoo	bird of prey	Bombycillidae	mannikin
columbiform	buzzard	bowerbird	martin
conure	caracara	broadbill	meadowlark
dodo	condor	buffalo weaver	Mimidae
domestic pigeon	eagle	bulbul	mockingbird
lovebird	falcon	bunting	monarch
macaw	falconiform	butcherbird	Muscicapidae
parakeet	golden eagle	Callaeidae	mynah
parrot	goshawk	Campephagidae	Nectariniidae
passenger pigeon	gyrfalcon	canary	nightingale
pigeon	harrier	Carduelidae	nightingale thrush
psittaciform	hawk	catbird	nuthatch
sandgrouse	hobby	Certhiidae	oriole
turtledove	kestrel	chat	oropendola
wood pigeon	kite	chat-thrush	ovenbird
<i>birds—coraciiform</i>	lammergeier	chough	Panuridae
<i>and piciform orders:</i>	merlin	cisticola	Paridae
barbet	osprey	cock-of-the-rock	Parulidae
coraciiform	peregrine falcon	cordon bleu	passeriform
flicker	secretary bird	Corvidae	peewee
honey guide	sparrowhawk	Cotingidae	Philepittidae
hornbill	turkey vulture	creeper	phoebe
ivory-billed	vulture	crow	pipit
woodpecker	<i>birds—galliform and</i>	cuckoo-shrike	pitta
jacamar	<i>gruiform orders:</i>	currawong	Ploceidae
kingfisher	bustard	Dendrocolaptidae	prinia
kookaburra	button quail	dipper	quelea
motmot	coot	drongo	raven
piciform	crake	Emberizidae	redstart
piculet	crane	Estrildidae	Remizidae
puffbird	curassow	fairy bluebird	robin
roller	finfoot	false sunbird	rockfowl
sapsucker	galliform	fantail	rosefinch
toucan	gallinule	flowerpecker	scrub-bird
woodpecker	grouse	flycatcher	seedeater
<i>birds—cuculiform</i>	gruiform	forktail	sharpbill
<i>and owl orders:</i>	guinea fowl	Furnariidae	shrike
ani	hoatzin	Galapagos finch	shrike-vireo
barn owl	jungle fowl	gnatcatcher	silky flycatcher
coucal	limpkin	goldfinch	song-babbler
cuckoo	megapode	grackle	songbird
cuculiform	mesite	Grallinidae	sparrow
eagle owl	partridge	grass finch	starling
fish owl	peacock	grosbeak	Sturnidae
ground cuckoo	pheasant	ground thrush	sunbird
hawk owl	ptarmigan	helmet-shrike	swallow
horned owl	quail	Hirundinidae	Sylviidae
owl	rail	honeycreeper	tailorbird
roadrunner	seriema	honeyeater	tanager
screech owl	trumpeter	house sparrow	tapaculo
short-eared owl	turkey	hypocoly	thickhead
turaco	whooping crane	Icteridae	thrush
wood owl		Irenidae	

- tit
 tityra
 towhee
 treecreeper
 Turdidae
 tyrannulet
 tyrant flycatcher
 umbrellabird
 vanga-shrike
 vireo
 wagtail
 warbler
 wattle-eye
 waxbill
 waxwing
 weaver
 white-eye
 whydah
 woodcreeper
 woodswallow
 woodwarbler
 wren
 Xenicidae
birds—others:
 albatross
 aviary
 aviculture
 bird
 bittern
 booby
 cassowary
 casuariiform
 ciconiiform
 coly
 Colymbiformes
 cormorant
 diving petrel
 egret
 emu
 flamingo
 frigate bird
 fulmar
 gannet
 grebe
 hammerhead
 heron
 ibis
 kiwi
 loon
 moa
 ornithology
 ostrich
 pelecaniform
 pelican
 penguin
 petrel
 plumage
 prion
 procellariiform
 rhea
 shearwater
 shoebill
 snakebird
- spoonbill
 stork
 storm petrel
 syrinx
 tinamou
 trogon
 tropic bird
bryophytes:
 bryophyte
 bug-on-a-stick
 carpet moss
 cord moss
 cushion moss
 granite moss
 hair-cap moss
 hornwort
 leafy liverwort
 liverwort
 luminous moss
 Marchantia
 moss
 peat moss
 tree moss
 wind-blown moss
classification:
 nomenclature
 taximetrics
 taxon
 taxonomy
enterocoelomates:
 acorn worm
 amphioxus
 arrowworm
 beardworm
 bêche-de-mer
 blastoid
 brittle star
 cake urchin
 carpod
 chordate
 crinoid
 crown-of-thorns
 starfish
 echinoderm
 echinoid
 graptolite
 heart urchin
 hemichordate
 protochordate
 pterobranch
 sand dollar
 sea cucumber
 sea lily
 sea squirt
 sea urchin
 starfish
 tunicate
*fishes—atheriniform
 and related orders:*
 atheriniform
 dealfish
 dory
 flying fish
- grunion
 killifish
 lantern-eye fish
 live-bearer
 molly
 oarfish
 silversides
 spiny-finned
 fish
*fishes—
 batrachoidiform and
 related orders:*
 anglerfish
 batfish
 brotula
 cave fish
 clingfish
 cod
 frogfish
 goosefish
 grenadier
 hake
 paracanthopterygian
 pearlfish
 pollock
 toadfish
 whiting
*fishes—
 cartilaginous:*
 basking shark
 blue shark
 carcharhinid
 chimaera
 chondrichthian
 Cladoselache
 devil ray
 dogfish
 electric ray
 guitarfish
 hammerhead shark
 mackerel shark
 mako shark
 monkfish
 ray
 saw shark
 sawfish
 shark
 skate
 stingray
 thresher shark
 tiger shark
 white shark
*fishes—cypriniform
 and siluriform
 orders:*
 barb
 bitterling
 bullhead
 carp
 catfish
 characin
 chub
 corydoras
- dace
 electric catfish
 electric eel
 goldfish
 hatchetfish
 knifefish
 labeo
 loach
 madtom
 minnow
 ostariophysan
 pencil fish
 piranha
 roach
 sucker
 tench
 tetra
 tigerfish
 wels
 zebra fish
*fishes—
 gasterosteiform
 order:*
 cornetfish
 gasterosteiform
 pipefish
 sea horse
 shrimpfish
 stickleback
 swamp eel
 trumpet fish
*fishes—jawless fish
 and placoderms:*
 Agnatha
 antiarch
 Arctolepis
 arthrodire
 Bothriolepis
 Cephalaspis
 hagfish
 lamprey
 ostracoderm
 Palaeospondylus
 placoderm
 spiny shark
*fishes—perciform
 order:*
 angelfish
 archer fish
 barracuda
 bass
 bigeye
 black bass
 blenny
 bluegill
 bonito
 butterfish
 butterfly fish
 carangid
 cichlid
 crappie
 damselfish
 darter

- discus fish
 dragonet
 drum
 fingerfish
 glassfish
 goatfish
 goby
 gourami
 grouper
 grunt
 hind
 hogfish
 jack
 jewfish
 labyrinth fish
 mackerel
 marlin
 mojarra
 moonfish
 mudskipper
 mullet
 Nile perch
 parrot fish
 perch
 perciform
 pikeperch
 pomfret
 pompano
 porgy
 prickleback
 remora
 sailfish
 scat
 sea bass
 sheepshead
 Siamese fighting
 fish
 sleeper
 slipmouth
 snapper
 snook
 soapfish
 spadefish
 spearfish
 spiny eel
 stargazer
 sunfish
 surfperch
 surgeonfish
 swordfish
 threadfin
 tilefish
 tripletail
 tuna
 weakfish
 weever
 wolffish
 wrasse
fishes—
pleuronectiform
and tetraodontiform
orders:
 boxfish
 dab
- filefish
 flatfish
 flounder
 halibut
 mola
 plaice
 porcupine fish
 puffer
 sole
 tetraodontiform
 triggerfish
 turbot
fishes—salmoniform
order:
 Atlantic salmon
 bristlemouth
 brook trout
 brown trout
 capelin
 char
 coho
 hatchetfish
 king salmon
 lake trout
 mudminnow
 pike
 rainbow trout
 salmon
 salmoniform
 sandfish
 scaleless dragonfish
 smelt
 spookfish
 trout
 viperfish
 whitefish
fishes—scorpaeniform
and related orders:
 dragonfish
 flathead
 flying gurnard
 greenling
 lion-fish
 lump sucker
 poacher
 redfish
 scorpaeniform
 scorpion fish
 sculpin
 sea robin
 snailfish
 stonefish
 zebra fish
fishes—others:
 alewife
 anchovy
 bichir
 bony fish
 bowfin
 Cheirolepis
 chondrosteian
 clupeiform
 coelacanth
 crossopterygian
- deep-sea fish
 Dipterus
 eel
 elopiform
 Eusthenopteron
 fish
 gar
 gulper
 herring
 holostean
 ladyfish
 lungfish
 menhaden
 moray
 mormyrid
 notopterid
 osteoglossomorph
 paddlefish
 Rhipidistia
 sardine
 shad
 sturgeon
 tarpon
 teleost
 wolf herring
fungi:
 Agaricales
 Amanita
 Armillaria
 Ascomycetes
 Basidiomycetes
 Boletaceae
 cup fungus
 Deuteromycetes
 fungus
 Lycoperdales
 mushroom
 mycorrhiza
 Oomycetes
 Polyporales
 stinkhorn
 truffle
 water mold
 yeast
 Zygomycetes
gymnosperms:
 alerce
 American
 arborvitae
 Araucaria
 arborvitae
 bald cypress
 big tree
 California nutmeg
 cedar
 conifer
 Cordaitales
 Cupressaceae
 cycad
 Cycadeoidales
 Cycas
 cypress
 cypress pine
- dawn redwood
 Douglas fir
 eastern red cedar
 English yew
 Ephedra
 false cypress
 fir
 giant arborvitae
 ginkgo
 Glossopteris
 Gnetaceae
 gymnosperm
 hemlock
 incense cedar
 Japanese cedar
 Japanese torreya
 Japanese yew
 juniper
 larch
 Lebachia
 Pinaceae
 pine
 Podocarpaceae
 redwood
 seed fern
 Sequoia
 spruce
 Taxaceae
 Taxodiaceae
 Torreya
 umbrella pine
 Welwitschiaceae
 yellowwood
 yew
insects—coleopteran
order:
 alfalfa weevil
 bark beetle
 beetle
 bess beetle
 billbug
 blister beetle
 boll weevil
 branch and twig
 borer
 carrion beetle
 casebearing beetle
 chafer
 checkered beetle
 click beetle
 coleopteran
 Colorado potato
 beetle
 cucumber beetle
 darkling beetle
 dermestid beetle
 firefly
 flat bark beetle
 flea beetle
 glowworm
 ground beetle
 ladybird beetle
 leaf-rolling weevil
 long-horned beetle

metallic	honeybee	tussock moth	neuropteran
wood-boring	horntail	white butterfly	odonate
beetle	hymenopteran	yucca moth	orthopteran
plum curculio	ichneumon	zebra swallowtail	plant bug
potato beetle	leaf-cutter bee	butterfly	proturan
predaceous	sand wasp	<i>insects—others:</i>	psocid
diving beetle	sawfly	alderfly	pygmy grasshopper
primitive weevil	spider wasp	ambush bug	red bug
rhinoceros beetle	Symphyta	antlion	San Jose scale
rove beetle	thread-waisted	aphid	scale insect
scarab beetle	wasp	apterygote	scorpionfly
seed beetle	velvet ant	assassin bug	shield-backed
soldier beetle	wasp	back swimmer	katydid
spider beetle	wood wasp	bedbug	short-horned
stag beetle	<i>insects—lepidopteran</i>	bristletail	grasshopper
strepsipteran	<i>order:</i>	bug	smaller water
tiger beetle	bagworm moth	burrower bug	strider
tortoise beetle	blue butterfly	caddisfly	snakefly
tumbling flower	bollworm	chewing louse	springtail
beetle	brush-footed	chinch bug	stinkbug
unicorn beetle	butterfly	cicada	stonefly
water scavenger	carpenter moth	cockroach	sucking louse
beetle	casebearer	cone-headed	termite
weevil	clearwing moth	grasshopper	thrips
whirligig beetle	copper butterfly	coreid bug	treehopper
<i>insects—fly order:</i>	diamondback	cottony-cushion	walkingstick
anthomyiid fly	moth	scale	water boatman
bee fly	flour moth	cricket	water scorpion
biting midge	forester moth	dipluran	water strider
black fly	gelechiid moth	dobsonfly	webspinner
blow fly	geometrid moth	dragonfly	whitefly
bot fly	gypsy moth	earwig	<i>lophophorates:</i>
crane fly	hairstreak	ephemeropteran	Atrypa
dipteran	harvester	flea	horseshoe worm
flesh fly	hawk moth	flower bug	lamp shell
fly	lappet	froghopper	lingulid
fruit fly	leaf roller moth	giant water bug	moss animal
fungus gnat	lepidopteran	grape phylloxera	<i>lower invertebrates:</i>
gall midge	measuring worm	grasshopper	archaeocyathid
Hessian fly	milkweed butterfly	harlequin	Ascaris
horse fly	monarch butterfly	cabbage bug	aschelminth
housefly	morpho	heteropteran	Aurelia
hover fly	moth	homopteran	bread crumb
leaf miner	olethreutid moth	human louse	sponge
louse fly	owlet moth	jumping plant	Cassiopea
midge	painted lady	louse	Chrysaora
mosquito	parnassian	katydid	clionid
robber fly	butterfly	lace bug	cnidarian
tachinid fly	peppered moth	lacewing	coral
tsetse fly	pyralid moth	leaf insect	ctenophore
vinegar fly	regal moth	leafhopper	eelworm
warble fly	saturniid moth	locust	entoproct
<i>insects—</i>	silkworm moth	long-horned	eye worm
<i>hymenopteran order:</i>	skipper	grasshopper	filarial worm
ant	slug caterpillar	louse	flatworm
Apocrita	moth	lygaeid bug	flake
bee	sulfur butterfly	mantid	freshwater
braconid	swallowtail	mantispid	jellyfish
bumblebee	butterfly	marsh treader	gastrotrich
chalcid	tent caterpillar	mayfly	Gonionemus
cuckoo wasp	moth	meadow	guinea worm
fig wasp	tiger moth	grasshopper	horn coral
gall wasp	tineid moth	mealybug	horny sponge
honey ant		mole cricket	Hydra

Hydractinia	gerenuk	African	olingo
hydroid	giraffe	hunting dog	otter
jellyfish	gnu	Arctic fox	ounce
Leucosolenia	goat	Asiatic black bear	Pallas's cat
Liriope	guanaco	badger	panda
lungworm	hartebeest	bat-eared fox	polar bear
medusa	hippopotamus	bear	polecat
mesozoan	ibex	bearded seal	procyonid
millepore	impala	binturong	puma
nematocyst	Kobus	black bear	raccoon
nematode	kudu	bobcat	raccoon dog
Obelia	llama	brown bear	ratel
pinworm	moose	bush dog	sable
planarian	mountain goat	cacomistle	sea lion
polyp	mule deer	Caffre cat	seal
Portuguese	muntjac	canine	serval
man-of-war	musk deer	caracal	skunk
priapulid	musk-ox	carnivore	sloth bear
ribbon worm	nyala	cat	South
rotifer	okapi	cheetah	American fox
sea anemone	oryx	civet	spectacled bear
sea fan	peccary	clouded leopard	sun bear
sea gooseberry	Père David's deer	coati	suricate
sea pen	pig	coyote	tayra
sea walnut	pronghorn	crabeater seal	tiger
siliceous sponge	red deer	dhole	viverrid
spiny-headed	reedbuck	dingo	walrus
worm	reindeer	dog	weasel
sponge	roe deer	elephant seal	Weddell seal
tapeworm	ruminant	ermine	wildcat
threadworm	saiga	fennec	wolf
trichina	sassaby	ferret	wolverine
Venus's flower	sheep	fisher	<i>mammals—cetacean</i>
basket	sika	flat-headed	<i>order:</i>
worm	springbok	cat	baleen whale
zoanthid	tahr	fossa	beaked whale
<i>mammals—</i>	vicuña	fox	beluga
<i> artiodactyl order:</i>	wapiti	fur seal	blue whale
alpaca	warthog	genet	bottlenose whale
antelope	water buffalo	golden cat	cetacean
aoudad	white-tailed deer	gray fox	dolphin
artiodactyl	yak	grison	fin whale
aurochs	<i>mammals—bat</i>	grizzly bear	gray whale
babirusa	<i>order:</i>	harbour seal	humpback whale
bighorn	bat	harp seal	killer whale
bison	brown bat	hooded seal	narwhal
boar	bulldog bat	hyena	pilot whale
bongo	disk bat	jackal	porpoise
bovid	false vampire bat	jaguar	right whale
brocket	free-tailed bat	jaguarundi	sei whale
buffalo	Hipposideridae	kinkajou	sperm whale
bush pig	horseshoe bat	leopard	whale
camel	Jamaican fruit bat	leopard cat	<i>mammals—extinct:</i>
cattle	New Zealand	linsang	Barylambda
chamois	short-tailed bat	lion	brontothere
chevrotain	Phyllostomatidae	lynx	Camelops
deer	Pteropodidae	margay	cave bear
dibatag	sheath-tailed bat	marten	Chalicotherium
duiker	vampire bat	mink	Condylarthra
eland	Vespertilionidae	mongoose	Coryphodon
fallow deer	<i>mammals—carnivore</i>	monk seal	Creodonta
gaur	<i>order:</i>	mustelid	dawn horse
gazelle	aardwolf	ocelot	Dinohyus

Dryopithecus	wallaby	<i>mammals—rodent</i>	hyrax
Elasmotherium	wombat	<i>order:</i>	lagomorph
Glyptodon	<i>mammals—</i>	agouti	mammal
Indricotherium	<i>perissodactyl</i>	bamboo rat	manatee
Irish elk	<i>order:</i>	bandicoot rat	pangolin
litoptern	ass	beaver	pika
mammoth	donkey	cane rat	proboscidean
mastodon	equine	capybara	rabbit
Merychippus	horse	cavy	sea cow
Miacis	mule	chinchilla	sirenian
Moeritherium	perissodactyl	chipmunk	ungulate
Moropus	Przewalski's horse	cloud rat	<i>protists—algae:</i>
multituberculate	rhinoceros	cotton rat	Acetabularia
Notoungulata	tapir	dormouse	alga
Oreopithecus	zebra	field mouse	algology
Phenacodus	<i>mammals—primate</i>	flying squirrel	brown algae
sabre-toothed cat	<i>order:</i>	gerbil	Chlorella
taeniodont	ape	gopher	desmid
Thylacosmilus	avahi	grasshopper	diatom
titanothere	aye-aye	mouse	dulse
Toxodon	baboon	ground squirrel	Fucus
Triconodon	bonobo	guinea pig	green algae
Uintatherium	capuchin monkey	gundi	Irish moss
woolly rhinoceros	Celebes black ape	hamster	kelp
<i>mammals—</i>	chimpanzee	harvest mouse	laver
<i>insectivore and</i>	colobus	hutia	Nostoc
<i>edentate orders:</i>	diana monkey	jerboa	Oedogonium
anteater	drill	jumping mouse	phytoplankton
armadillo	durukuli	kangaroo rat	Pleurococcus
edentate	galago	lemming	red algae
elephant shrew	gelada	maned rat	Sargassum
golden mole	gibbon	marmot	sea lettuce
hedgehog	gorilla	mole rat	seaweed
insectivore	guenon	mouse	spirogyra
mole	hamadryas	muskrat	stonewort
otter shrew	howler monkey	nutria	Ulothrix
short-tailed shrew	indri	paca	Vaucheria
shrew	langur	pocket mouse	water bloom
sloth	lemur	porcupine	water net
solenodon	loris	pouched rat	<i>protists—</i>
tenrec	macaque	prairie dog	<i>protozoans:</i>
<i>mammals—</i>	mandrill	rat	actinomyxidian
<i>monotremes and</i>	mangabey	rice rat	amoeba
<i>marsupials:</i>	marmoset	rock rat	apicomplexan
bandicoot	monkey	rodent	astome
cuscus	orangutan	sewellel	Balantidium
echidna	patas monkey	spiny rat	Ceratium
glider	potto	springhare	Chlamydomonas
kangaroo	primate	squirrel	chloromonad
koala	proboscis monkey	tuco-tuco	chryomonad
marsupial	rhesus monkey	viscacha	ciliate
marsupial mole	saki	vole	coccolith
marsupial mouse	siamang	water rat	cryptomonad
monotreme	sifaka	white-footed	dinoflagellate
native cat	spider monkey	mouse	Entamoeba
numbat	squirrel monkey	wood rat	entodiniomorph
opossum	tarsier	woodchuck	Euglena
phalanger	titi	<i>mammals—others:</i>	flagellate
platypus	tree shrew	aardvark	foraminiferan
rat kangaroo	uakari	colugo	fusulinid
rat opossum	woolly monkey	dugong	regarine
Tasmanian devil	woolly spider	elephant	Gymnodinium
Tasmanian wolf	monkey	hare	gymnostome

- haplosporidian
 helioflagellate
 heliozoan
 heterochlorid
 heterotrich
 Holomastigotoides
 hymenostome
 hypermastigote
 hypotrich
 microsporidian
 myxosporidian
 Nosema
 odontostome
 oligotrich
 opalinid
 Paramecium
 peritrich
 Plasmodium
 protomonad
 protozoan
 pseudopodium
 radiolarian
 rhizomastigote
 Sarcocystis
 sarcodine
 suctorian
 testacean
 tintinnid
 trichocyst
 trichomonad
 trichostome
 volvocid
 Volvox
 Vorticella
protists—others:
 beard lichen
 Iceland moss
 lichen
 manna
 Myxomycetes
 oak moss
 Parmelia
 Plasmodio-
 phoromycetes
 protist
 slime mold
reptiles—
crocodilians:
 alligator
 caiman
 crocodile
 gavial
reptiles—extinct:
 Albertosaurus
 Allosaurus
 Anatosaurus
 Ankylosaurus
 Apatosaurus
 brachiosaur
 Bradysaurus
 Camptosaurus
 carnosaur
 ceratopsian
 Ceratosaurus
 Clidastes
 Coelophysis
 cynodont
 Cynognathus
 Dicynodon
 Dimetrodon
 Dimorphodon
 dinosaur
 Diplodocus
 dromaeosaur
 Edaphosaurus
 Euparkeria
 Hyspilophodon
 ichthyosaur
 iguanodon
 Lambeosaurus
 Limnoscelis
 Maiasaura
 megalosaur
 Mesosaurus
 mosasaur
 Moschops
 Nothosaurus
 ornithischian
 Ornitholestes
 Ornithomimus
 ornithopod
 Oviraptor
 Pachycephalo-
 saurus
 Pentaceratops
 phytosaur
 Plateosaurus
 plesiosaur
 Protoceratops
 Psittacosaurus
 Pteranodon
 pterodactyl
 pterosaur
 Rhamphorhyn-
 chus
 saurischian
 sauropod
 sauropterygian
 Stegosaurus
 Struthiomimus
 thecodont
 therapsid
 theropod
 triceratops
 tritylodont
 tyrannosaur
reptiles—lizards:
 Agamidae
 anole
 chameleon
 gecko
 Gila monster
 glass snake
 horned toad
 iguana
 Komodo dragon
 lizard
 monitor lizard
 racerunner
 skink
reptiles—snakes:
 adder
 anaconda
 black snake
 blind snake
 boa
 boomslang
 brown snake
 bull snake
 bushmaster
 Cerastes
 coachwhip
 cobra
 colubrid
 copperhead
 coral snake
 egg-eating snake
 elapid
 fer-de-lance
 flying snake
 garter snake
 green snake
 hognose snake
 indigo snake
 king snake
 krait
 mamba
 mangrove snake
 moccasin
 python
 racer
 rat snake
 rattlesnake
 sea snake
 shieldtail snake
 sidewinder
 snake
 taipan
 tree snake
 vine snake
 viper
 wart snake
 water snake
reptiles—turtles:
 Blanding's turtle
 box turtle
 Emydidae
 mud turtle
 musk turtle
 painted turtle
 pond turtle
 sea turtle
 side-necked
 turtle
 snake-necked
 turtle
 snapping turtle
 softshell turtle
 terrapin
 tortoise
 turtle
 wood turtle
reptiles—others:
 archosaur
 reptile
 tuatara
schizocoelomates—
annelids:
 annelid
 earthworm
 fanworm
 feather-duster
 worm
 fireworm
 leech
 lugworm
 oligochaete
 palolo worm
 peacock worm
 polychaete
 rag worm
 sea mouse
schizocoelomates—
mollusks:
 ammonoid
 ark shell
 belemnoid
 bivalve
 bubble shell
 cephalopod
 chiton
 clam
 cockle
 conch
 cone shell
 coquina clam
 cowrie
 cuttlefish
 ear shell
 gaper clam
 gastropod
 geoduck
 jingle shell
 land snail
 mollusk
 monoplaco-
 phoran
 murex
 mussel
 nautilus
 nudibranch
 octopus
 olive shell
 opisthobranch
 oyster
 periwinkle
 piddock
 prosobranch
 pteropod
 pulmonate

razor clam	pentastomid	Lycophyta	tracheophyte
scallop	schizocoelomate	Marattiaceae	whisk fern
seashell	spoonworm	Ophioglossaceae	<i>viruses:</i>
shipworm	tardigrade	Osmundaceae	adenovirus
slug	trochophore	Pleuromeia	arbovirus
squid	<i>tracheophytes:</i>	Polypodiaceae	cytomegalovirus
top shell	Adiantaceae	prefern	lysogeny
triton shell	angiosperm	Psilotophyta	myxovirus
tusk shell	Aspleniaceae	quillwort	papillomavirus
whelk	bracken	Rhynie plants	picornavirus
worm shell	cliffbrake	Salviniales	plant virus
<i>schizocoelomates—</i>	club moss	Schizaeaceae	polyoma virus
<i>others:</i>	fern	Sphenophyta	poxvirus
oncopod	gymnosperm	spike moss	virion
onychophoran	horsetail	staghorn fern	virology
peanutworm	Lepidodendron		virus

Biographies

See Section 10/34 of Part Ten

INDEX: See entries under all of the terms above

Division II. The Molecular Basis of Vital Processes

[For Part Three headnote see page 95.]

The outlines in the three sections of Division II deal with the molecular level of biotic organization and set forth theories of the chemical transformations and the exchanges of energy that occur in the distinctively vital processes treated in Section 311 of Division I.

- Section 321. Chemicals and the Vital Processes 112
 322. Metabolism: Bioenergetics and Biosynthesis 115
 323. Vital Processes at the Molecular Level 116

Section 321. Chemicals and the Vital Processes

- A. The inorganic milieu of living systems
- B. Organic chemicals participating naturally in the life processes
 1. Carbohydrates
 2. Lipids
 3. Proteins and peptides
 4. The major carrier of chemical energy: ATP
 5. Nucleic acids
 - a. General features
 - b. Deoxyribonucleic acid (DNA)
 - c. Ribonucleic acid (RNA)
 6. Biological pigments and coloration
 7. Enzymes
 8. Vitamins
 9. Hormones
 - a. General features of hormones: relationship between endocrine regulation and neural regulation, the evolution of hormones
 - b. The hormones of vertebrates
 - c. The hormones and hormonelike substances of invertebrates: neurohormones, molting hormones, pheromones
 - d. The hormones of plants

10. Other natural products: alkaloids, steroids and sterols, isoprenoids and terpenes
- C. Drugs: chemicals administered to an organism to change its physiological state or to combat pathogens
1. Sources and development of drugs
 2. General aspects of drug action
 3. Absorption, distribution, metabolism, and excretion of drugs
 4. Classification of drugs by organ or organ system of principal effect
 - a. Drugs affecting the cardiovascular system
 - b. Drugs affecting smooth and skeletal muscle systems
 - c. Drugs affecting the central nervous system
 - d. Drugs affecting the autonomic nervous system and the eyes
 - e. Drugs affecting the excretory system
 - f. Drugs affecting the digestive system
 - g. Drugs affecting the reproductive systems
 - h. Drugs affecting the immune response system
 - i. Drugs affecting the histamine response system
 5. Drugs directed against disease organisms
 - a. Drugs derived from living microorganisms: antibiotics
 - b. Chemical compounds used to treat infectious diseases: chemotherapeutic drugs
 6. Drugs directed at the suppression of cancer
 7. Drug use and abuse: the nature of drug addiction and dependence
[see 522.C.9.]
- D. Ethyl alcohol, alcohol consumption
[see 522.C.9.]
- E. Biocides and biorepellents
1. Antiseptics and disinfectants
 2. Biocides directed by mankind against animal and plant pests
 3. Biotoxins produced by microorganisms, plants, and animals: microbial toxins, phytotoxins, zootoxins
 4. Biological and chemical warfare agents
[see 736.A.6.]
- F. The selective concentration of chemicals by organisms

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with chemicals and the vital processes

Biochemical Components of Organisms	Drugs and Drug Action
Cells: Their Structures and Functions	Poisons and Poisoning
Chemical Compounds	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>biocides:</i>	fungicide	mycotoxin	monosaccharide
Agent Orange	herbicide	poison	pectin
aldrin	insecticide	toxin	polysaccharide
chemosterilant	Malathion	venom	starch
chloral	parathion	<i>carbohydrates:</i>	sugar
chlordane	phorate	carbohydrate	<i>drugs affecting the</i>
DDT	rodenticide	cellulose	<i>autonomic nervous</i>
dichlorobenzene	Toxaphene	disaccharide	<i>system:</i>
dimethoate	<i>biotoxins:</i>	glucose	adrenergic drug
fumigant	lambkill	glycoside	anticholinesterase

- atropine
beta blocker
cholinergic drug
ganglion blocking agent
neuromuscular blocking agent
drugs affecting the cardiovascular system:
digitalis
heparin
nitroglycerin
drugs—analgesics:
acetaminophen
acetanilide
analgesic
antipyrine
aspirin
salicylic acid
drugs—anesthetics:
anesthetic
chloroform
cocaine
curare
cyclopropane
procaine
hydrochloride
drugs—antibiotics:
ampicillin
antibiotic
cephalosporin
erythromycin
penicillin
streptomycin
tetracycline
drugs—antiseptics:
Dakin's solution
iodoform
merbromin
silver nitrate
drugs—chemotherapeutic:
allopurinol
anthelmintic
catechu
chloroquine
diethylcarbamazine
citrate
diethylstilbestrol
isoniazid
pamaquine
Prontosil
quinacrine
quinine
sulfa drug
sulfadiazine
sulfanilamide
sulfonamide
drugs—hallucinogens:
bufotenine
- DMT
hallucinogen
hashish
ibogaine
LSD
marijuana
mescaline
PCP
peyote
psilocin and psilocybin
drugs—narcotics:
codeine
fentanyl
heroin
methadone
morphine
narcotic
opium
drugs—sedatives:
barbiturate
chloral hydrate
paraldehyde
sedative-hypnotic drug
thalidomide
drugs—stimulants:
amphetamine
caffeine
imipramine
iproniazid
isocarboxazid
methamphetamine
stimulant
tranlycypromine
drugs—tranquilizers:
chlordiazepoxide
chlorpromazine
diazepam
lithium carbonate
meprobamate
reserpine
tranquilizer
drugs—other drugs and drug action:
antacid
antagonism
antihistamine
antimicrobial agent
astringent
colchicine
cytotoxic drug
diuretic
drug
ephedrine
laxative
phenol
coefficient
promethazine
quinidine
- scopolamine
theophylline
urethane
enzymes and enzyme action:
allosteric control
amylase
cofactor
cooperativity
enzyme
feedback inhibition
hydrolase
induction
inhibition
ligase
lipase
Michaelis-Menten hypothesis
nuclease
pepsin
proteolytic enzyme
renin
serotonin
transaminase
zymogen
hormones:
aldosterone
androgen
corticoid
cortisol
enterogastrone
epinephrine and norepinephrine
estrogen
growth hormone
hormone
insulin
luteinizing hormone
melatonin
neurohormone
progesterone
testosterone
isoprenoids and terpenes:
abietic acid
camphor
isoprene
limonene
menthol
pinene
terpene
lipids:
capsaicin
fatty acid
lecithin
lipid
phospholipid
prostaglandin
sphingolipid
triglyceride
- nucleic acids:*
adenine
cytosine
DNA
guanine
nucleic acid
nucleoside
nucleotide
RNA
thymine
uracil
pigments and coloration:
auxochrome
carotene
chlorophyll
chromophore
flavonoid
melanin
phytol
porphyrin
quinone
proteins and peptides:
actin
amino acid
collagen
glutamic acid
glutamine
gluten
histidine
histone
hydroxyproline
keratin
myoglobin
peptide
prolamin
protein
scleroprotein
steroids and sterols:
cholesterol
cortisone
ergosterol
saponin
steroid hormone
vitamins:
biotin
carnitine
choline
folic acid
niacin
pantothenic acid
para-aminobenzoic acid
vitamin
vitamin A
vitamin B complex
vitamin B₁
vitamin B₂
vitamin B₆
vitamin B₁₂

vitamin C	<i>other:</i>	denaturation	sapogenin
vitamin D	adenosine	histamine	secretion
vitamin E	triphosphate	piperine	
vitamin K			

Biographies

See Section 10/34 of Part Ten

INDEX: See entries under all of the terms above

Section 322. Metabolism: Bioenergetics and Biosynthesis

- A. Photosynthesis: the initiation of energy conversion in the biosphere
[see also 335.B.]
1. The biological importance of photosynthesis
 2. Factors that influence the rate of photosynthesis and the energy efficiency of photosynthesis
 3. Determination of the mechanism of photosynthesis
 4. The site of the photosynthetic process in green plants: the chloroplast
 5. The photosynthetic pigments
 6. The energetics of photosynthesis: photoelectron transfer, photophosphorylation
 7. The metabolic path of carbon in photosynthesis: the carbon reduction cycle
- B. Metabolism: the totality of all chemical processes in the living organism
1. The fragmentation of complex molecules: catabolism
 2. The combustion of food materials and the conservation of part of the energy in them: cellular respiration, oxidation and transduction
 3. The biosynthesis of cell components: anabolism
 4. Regulation of metabolism
- C. The nitrogen cycle: nitrogen fixation, nitrification and denitrification

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with metabolism: bioenergetics and biosynthesis

Cells: Their Structures and Functions
Metabolism
Photosynthesis

MICROPAEDIA: Selected entries of reference information

General subjects

adenosine	catabolism	feedback inhibition	metabolism
triphosphate	cellular respiration	gluconeogenesis	photosynthesis
anabolism	chloroplast	induction	tricarboxylic acid
antimetabolite	cytochrome	inhibition	cycle

Biographies

See Section 10/34 of Part Ten

INDEX: See entries under all of the terms above

Section 323. Vital Processes at the Molecular Level

- A. The cell membrane
1. The nature of membranes
 2. Compartmentalization of the cell
 3. Movement of water across cell membranes: osmosis
 4. Movement of solutes through membranes in response to a concentration gradient
 5. Movement of solutes through membranes independent of concentration gradients: active transport, pinocytosis
- B. Bioelectricity
- C. The nerve impulse
1. The structure of the neuron
 2. Characteristics of artificially stimulated nerve fibres
 3. Nature of the nerve impulse
 4. Transmission of the nerve impulse: the synapse
- D. Muscle contraction
1. Contractile or motile activity of some type as a characteristic of all living things
 2. Striated, or skeletal, muscle in higher animals
 3. Cardiac muscle
 4. Smooth muscle
- E. Bioluminescence
1. The significance of bioluminescence in behaviour, metabolism, and research
 2. The range and variety of bioluminescent organisms
 3. The biochemical events of light emission: enzymic and nonenzymic systems

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with vital processes at the molecular level

Cells: Their Structures and Functions
 Electricity and Magnetism
 Muscles and Muscle Systems
 Nerves and Nervous Systems

MICROPAEDIA: Selected entries of reference information

General subjects

acetylcholine	bioluminescence	membrane	osmosis
actin	end-plate potential	muscle	pinocytosis
action potential	excitatory	nervous system	resting potential
adrenaline and noradrenaline	postsynaptic potential	neuromuscular junction	sodium pump
all-or-none law	marine	neuron	synapse
bioelectricity	phosphorescence	neurotransmitter	

Biographies

See Section 10/34 of Part Ten

INDEX: See entries under all of the terms above

Division III. The Structures and Functions of Organisms

[For Part Three headnote see page 95.]

Division I deals with the nature, origin, evolution, distinctive properties, and classification of living things. Division II deals with the molecular level of biotic organization. The outlines in the nine sections of Division III deal with life at the cellular level and at the organismic level.

- Section 331. The Cellular Basis of Form and Function 117
 332. The Relation of Form and Function in Organisms 118
 333. Coordination of Vital Processes: Regulation and Integration 120
 334. Covering and Support: Integumentary, Skeletal, and Muscular Systems 122
 335. Nutrition: the Procurement and Processing of Nutrients 123
 336. Gas Exchange, Internal Transport, and Elimination 124
 337. Reproduction and Sex 126
 338. Development: Growth, Differentiation, and Morphogenesis 128
 339. Heredity: the Transmission of Traits 129

Section 331. The Cellular Basis of Form and Function**A. Cell theory and classification**

1. The cell theory
 - a. Historical background
 - b. Challenges to and revisions of the cell theory in the light of later knowledge
2. Classification of cells
 - a. General features: comparisons between cells and viruses and between procaryotic and eucaryotic cells, tissues as providing a functional classification of cells
 - b. Cells and tissues of animals: absorptive cells, secretory cells, nerve cells, sensory cells, muscle cells, cells in supporting tissues, circulating cells, reproductive cells
 - c. Cells and tissues of higher plants: outstanding features of the plant cell; meristematic, epidermal, and other types of plant cells
 - d. Comparison between animal cells and plant cells

B. Cell design and cell organization

1. The cell as a molecular system
 - a. Macromolecules in cells: nucleic acids, proteins, polysaccharides
 - b. Small molecules in cells: lipids, nucleotides, amino acids, fatty acids
2. Form and structure of the cell
 - a. Sizes and shapes of cells
 - b. Morphological elements: parts of cells—cell membrane, extracellular matrix, mitochondria, ribosomes, cytoskeleton, nuclear envelope, chromosomes, nucleolus
 - c. Procaryotic and eucaryotic cells
[see also 312.A.3.b.]

C. Functional aspects of cells

1. The internal environment and the cell matrix: the concept of the cell as a “protoplasm,” the concept of the cell as a “bag” containing a water solution of molecules
2. Cell membranes
[see 323.A.]
3. Interplay of nucleus and cytoplasm
4. Cell movement: ciliary, flagellar, and amoeboid
5. Cells in combination: cohesion and communication to form tissues and multicellular organisms

D. The cell cycle

1. Cell growth: doubling of size, genetic replication, preparation for division

2. Cell division

- a. Mitosis: condensation of chromosomes and dissolution of nuclear envelope; splitting of chromosomes; formation of new nuclear envelopes
- b. Cytokinesis: constriction of animal cell into halves by contractile ring of actin filaments; division of plant cell by formation of cell plate and new cell wall
- c. Meiosis: division of germ cell into gametes, or reproductive cells, each with one-half of the genetic material of parent cell

E. Fertilization

1. Characteristics of the mature egg
2. Events of fertilization
3. Biochemical analysis of the events of fertilization
4. Mechanisms that aid in the union of gametes

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major article dealing with the cellular basis of form and function

Cells: Their Structures and Functions

MICROPAEDIA: Selected entries of reference information

General subjects

cell	cytoskeleton	meiosis	protoplasm
chromosome	fertilization	mitosis	receptor
cilium	fission	multicellular	recombination
cytology	flagellum	organism	ribosome
cytoplasm	gamete	nucleus	
cytoplasmic	in vitro	ploidy	
streaming	fertilization		

Biographies

See Section 10/34 of Part Ten

INDEX: See entries under all of the terms above

Section 332. The Relation of Form and Function in Organisms

A. Biological form and function

B. Plant tissues and fluids: classification, organization, main functions

1. Relatively undifferentiated tissues of nonvascular plants
2. Well-differentiated tissues in vascular plants
 - a. Meristematic (cell-producing) tissues: apical, lateral, intercalary
 - b. Mature tissues
 - i. Dermal (protective) tissues: the epidermis of the primary plant body, the periderm of the secondary plant body
 - ii. Vascular (conducting) tissues: the xylem, the phloem
 - iii. Fundamental (ground) tissues: the parenchyma, the supportive collenchyma and sclerenchyma, the endodermis

3. Cells of plant tissues

[see 331.A.2.c.]

C. Organs of plants: tissue organization, functions, and types

1. Development of organs in vascular plants: internal and external morphology, tissue organization, functions, types, and modifications; the stem; the leaf; the root
2. Physiology of organs in vascular plants

3. Diverse sizes and forms of organ systems in vascular plants: potential for unlimited growth
 - a. Varieties of shoot systems
 - b. Varieties of root systems
 - c. Varieties of reproductive organs and organ systems
 4. Organs of nonvascular plants: analogues of stem, leaf, and root
 5. Evolution of plant organs and organ systems into the complex, multicellular state
- D. Animal tissues and fluids: classification, organization, and main functions
1. Classification of tissues: anatomical, embryological, functional
 2. Tissues for assimilation, storage, transport, and excretion: alimentary, liver, kidney, and lung tissues; blood and lymph
 3. Tissues for coordination: nervous and sensory tissues, endocrine tissues
 4. Tissues for support and movement: connective tissues, cartilage, bone, muscle
 5. Other tissues: reproductive tissues, hemopoietic tissues, tissue fluids
 6. Cells of animal tissues
[see 331.A.2.b.]
- E. Animal organs and organ systems
1. Specialized organ systems
 - a. Relating to the environment primarily: integumentary, skeletal, muscular, nervous, and endocrine systems
[see also 333.C. and D.; 334.A., B., and C.]
 - b. Serving cell metabolism primarily: digestive, respiratory, circulatory, and excretory systems
[see also 335.C.; 336.A., B., and C.]
 - c. Serving genetic continuity primarily: the reproductive system
 2. Interrelationships between organ systems: functional interdependence, feedback mechanisms
 3. Development of organ systems
[see also 338.D.]
 4. Evolution of organ systems

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the relation of form and function in organisms

Animals	Integumentary Systems
Blood	Muscles and Muscle Systems
Cells: Their Structures and Functions	Nerves and Nervous Systems
Circulation and Circulatory Systems	Plants
Digestion and Digestive Systems	Reproduction and Reproductive Systems
Endocrine Systems	Respiration and Respiratory Systems
Excretion and Excretory Systems	Supportive and Connective Tissues

MICROPAEDIA: Selected entries of reference information

General subjects

bark	inflorescence	phloem	symmetry
cambium	leaf	pistil	tissue
connective tissue	lignin	placenta	vascular bundle
cortex	meristem	root	vascular system
epithelium	mucus	sclerenchyma	vessel
flower	organ	sieve tube	wood
growth ring	parenchyma	stomate	xylem

Biographies

See Section 10/34 of Part Ten

INDEX: See entries under all of the terms above

Section 333. Coordination of Vital Processes: Regulation and Integration

- A. Maintenance of steady states in biological systems: homeostasis
 - 1. The nature of homeostatic systems
 - 2. Homeostatic processes
 - 3. Homeostatic control hierarchies: homeostatic subsystems that serve either organisms or natural communities
 - 4. Origin and evolution of homeostasis
 - 5. Individual adjustments to gradual changes in the physical environment: acclimatization
 - 6. Inactive states accompanied by a lower than normal rate of metabolism: dormancy
- B. Information reception and processing: sensory reception
 - 1. Classification of sensory systems
 - a. According to location of receptors: exteroceptors, interoceptors
 - b. According to type of stimulus: photoreceptors, thermoreceptors, chemoreceptors, mechanoreceptors, electroreceptors, sound receptors
 - 2. Evolution of sensory systems: specialized organs and information-processing structures
 - 3. Sensory information: interactions between adjacent sense cells and sensory neurons
- C. Endocrine systems in animals
 - 1. General features of hormonal coordination: the relationships between endocrine and neural regulation
 - 2. Vertebrate endocrine systems
 - a. Relationships of endocrine glands to each other and to the blood
 - b. Structure and function
 - 3. Invertebrate endocrine systems: insects, crustaceans, annelid worms
 - 4. Comparative, adaptive, and evolutionary aspects of endocrine systems: the neurosecretory cell, hypothalamus-pituitary control systems
 - 5. The human endocrine system
[see 421.E.]
- D. Nervous systems in animals
 - 1. Comparison of chemical and nervous regulation: control mechanisms located between the stimulus and the response
 - 2. Nervous coordination
 - a. Intracellular coordination: general cytoplasmic responsiveness, or irritability, to a stimulus
 - b. Organelle systems: the channeling of responsiveness at the subcellular level within more complex protozoans
 - c. Nervous systems: the channeling of responsiveness at the cellular level within multicellular organisms
 - i. The neuron, or nerve cell
 - ii. The transmission of the nerve impulse and the synapse
[see 323.C.]
 - 3. Invertebrate nervous systems
 - a. Theories of the evolutionary origin of the nervous system
 - b. Diffuse nervous systems
 - c. Centralized nervous systems
 - 4. Vertebrate nervous systems
 - a. The central nervous system: the brain and its components; the spinal cord; the brain coverings (meninges), cavities, cerebrospinal fluid, and neuroglia (nonnervous tissue)

- b. The peripheral nervous system
 - c. Embryonic development of the vertebrate nervous system
 - d. Evolution of the vertebrate nervous system
 - e. Biodynamics of the vertebrate nervous system
5. The human nervous system
[see 421.J.]
- E. The biological clock: periodicity
- 1. Rhythms without apparent external correlates: brain waves, breathing, heartbeat
 - 2. Rhythms correlated with natural geophysical cycles: solar-day rhythms, lunar-tidal rhythms, monthly rhythms, annual or seasonal rhythms, epochal rhythms
 - 3. The mechanism of the biological clock
 - 4. Factors affecting biological periodicities
 - 5. The amplification and superimposition of individual rhythms in communities
[see 352.C.1.b.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the coordination of vital processes: regulation and integration

Endocrine Systems
Nerves and Nervous Systems
Sensory Reception

MICROPAEDIA: Selected entries of reference information

General subjects

<i>endocrine systems:</i>	ganglion	rod	lateral line system
adrenal gland	meninges	visual pigment	mechanoreception
endocrine system	nervous system	<i>sensory reception—</i>	receptor
parathyroid gland	neuron	<i>sound reception:</i>	sense
pituitary gland	reflex	ear	smell
secretion	spinal cord	echolocation	taste
thyroid gland	synapse	external auditory canal	thermoreception
<i>nervous systems:</i>	vagus nerve	sound reception	touch reception
adrenergic nerve	<i>sensory reception—</i>	tympanic	<i>other:</i>
fibre	<i>photoreception:</i>	membrane	acclimatization
autonomic nervous system	cone	vestibulocochlear nerve	biological rhythm
brain	eye	<i>sensory reception—</i>	diapause
cerebral fissure	eyespot	<i>other:</i>	hibernation
cerebrospinal fluid	macula lutea	chemoreception	homeostasis
cranial nerve	photoreception		tropism
	rhodopsin		

Biographies

See Section 10/34 of Part Ten

INDEX: See entries under all of the terms above

Section 334. Covering and Support: Integumentary, Skeletal, and Musculatory Systems

- A. The body covering
 - 1. General features of the body covering, of integument: comparisons among unicellular organisms, plants, and animals
 - 2. Invertebrate integuments: organization and function
 - a. Cellular components and their derivatives
 - b. Noncellular coatings of the integument
 - 3. Vertebrate integuments: cellular components and their derivatives
 - a. Skin layers: the epidermis, the dermis
 - b. Skin derivatives and appendages: skin glands and pigment; epidermal scales; claws, nails, and hoofs; horns and antlers; feathers and hair; dermal derivatives
 - 4. Skin variations among vertebrates
 - 5. Embryology and evolution of the vertebrate skin
 - 6. The biodynamics of vertebrate skin
 - 7. Human integument and derivatives: skin, hair, nails, sebaceous glands, sweat glands
- B. The body skeleton
 - 1. The roles of the body skeleton
 - 2. Description and composition of the skeletal elements
 - a. Cuticular structures: bone, crystals, cuticle, ossicles, spicules
 - b. Semirigid structures: flexible cuticular structures, calcareous spicules that are not tightly packed, keratin, notochord, cartilage
 - c. Other elements: connective tissue, the hydrostatic skeleton, elastic structures, buoyancy devices
 - 3. The invertebrate skeleton: organization and function
 - 4. The vertebrate skeleton: structure and function
 - a. General features
 - b. Embryology of vertebrate skeletons
 - c. Vertebral column and thoracic skeleton
 - d. Appendicular skeleton: pectoral girdle, pelvic girdle, limbs
 - 5. Joints in vertebrates and invertebrates permitting various types of movement
 - 6. Properties of bone and its development
 - 7. The human skeletal system
- C. The body musculature
 - 1. General features of muscle tissue: its role in movement, support, colour changes, temperature regulation, and discharge of certain glands; arrangement and gross function
 - 2. Muscle contractile systems
 - a. Simple contractile systems: simple contractile fibrils and epithelio-muscular cells
 - b. Complex contractile tissues: striated muscle, smooth muscle
 - 3. Muscle contraction
[see 323.D.]
 - 4. Invertebrate muscle systems
 - 5. Vertebrate muscle systems
 - a. Embryonic development and divisions of the muscular system
 - b. Evolution of the vertebrate musculatory system

- c. Function and regulation of muscle action
 - d. Electric organs in certain fishes
6. The human muscular system
[sec 421.H.6. and 7.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with covering and support: integumentary, skeletal, and muscular systems

Integumentary Systems
Muscles and Muscle Systems
Supportive and Connective Tissues

MICROPAEDIA: Selected entries of reference information

General subjects

<i>integument:</i>	extensor muscle	fontanel	<i>other:</i>
bark	flexor muscle	humerus	ankle
beak	gluteus muscle	joint	arm
claw	iliocostalis muscle	ligament	digit
dermis	latissimus dorsi	metacarpal	elbow
epidermis	levator muscle	occipital	face
exoskeleton	muscle	parietal bone	foot
feather	pectoralis muscle	pelvic girdle	hand
hair	sphincter muscle	radius	heel
horn	trapezius muscle	rib	hip
integument	triceps muscle	sacrum	jaw
mantle	<i>supportive and</i>	scapula	knee
nail	<i>connective tissues:</i>	skeleton	leg
scale	bone	skull	shoulder
test	carpal bone	sternum	tail
<i>musculature:</i>	cartilage	tarsal	thorax
abdominal muscle	clavicle	tibia	wrist
abductor muscle	connective tissue	ulna	
adductor muscle	femur	vertebral column	
biceps muscle	fibula	zygomatic arch	

Biographies

See Section 10/34 of Part Ten

INDEX: See entries under all of the terms above

Section 335. Nutrition: the Procurement and Processing of Nutrients

A. The basic features of nutrition

1. The various nutritional patterns; *e.g.*, autotrophism and heterotrophism, phototrophism and chemotrophism
2. Methods of ingestion or penetration
[see C., below]
3. The essential nutrients: compounds that cannot be synthesized by an organism and must be supplied in food; the nutritional needs of organisms
4. Syntrophism: nutritional interrelationships in which the immediate or end products of metabolism of one organism may provide essential nutrients for another

B. Photosynthesis: the production of food in green plants
[see also 322.A.]

C. Digestion and digestive systems

1. The contrast between autotrophs and heterotrophs

2. The alimentary system in animals other than humans
 - a. Invertebrate digestive systems: vacuolar systems, channel-network systems, saccular systems, tubular systems
 - b. Vertebrate digestive systems: oral cavity, teeth, and pharynx; esophagus and stomach; small intestine, pancreas, and liver; the large intestine
 - c. Embryology and evolutionary development of the vertebrate digestive system
 - d. Biodynamics of the vertebrate digestive system: control of secretions and intestinal movements
3. The human alimentary system
[see 421.D.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with nutrition: the procurement and processing of nutrients
 Digestion and Digestive Systems
 Nutrition

MICROPAEDIA: Selected entries of reference information

General subjects

<i>digestive system:</i>			<i>other:</i>
alimentary	plica circularis	nutritional	bile
canal	pylorus	type	bilirubin
anal canal	rectum	protein	chyme
anus	small intestine	vitamin	feces
appendix	stomach	<i>oral cavity:</i>	intestinal gas
argentaffin cell	villus	canine tooth	
cecum	<i>ingestion and</i>	cementum	
colon	<i>digestion:</i>	dentine	
digestion	chewing	enamel	
esophagus	defecation	gum	
gallbladder	digestion	ivory	
gastric gland	peristalsis	palate	
large intestine	swallowing	periodontal	
liver	<i>nutrients and</i>	membrane	
pancreas	<i>nutrition:</i>	saliva	
Paneth's cell	carbohydrate	salivary gland	
pharynx	fat	tongue	
	nutrition	tooth	

Biographies

See Section 10/34 of Part Ten

INDEX: See entries under all of the terms above

Section 336. Gas Exchange, Internal Transport, and Elimination

- A. Respiration and respiratory systems
 1. The process of extracting oxygen and releasing carbon dioxide
 2. Gases in the environment: the range of respiratory problems faced by aquatic and terrestrial animals
 3. Basic types of respiratory structures
 - a. Respiratory organs of invertebrates: tracheae and gills
 - b. Respiratory organs of vertebrates: gills and lungs
 4. Dynamics of respiratory mechanisms
 5. The control of respiration: neural reflexes, muscular feedback, chemically sensitive controls
 6. Adaptation to special environmental conditions

7. The human respiratory system
[see 421.C.]

B. Circulation and circulatory systems

1. Circulation and transport patterns: general aspects common to all circulatory systems
 - a. Circulation in single cells: streaming movements within the protoplasm
 - b. Circulation in multicellular animals
2. The fluid media involved in circulation: blood and lymph
 - a. Evolutionary origins of circulating fluids
 - b. Plasma
 - c. Formed elements of the circulating fluid: red cells, white cells, platelets, thrombocytes
 - d. Lymphocytes and lymph in vertebrates
3. Transport systems in animals
 - a. Invertebrate circulatory systems
 - b. Vertebrate circulatory systems
 - c. Coronary circulation
 - d. Embryonic development of the circulatory system
 - e. Biodynamics of vertebrate circulation
 - f. The human cardiovascular system
[see 421.A.]
4. Plant internal transport

C. Elimination: the disposal of wastes

1. General features of elimination
2. Excretion and excretory systems
 - a. Excretory mechanisms
 - b. Invertebrate excretory systems
 - c. Vertebrate excretory systems
 - d. The evolution of the vertebrate excretory system
 - e. The human excretory system
[see 421.G.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with gas exchange, internal transport, and elimination

Cells: Their Structures and Functions
Circulation and Circulatory Systems
Excretion and Excretory Systems
Respiration and Respiratory Systems

MICROPAEDIA: Selected entries of reference information

General subjects

<i>blood and lymph:</i>	platelet	blood pressure	hepatic vein
agglutinin	serum albumin	capillary	lung
blood	thymus	cardiovascular	lymph node
complement	<i>circulatory and</i>	system	lymph nodule
erythrocyte	<i>respiratory systems:</i>	circulation	portal vein
hemoglobin	aorta	coronary artery	pulmonary
hemolysis	artery	diaphragm	circulation
leukocyte	asphyxia	diastole	pulse
lymph	atrium	gill	renal vein
lymphocyte		heart	respiration

systemic	<i>excretory systems:</i>	perspiration	phloem
circulation	cloaca	renal capsule	root
systole	excretion	renal pelvis	sieve tube
trachea	kidney	renal pyramid	translocation
valve	loop of Henle	urinary bladder	transpiration
vein	malpighian tubule	urine	transport
vena cava	nasal gland	<i>plant internal</i>	vascular bundle
venous sinus	nephridium	<i>transport system:</i>	vessel
ventricle	nephron	mass flow	xylem

Biographies

See Section 10/34 of Part Ten

INDEX: See entries under all of the terms above

Section 337. Reproduction and Sex

- A. The forms of reproduction and their comparative adaptive significance
 - 1. Levels of reproduction
 - a. Molecular replication and reproduction
 - b. Cell reproduction: binary and multiple fission
 - c. Reproduction of organisms
[see A.2., below]
 - d. Life cycles of plants and animals
 - 2. Reproduction of organisms: sexual and asexual reproduction
 - 3. Natural selection and reproduction: the evolution of reproduction and variation control
[see also 312.C.]
- B. Sex and sexuality
 - 1. The distinctions between sex, sexuality, and reproduction
 - 2. Transduction and transformation as sexlike recombination in viruses and bacteria
 - 3. The adaptive significance of sex: establishment of genetic diversity
 - 4. The origin of sex and sexuality
 - 5. Sex patterns
 - 6. Determination of the sex of individuals
 - a. The sex chromosomes
 - b. Abnormal chromosome effects
 - c. The effect of parthenogenetic development
 - d. Environmental and hormonal influences
- C. The reproductive system in plants: its organization and function
 - 1. General features: asexual systems that create new plants identical to the parent plant, sexual systems that create new plants different from either of the two parents
 - 2. The sex organs of bryophytes
 - a. In liverworts and hornworts
 - b. In mosses
 - 3. The variations of sex organs in tracheophytes
 - a. In spore plants
 - b. In seed plants
 - 4. Variations in reproductive cycles: apogamy and apospory (apparent secondary loss of capacity for sexual reproduction)

5. The physiology of reproduction: the influence of internal and environmental factors on the maturation of sporophytes and gametophytes as manifested by their ability to produce spores and gametes
- D. The reproductive system in animals: its organization and function
1. General features
 2. Reproductive systems of invertebrates
 - a. Gonads, associated structures, and products in monoecious and dioecious types
 - b. Mechanisms that aid in the union of gametes
 - c. Specializations associated with parthenogenesis
 - d. Provisions for the developing embryo
[see 338.D.2.b.]
 3. Reproductive systems of vertebrates
 - a. Gonads, associated structures, and products
 - b. Adaptations for internal fertilization; *e.g.*, the cloaca, intromittent (copulatory) organs, accessory structures
 - c. Role of gonads in hormone cycles
 - d. Provision for the developing embryo
[see 338.D.2.b.]
 - e. The human reproductive system
[see 421.F.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with reproduction and sex

Behaviour, Animal
Reproduction and Reproductive Systems
Sex and Sexuality

MICROPAEDIA: Selected entries of reference information

General subjects

<i>plant reproduction:</i>	cross-fertilization	menopause	sperm
gametophyte	fertilization	menstruation	spermatogenesis
ovary	fission	ovary	testis
ovule	gestation	ovulation	<i>other:</i>
pistil	incubation	ovum	alternation of
pollen	meiosis	placenta	generations
pollination	parturition	uterus	courtship
propagation	recombination	vagina	fertility and
pseudocopulation	reproduction	<i>reproductive</i>	infertility
spore	self-fertilization	<i>system—male:</i>	gamete
sporophyte	sexual intercourse	bulbourethral	gonad
<i>reproductive</i>	viviparity	gland	hermaphroditism
<i>processes:</i>	<i>reproductive</i>	ductus deferens	orgasm
artificial	<i>system—female:</i>	epididyme	sex
insemination	egg	penis	sex chromosome
budding	estrus	prostate gland	
conjugation	fallopian tube	seminal vesicle	

Biographies

See Section 10/34 of Part Ten

INDEX: See entries under all of the terms above

Section 338. Development: Growth, Differentiation, and Morphogenesis

- A. The nature and scope of biological development
- B. The constituent processes of development and their control
 - 1. Growth
 - 2. Morphogenesis
 - 3. Differentiation
 - 4. Control and integration of development
- C. Development of plants
 - 1. General features: types of life cycles, alternation of generations as independent phases of the life cycle
 - 2. Preparatory events
 - a. Formation of sex cells
 - b. Pollination
 - c. Fertilization
 - 3. Early development: from fertilized egg (zygote) to seedling
 - a. Embryo formation
 - b. Independent dormant stages and germination of the seeds and fruits of higher plants, dispersal
 - 4. Later development: the sporophyte plant body
- D. Development of animals
 - 1. Preparatory events: the egg and its activation by normal fertilization or by parthenogenesis
 - 2. Early development
 - a. Embryo formation: cleavage, gastrulation
 - b. Embryonic adaptations for the maintenance of the developing embryo: shell, yolk stores, membranous sacs, placenta
 - 3. Organ formation
 - 4. Postembryonic development: transformation of the newborn into the adult
- E. Aging and decline in animals: life span, death
[for aging in humans, see 422.A.]
 - 1. Senescence in mammals
 - 2. Causes of aging
 - 3. The duration of life
- F. Specialized patterns of development
 - 1. Biological regeneration
 - 2. The healing processes and scar tissue formation
 - 3. Biological malformation
 - 4. Twinning: multiple births
 - 5. Development in vitro: cell and tissue cultures
 - 6. Development of transplanted tissues and organs

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with development: growth, differentiation, and morphogenesis
Death
Growth and Development, Biological

MICROPAEDIA: Selected entries of reference information

General subjects

<i>animal development:</i>	larva	<i>development</i>	parthenocarpy
amnion	metamorphosis	<i>processes:</i>	seed
blastocyst	neural crest	aging	<i>other:</i>
chorion	notochord	death	blastema
cleavage	nymph	development	dysplasia
ectoderm	paedomorphosis	histogenesis	monster
embryo	parturition	organogenesis	
endoderm	placenta	regeneration	
fetus	pupa	<i>plant development:</i>	
gastrula	segmentation	endosperm	
gestation	umbilical cord	germination	
incubation		fruit	

Biographies

See Section 10/34 of Part Ten

INDEX: See entries under all of the terms above

Section 339. Heredity: the Transmission of Traits

A. Basic features of heredity

1. Early speculations on the nature of heredity
2. Mendelian genetics: Mendel's experiments and their significance, the universality of Mendel's laws, interactions among genes and their variant forms (alleles)
3. The combined action of heredity and environment in producing an organism

B. The physical basis of heredity

1. Chromosomes and genes: the cellular basis of heredity
2. Molecular genetics: the chemical and molecular nature of genes, the genetic code and its mutations, the expression and regulation of genes, applications of molecular genetics

C. Heredity and evolution

[see also 312.C.]

1. Population genetics: the gene pool, the Hardy-Weinberg principle, changes in gene frequencies
2. Natural selection as an agent of evolutionary change
3. Artificial selection for genetic improvements of selected organisms: domesticated animals, cultivated plants, humankind
[see also 355.B.3.]
4. Outbreeding and inbreeding: the effects of consanguinity on the vigour of offspring

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major article dealing with heredity: the transmission of traits

Genetics and Heredity, The Principles of

MICROPAEDIA: Selected entries of reference information

General subjects

albinism	genetic code	inbreeding	plasmid
allele	genetic drift	linkage group	polyploidy
character	genotype	Mendelism	recessiveness
chimera	Hardy-Weinberg	mutation	testercross
chromosome	law	operon	transformation
dominance	heredity	pedigree	variation
gene	hybrid	phenotype	

Biographies

See Section 10/34 of Part Ten

INDEX: See entries under all of the terms above

Division IV. Behavioral Responses of Organisms

[For Part Three headnote see page 95.]

Several of the sections in Division III deal with the structure and internal functioning of organisms. The outlines in the two sections of Division IV deal with the external actions and reactions of living things in relation to changes in their environment.

Section 341. Nature and Patterns of Behavioral Responses 130

342. Development and Range of Behavioral Capacities: Individual and Group Behaviour 131

Section 341. Nature and Patterns of Behavioral Responses

- A. Diverse conceptions of animal behaviour
 - 1. The variety of animal behaviour
 - 2. Classification of animal behaviour
 - 3. Components of animal behaviour
- B. Patterns of stereotyped response: unlearned behavioral reactions of organisms to some environmental stimulus
 - 1. Plant movements: tropic and nastic movements, nutation, other autonomous movements
 - 2. Animal movements: reflex and reflexlike activities, taxes, fixed action patterns and instinct
 - 3. Photoperiodism
- C. Hormonal and nervous control of behaviour
 - 1. Interaction of endocrine and nervous systems
 - 2. Hormonal influences on behaviour; *e.g.*, by sex hormones
 - 3. The nervous system and behaviour: the role of the nervous system in receiving information, processing it in the brain and spinal cord, and initiating the appropriate response
- D. Evolution of behaviour
 - 1. Evidence of the genetic determination of behaviour
 - 2. The influence of experience on behaviour: phyletic patterns in the evolution of learning
 - 3. Evolutionary origins and evolutionary consequences of behaviour patterns

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major article dealing with the nature and patterns of behavioral responses
Behaviour, Animal

MICROPAEDIA: Selected entries of reference information

General subjects

animal behaviour	instinct	play	tropism
behaviour genetics	photoperiodism	reflex	

Biographies

See Section 10/34 of Part Ten

INDEX: See entries under all of the terms above

Section 342. Development and Range of Behavioral Capacities: Individual and Group Behaviour

- A. Basic behavioral activities of individuals
1. Food getting
 2. Locomotion
 3. Avoidance behaviour
 4. Aggressive behaviour: attack and defensive threats
 5. Behaviour related to habitat
 6. Behaviour related to reproduction
- B. Higher behavioral characteristics of individual animals
1. Simple nonassociative learning; *e.g.*, habituation, sensitization
 2. Associative learning; *e.g.*, classical and instrumental, or operant, conditioning
 3. Spatial learning; *e.g.*, maze learning, navigation
 4. Perceptual learning; imitation and observational learning; *e.g.*, song learning, imprinting
 5. Complex problem solving
 - a. Discriminations of relational and abstract stimuli
 - b. Generalized rule learning
 - c. Insight and reasoning
 - d. Language learning
- C. The behaviour of animals in groups
1. Distinctions between groups of social animals and groups of nonsocial ones
 2. Animal communication
 3. The range of social behaviour among social and nonsocial animals
 4. Dynamics of social behaviour
- D. Evolution of behaviour
[see 341.D.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the development and range of behavioral capacities: individual and group behaviour

Behaviour, Animal
Learning, Animal

MICROPAEDIA: Selected entries of reference information

General subjects

aggressive behaviour	brooding	habituation	sound production
alarm signal	cannibalism	homing	submissive behaviour
animal behaviour	cleaning behaviour	imprinting	suckling
animal communication	colony	learning	terrestrial locomotion
aquatic locomotion	conditioning	locomotion	territorial behaviour
associative learning	courtship	motivation	
avoidance behaviour	display behaviour	nest	
bird song	dominance hierarchy	pheromone	
brachiation	feeding behaviour	predation	
	flight	reproductive behaviour	
	habit	scavenger	

Biographies

See Section 10/34 of Part Ten

INDEX: See entries under all of the terms above

Division V. The Biosphere: the World of Living Things

[For Part Three headnote see page 95.]

Division I of Part Three deals with the nature, origin, evolution, distinctive properties, and classification of living things. Divisions II, III, and IV deal with life at the molecular, cellular, organismal, and behavioral levels.

The outlines in the five sections of Division V deal with the world of living things taken as a single system of biotic and environmental interactions and interdependencies.

- Section 351. Basic Features of the Biosphere 132
- 352. Biological Populations and Communities 133
 - 353. Hazards of Life in the Biosphere: Disease and Death 135
 - 354. Biogeographic Distribution of Organisms: Ecosystems 136
 - 355. The Place of Humans in the Biosphere 137

Section 351. Basic Features of the Biosphere

- A. The extent of the biosphere
 - 1. Preconditions of the biosphere: the Earth as an ideal medium for life
[see 312.A.2.]
 - 2. The levels of organization within the biosphere: the biocycle, the ecosystem, the community, the population
[see 352.A. and C.; 354]
 - 3. Energy flow in the biosphere
 - 4. Cycling of matter in the biosphere
 - a. The general pattern of chemical cycles in nature
[see also 214.C.]
 - b. The carbon and oxygen cycles
 - c. The nitrogen cycle
 - d. The sulfur cycle
 - e. The water cycle
[see also 222.D.]
 - f. The sedimentary cycles of essential minerals
 - 5. The concept of the noosphere: mankind's place in the biosphere
[see 355.B.]
- B. The ecosystem: a collection of integrated communities and their environment
 - 1. Definition of an ecosystem
 - 2. The biotic components of the ecosystem
 - a. Producers
 - b. Consumers
 - c. Decomposers
 - 3. The abiotic components of the ecosystem
 - a. Pressure and temperature
[see 223.E.1.]
 - b. Radiation
 - c. Illumination

- d. Water and soil characteristics, salts
- e. Wave action: wind and water
- f. Fire as a limiting factor
- 4. The conditioning of the abiotic environment by living organisms
- 5. The effect of microenvironments on the ecosystem
- 6. Processes that determine the nature and productivity of the ecosystem
- 7. Types of ecosystems
[see 354]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major article dealing with the basic features of the biosphere
Biosphere, The

MICROPAEDIA: Selected entries of reference information

General subjects

biochemical	carbon cycle	nitrogen cycle	sulfur cycle
oxygen demand	ecosystem	oxygen cycle	vernalization
biogeochemical	eutrophication	phosphorus	
cycle	food chain	cycle	
biosphere	microclimate		
body heat			

Biographies

See Section 10/34 of Part Ten

INDEX: See entries under all of the terms above

Section 352. Biological Populations and Communities

A. Biological populations

- 1. The study of populations
[see 10/34.B.4.]
- 2. The measurable characteristics of biological populations
 - a. Age, sex, and genetic differences and their distribution
 - b. Numbers and density: the effects of natality and mortality, the reproductive rate and death rate
- 3. Growth of populations: growth form and carrying capacity
- 4. Fluctuations in stable populations: variations in population size
- 5. Movements: migration; emigration; dispersion; dispersal; the influence of topographical, climatic, and biological barriers
- 6. Interactions of populations
[see B., below]
- 7. Factors affecting the structure of human populations
[see 524.A.]

B. Biotic interactions

- 1. Intraspecific interactions: positive and negative interactions of individuals within a species
- 2. Interspecific interactions: interactions among members of different species
 - a. The range of interspecies associations
 - b. Negative interactions, in which one or both populations are harmed: consumption, parasitic interactions, amensalism and antagonism

- c. Positive interactions, in which one or both populations are benefited: commensalism, mutualism
 - d. Neutralistic interactions
3. Interactions between populations of different species and the ecological, evolutionary, and biogeographical aspects of interaction on the population level

C. Biological communities

1. Community structure

- a. Vertical and horizontal patterns: the influence of variations in environmental conditions on the stratification and zonation of organisms
- b. Time relations: periodicity and population changes in the community
- c. Interactions in the community: heterotrophic nutrition, predation, symbiosis
- d. Niches and species diversity
- e. Ecotones and the "edge effect"

2. Community function: energy flow

3. Community succession: growth toward a stable, mature condition

4. Communities in space

- a. Landscape patterns: the habitats of a landscape as forming a pattern of environmental gradients
- b. Climax interpretation: monocl意思 theory, polyclimax theory, and climax pattern hypothesis
- c. Community gradients: coenclines

5. Community classification and its bases

- a. The association as the unit of classification
- b. The biome or formation as the unit of classification
- c. Other bases for classification: *e.g.*, ecological succession, habitat, community metabolism

6. Community structure in past ages: biogeographical succession

[see 242.B. and 243]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with biological populations and communities

Behaviour, Animal
Biosphere, The

MICROPAEDIA: Selected entries of reference information

General subjects

amensalism	ecology	homing	parasitology
biome	ecosystem	migration	predation
carnivore	ecotone	mutualism	symbiosis
commensalism	epiphyte	niche	trophic level
community	flyway	parasitism	
competition	herbivore		

Biographies

See Section 10/34 of Part Ten

INDEX: See entries under all of the terms above

Section 353. Hazards of Life in the Biosphere: Disease and Death

- A. Disease as a departure from the "normal" state, or a disruption of homeostasis; death as the irreparable disruption of life processes
1. The nature of noncommunicable disease: metabolic defects, environmental hazards
 2. The nature of communicable, or contagious, disease
 - a. The multifactorial concept of contagious disease
 - b. Endemic disease and epidemic disease
 3. Immunity
[see also 422.C.2.]
 4. Control of disease: prevention, treatment
- B. Plant diseases
- C. Animal diseases
- D. Human diseases
[see 423]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with hazards of life in the biosphere: disease and death

Death
Disease
Immunity

MICROPAEDIA: Selected entries of reference information

General subjects

<i>animal diseases and zoonoses:</i>	malaria	autoimmunity	ergot
actinomycosis	mastitis	drug allergy	fruit spot
African swine fever	mycosis	immunity	leaf blister
anthrax	myopathy	immunization	mosaic
ascariasis	nagana	interferon	Panama disease
aspergillosis	pox disease	interleukin	powdery mildew
bloat	Q fever	phagocytosis	psoriasis
brucellosis	rabies	toxoid	rot
canine distemper	Rift Valley fever	vaccine	rust
cestodiasis	rinderpest	variolation	scab
coccidiosis	salmonellosis	<i>plant diseases:</i>	scorch
equine encephalitis	scrapie	aster yellows	smut
erysipelothrix infection	strangles	black knot	snow mold
feline distemper	swine fever	black spot	sunscald
foot-and-mouth disease	toxoplasmosis	blight	wilt
glanders	trichomoniasis	bulb rot	<i>other:</i>
histoplasmosis	tularemia	bunt	bacteria
hookworm disease	yellow fever	canker	disease
hyperkeratosis	zoonosis	clubroot	drowning
leptospirosis	<i>immunity and immunization:</i>	crown gall	epidemic
listeriosis	antibody	curly top	germfree life
lungworm	antigen	damping-off	prión
	antitoxin	dieback	quarantine
	autoantibody	downy mildew	veterinary science
		Dutch elm disease	virus

Biographies

See Section 10/34 of Part Ten

INDEX: See entries under all of the terms above

Section 354. Biogeographic Distribution of Organisms: Ecosystems

- A. Terrestrial ecosystems
 - 1. The land environment
 - a. Land as a medium for life and the comparison of the terrestrial and aquatic ecosystems
 - b. Limiting factors to living on land
 - c. Major terrestrial biomes: the tundra, the coniferous forest, the middle-latitude forest, the tropical rain forest, the grassland and savanna, the scrublands, the desert
 - d. Specialized biomes: polar biomes, subterranean biomes
 - 2. Major life-forms
 - a. Growth habits and indicator organisms
 - b. Classification by habitat: soil organisms, trees and other rooted plants, epiphytes and periphytes, permeants
 - c. Classification by niche: producers, consumers, decomposers
 - 3. Productivity in terrestrial ecosystems
- B. Aquatic ecosystems
 - 1. The aquatic environment
 - 2. The ocean and its communities: communities of the open sea
 - a. The sea as a biological environment
 - b. Character of oceanic populations: benthos, plankton, nekton
 - c. Adaptations to marine conditions
 - d. Productivity of marine communities as judged by biological oxygen consumption or by nutrient concentration
 - 3. Inland waters and their communities: freshwater communities
 - a. Lacustrine, or standing-water, communities: in lakes and ponds; in swamps, marshes, and bogs
 - b. Riverine, or flowing-water, communities: in rivers and streams, in springs
 - 4. Boundary ecosystems: between waters or between water and land
 - a. Estuarine communities: communities in brackish water
 - b. Neritic communities: life along seacoasts
 - 5. Productivity in aquatic ecosystems: the problem of determining productivity, comparisons of productivity
- C. The distribution of organisms
- D. Biogeographic regions and their inhabitants: regional floras and faunas
 - 1. The Megagaeian realm
 - a. Holarctic region: the nontropical parts of Eurasia, northern Africa, and North America
 - b. Ethiopian region: Africa south of the Sahara, southwestern Arabia, Madagascar
 - c. Oriental region: tropical southern and southeastern Asia
 - 2. The Notogaeian realm: Australia, New Guinea, New Zealand, tropical Pacific islands
 - 3. The Neogaeian realm: Central and South America
 - 4. The Antarctic realm: Antarctica and most of the sub-Antarctic islands

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with biogeographic distribution of organisms: ecosystems

Biosphere and Concepts of Ecology, The Lakes Oceans	Rivers Trees
--	-----------------

MICROPAEDIA: Selected entries of reference information

General subjects

<i>biogeographic regions:</i>	plain	<i>ocean layers:</i>	Mediterranean
Australian region	prairie	abyssal zone	vegetation
Ethiopian region	savanna	air-sea	scrubland
faunal region	turf	interface	thorn forest
floristic region	<i>ecosystems—</i>	bathyal zone	<i>other:</i>
Holarctic region	<i>other:</i>	bottom water	dispersion
Neotropical region	biome	halocline	land bridge
<i>ecosystems—forests:</i>	desert	littoral zone	Marine
cloud forest	ecosystem	pelagic zone	Biological
coniferous forest	estuary	photic zone	Laboratory
deciduous forest	lacustrine	<i>ocean populations:</i>	mesofauna
forest	ecosystem	benthos	shrub
rainforest	polar	nekton	soil organism
<i>ecosystems—</i>	biome	plankton	tree
<i>grasslands:</i>	rangeland	zooplankton	Wallace's Line
grassland	riverine ecosystem	<i>scrublands:</i>	
	tundra	chaparral	

Biographies

See Section 10/34 of Part Ten

INDEX: See entries under all of the terms above

Section 355. The Place of Humans in the Biosphere**A. The qualities that set human beings apart in the biosphere**

1. Structural characteristics and physical capabilities providing humans with a versatility unparalleled in the biosphere
2. Physiological characteristics underlying the unique behaviour of humans: lack of a definite breeding season, long life span with slow development and lengthy dependency to maturity
3. Behavioral capacity as the basis of the unique culture of humans: communication through propositional speech, intellect and conceptualization

B. The effects of human action upon the biosphere

1. The influence of the human species on the modification of the environment
2. The influence of the environment on the modification of the human species
3. The attempts to change genetic endowments through deliberate selective measures: eugenics

C. The utilization of organisms by humans

1. Domestication of plants and animals: distribution and development
2. The cultivation of plants: plant breeding and growing
3. The uses of plants
[see also 724.C.8. and 731]
4. The cultivation of animals: animal breeding and raising
5. Major uses of animals
[see also 724.C.8. and 731]

6. The maintenance of public and private collections of live and preserved animals and plants
 - a. Museums of natural history
 - b. Zoological gardens and aviaries
 - c. Institutional and private aquariums
 - d. Botanical gardens and arboretums
- D. The conservation and management of natural resources
 1. The nature and scope of conservation management
 2. Types of natural resources
 3. Management of natural resources
 4. Management of the world's food supply
 - a. The problem of food supply: special difficulties facing the developing countries
 - b. Attempts to increase the production and utilization of food supplies: the quest for new sources of food and food additives

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the place of humans in the biosphere

Biosphere and Concepts of Ecology, The	Farming and Agricultural Technology
Cats, Domestic	Forestry and Wood Production
Conservation of Natural Resources	Gardening and Horticulture
Dogs	Horses and Horsemanship

MICROPAEDIA: Selected entries of reference information

General subjects

<i>conservation and management of natural resources:</i>	nature reserve	domestic cat	vegetable
conservation	surface mining	domestication	zoo
desalination	terrace cultivation	fowl	<i>pollution and pollution control:</i>
drainage	wildlife	fruit	acid rain
ecosystem	conservation	gardening	emission-control system
endangered species	<i>domestication and raising of plants and animals:</i>	genecentre	greenhouse effect
flood	animal breeding	horse	pollution
forestry	animals, cruelty to	horticulture	refuse disposal system
Greenpeace	aquarium	hydroponics	sewage system
hunting	arboriculture	livestock	smog
irrigation	botanical garden	oceanarium	water purification
materials salvage	breed association	pet	
national forest	cereal	plant breeding	
national park	dog	studbook	
		terrarium	

Biographies

See Section 10/34 of Part Ten

INDEX: See entries under all of the terms above

Introduction to Part Four: The Cosmic Orphan

by Loren Eiseley

When I was a young lad of that indefinite but important age when one begins to ask, Who am I? Why am I here? What is the nature of my kind? What is growing up? What is the world? How long shall I live in it? Where shall I go? I found myself walking with a small companion over a high railroad trestle that spanned a stream, a country bridge, and a road. One could look fearfully down, between the ties, at the shallows and ripples in the shining water some 50 feet below. One was also doing a forbidden thing, against which our parents constantly warned. One must not be caught on the black bridge by a train. Something terrible might happen, a thing called death.

From the abutment of the bridge we gazed down upon the water and saw among the pebbles the shape of an animal we knew only from picture books—a turtle, a very large, dark mahogany-coloured turtle. We scrambled down the embankment to observe him more closely. From the little bridge a few feet above the stream, I saw that the turtle, whose beautiful markings shone in the afternoon sun, was not alive and that his flippers waved aimlessly in the rushing water. The reason for his death was plain. Not too long before we had come upon the trestle, someone engaged in idle practice with a repeating rifle had stitched a row of bullet holes across the turtle's carapace and sauntered on.

My father had once explained to me that it took a long time to make a big turtle, years really, in the sunlight and the water and the mud. I turned the ancient creature over and fingered the etched shell with its forlorn flippers flopping grotesquely. The question rose up unbidden. Why did the man have to kill something living that could never be replaced? I laid the turtle down in the water and gave it a little shove. It entered the current and began to drift away. "Let's go home," I said to my companion. From that moment I think I began to grow up.

"Papa," I said in the evening by the oil lamp in our kitchen. "Tell me how men got here." Papa paused. Like many fathers of that time, he was worn from long hours, he was not highly educated, but he had a beautiful resonant voice and he had been born on a frontier homestead. He knew the ritual way the Plains Indians opened a story.

"Son," he said, taking the pattern of another people for our own, "once there was a poor orphan." He said it in such a way that I sat down at his feet. "Once there was a poor orphan with no one to teach him either his way, or his manners. Sometimes animals helped him, sometimes supernatural beings. But above all, one thing was evident. Unlike other occupants of Earth he had to be helped. He did not know his place, he had to find it. Sometimes he was arrogant and had to learn humility, sometimes he was a coward and had to be taught bravery. Sometimes he did not understand his Mother Earth and suffered for it. The old ones who starved and sought visions on hilltops had

known these things. They were all gone now and the magic had departed with them. The orphan was alone; he had to learn by himself; it was a hard school."

My father tousled my head; he gently touched my heart. "You will learn in time there is much pain here," he said. "Men will give it to you, time will give it to you, and you must learn to bear it all, not bear it alone, but be better for the wisdom that may come to you if you watch and listen and learn. Do not forget the turtle, nor the ways of men. They are all orphans and they go astray; they do wrong things. Try to see better."

"Yes, papa," I said, and that was how I believe I came to study men, not the men of written history but the ancestors beyond, beyond all writing, beyond time as we know it, beyond human form as it is known today. Papa was right when he told me men were orphans, eternal seekers. They had little in the way of instinct to instruct them, they had come a strange far road in the universe, passed more than one black, threatening bridge. There were even more to pass, and each one became more dangerous as our knowledge grew. Because man was truly an orphan and confined to no single way of life, he was, in essence, a prison breaker. But in ignorance his very knowledge sometimes led from one terrible prison to another. Was the final problem then, to escape himself, or, if not that, to reconcile his devastating intellect with his heart? All of the knowledge set down in great books directly or indirectly affects this problem. It is the problem of every man, for even the indifferent man is making, unknown to himself, his own callous judgment.

Long ago, however, in one of the Dead Sea Scrolls hidden in the Judean Desert, an unknown scribe had written: "None there be, can rehearse the whole tale." That phrase, too, contains the warning that man is an orphan of uncertain beginnings and an indefinite ending. All that the archaeological and anthropological sciences can do is to place a somewhat flawed crystal before man and say: This is the way you came, these are your present dangers; somewhere, seen dimly beyond, lies your destiny. God help you, you are a cosmic orphan, a symbol-shifting magician, mostly immature and inattentive to your own dangers. Read, think, study, but do not expect this to save you without humility of heart. This the old ones knew long ago in the great deserts under the stars. This they sought to learn and pass on. It is the only hope of men.

What have we observed that might be buried as the Dead Sea Scrolls were buried for 2,000 years, and be broken out of a jar for human benefit, brief words that might be encompassed on a copper scroll or a ragged sheet of vellum? Only these thoughts, I think, we might reasonably set down as true, now and hereafter. For a long time, for many, many centuries, Western man believed in what we might call the existent world of nature; form as form was

seen as constant in both animal and human guise. He believed in the instantaneous creation of his world by the Deity; he believed its duration to be very short, a stage upon which the short drama of a human fall from divine estate and a redemption was in progress.

Worldly time was a small parenthesis in eternity. Man lived with that belief, his cosmos small and man-centred. Then, beginning about 350 years ago, thoughts unventured upon since the time of the Greek philosophers began to enter the human consciousness. They may be summed up in Francis Bacon's dictum: "This is the foundation of all. We are not to imagine or suppose, but to *discover*, what nature does or may be made to do."

When in following years scientific experiment and observation became current, a vast change began to pass over Western thought. Man's conception of himself and his world began to alter beyond recall. "'Tis all in pieces, all coherence gone," exclaimed the poet John Donne, Bacon's contemporary. The existing world was crumbling at the edges. It was cracking apart like an ill-nailed raft in a torrent—a torrent of incredible time. It was, in effect, a new nature comprising a past embedded in the present and a future yet to be.

First, Bacon discerned a *mundus alter*, another separate world that could be drawn out of nature by human intervention—the world that surrounds and troubles us today. Then, by degrees, time depths of tremendous magnitude began, in the late 18th century, to replace the Christian calendar. Space, from a surrounding candelabrum of stars, began to widen to infinity. The Earth was recognized as a mere speck drifting in the wake of a minor star, itself rotating around an immense galaxy composed of innumerable suns. Beyond and beyond, into billions of light years, other galaxies glowed through clouds of wandering gas and interstellar dust. Finally, and perhaps the most shocking blow of all, the natural world of the moment proved to be an illusion, a phantom of man's short lifetime. Organic novelty lay revealed in the strata of the Earth. Man had not always been here. He had been preceded, in the 4,000,000,000 years of the planet's history, by floating mollusks, strange fern forests, huge dinosaurs, flying lizards, giant mammals whose bones lay under the dropped boulders of vanished continental ice sheets.

The Orphan cried out in protest, as the cold of naked space entered his bones, "Who am I?" And once more science answered, "You are a changeling. You are linked by a genetic chain to all the vertebrates. The thing that is you bears the still aching wounds of evolution in body and in brain. Your hands are made-over fins, your lungs come from a creature gasping in a swamp, your femur has been twisted upright. Your foot is a reworked climbing pad. You are a rag doll resewn from the skins of extinct animals. Long ago, 2,000,000 years perhaps, you were smaller, your brain was not so large. We are not confident that you could speak. Seventy million years before that you were an even smaller climbing creature known as a tupaiid. You were the size of a rat. You ate insects. Now you fly to the Moon."

"This is a fairy tale," protested the Orphan. "I am here, I will look in the mirror."

"Of course it is a fairy tale," said the scientists, "but so is the world and so is life. That is what makes it true. Life is

indefinite departure. That is why we are all orphans. That is why you must find your own way. Life is not stable. Everything alive is slipping through cracks and crevices in time, changing as it goes. Other creatures, however, have instincts that provide for them, holes in which to hide. They cannot ask questions. A fox is a fox, a wolf is a wolf, even if this, too, is illusion. You have learned to ask questions. That is why you are, an orphan. *You are the only creature in the universe who knows what it has been.* Now you must go on asking questions while all the time you are changing. You will ask what you are to become. The world will no longer satisfy you. You must find your way, your own true self."

"But how can I?" wept the Orphan, hiding his head. "This is magic. I do not know what I am. I have been too many things."

"You have indeed," said all the scientists together. "Your body and your nerves have been dragged about and twisted in the long effort of your ancestors to stay alive, but now, small orphan that you are, you must know a secret, a secret magic that nature has given to you. No other creature on the planet possesses it. You use language. You are a symbol-shifter. All this is hidden in your brain and transmitted from one generation to another. You are a time-binder, in your head the symbols that mean things in the world outside can fly about untrammelled. You can combine them differently into a new world of thought or you can also hold them tenaciously throughout a lifetime and pass them on to others."

Thus out of words, a puff of air, really, is made all that is uniquely human, all that is new from one human generation to another. But remember what was said of the wounds of evolution. The brain, parts of it at least, is very old, the parts laid down in sequence like geological strata. Buried deep beneath the brain with which we reason are ancient defense centres quick to anger, quick to aggression, quick to violence, over which the neocortex, the new brain, strives to exert control. Thus there are times when the Orphan is a divided being striving against himself. Evil men know this. Sometimes they can play upon it for their own political advantage. Men crowded together, subjected to the same stimuli, are quick to respond to emotion that in the quiet of their own homes they might analyze more cautiously.

Scientists have found that the very symbols which crowd our brains may possess their own dangers. It is convenient for the thinker to classify an idea with a word. This can sometimes lead to a process called hypostatization or reification. Take the word "Man," for example. There are times when it is useful to categorize the creature briefly, his history, his embracing characteristics. From this, if we are not careful of our meanings, it becomes easy to speak of all men as though they were one person. In reality men have been seeking this unreal man for thousands of years. They have found him bathed in blood, they have found him in the hermit's cell, he has been glimpsed among innumerable messiahs, or in meditation under the sacred bō tree; he has been found in the physician's study or lit by the satanic fires of the first atomic explosion.

In reality he has never been found at all. The reason is very simple: men have been seeking Man capitalized, an imaginary creature constructed out of disparate parts in

the laboratory of the human imagination. Some men may thus perceive him and see him as either totally beneficent or wholly evil. They would be wrong. They are wrong so long as they have vitalized this creation and call it "Man." There is no Man; there are only men: good, evil, inconceivable mixtures marred by their genetic makeup, scarred or improved by their societal surroundings. So long as they live they are *men*, multitudinous and unspent potential for action. Men are great objects of study, but the moment we say "Man" we are in danger of wandering into a swamp of abstraction.

Surveying our fossil history perhaps we are not even justified as yet in calling ourselves true men. The word carries subtle implications that extend beyond us into the time stream. If a remote half-human ancestor, barely able to speak, had had a word for his kind, as very likely he did, and just supposing it had been "man," would we approve the usage, the shape-freezing quality of it, now? I think not. Perhaps no true orphan would wish to call himself anything but a traveler. Man in a cosmic timeless sense may not be here.

The point is particularly apparent in the light of a recent and portentous discovery. In 1953 James D. Watson and Francis H.C. Crick discovered the structure of the chemical alphabet out of which all that lives is constituted. It was a strange spiral ladder within the cell, far more organized and complicated than 19th-century biologists had imagined; the tiny building blocks constantly reshuffled in every mating had both an amazing stability and paradoxically, over long time periods, a power to alter the living structure of a species beyond recall. The thing called man had once been a tree shrew on a forest branch; now it manipulates abstract symbols in its brain from which skyscrapers rise, bridges span the horizon, disease is conquered, the Moon is visited.

Molecular biologists have begun to consider whether the marvelous living alphabet which lies at the roof of evolution can be manipulated for human benefit. Already some varieties of domesticated plants and animals have been improved. Now at last man has begun to eye his own possible road into the future. By delicate excisions and intrusions could the mysterious alphabet we carry in our bodies be made to hasten our advancement into the future? Already our urban concentrations, with all their aberrations and faults, are future-oriented. Why not ourselves? It is in our power to perpetuate great minds *ad infinitum*? But who is to judge? Who is to select this future man? There is the problem. Which of us poor orphans by the roadside, even

those peering learnedly through the electron microscope, can be confident of the way into the future? Could the fish unaided by nature have found the road to the reptile, the reptile to the mammal, the mammal to man? And how was man endowed with speech? *Could* men choose their way? Suddenly before us towers the blackest, most formidable bridge of our experience. Across what chasm does it run?

Biologists tell us that in the fullness of time more than ninety percent of the world's past species have perished. The mammalian ones in particular are not noted for longevity. If the scalpel, the excising laser ray in the laboratory, were placed in the hands of some one person, some one poor orphan, what would he do? If assured, would he reproduce himself alone? If cruel, would he by indirection succeed in abolishing the living world? If doubtful of the road, would he reproduce the doubt? "Nothing is more shameful than assertion without knowledge," the great Roman statesman and orator Cicero once pronounced as though he had foreseen this final bridge of human pride—the pride of a god without foresight.

After the disasters of the second World War when the dream of perpetual progress died from men's minds, an orphan of this violent century wrote a poem about the great extinctions revealed in the rocks of the planet. It concludes as follows:

I am not sure I love
 the cruelties found in our blood
 from some lost evil tree in our beginnings.
 May the powers forgive and seal us deep
 when we lie down,
 May harmless dormice creep and red leaves fall
 over the prisons where we wreaked our will.
 Dachau, Auschwitz, those places everywhere.
 If I could pray, I would pray long for this.

One may conclude that the poet was a man of doubt. He did not regret man; he was confident that leaves, rabbits, and songbirds would continue life, as, long ago, a tree shrew had happily forgotten the ruling reptiles. The poet was an orphan in shabby circumstances pausing by the roadside to pray, for he did pray despite his denial; God forgive us all. He was a man in doubt upon the way. He was the eternal orphan of my father's story. Let us then, as similar orphans who have come this long way through time, be willing to assume the risks of the uncompleted journey. We must know, as that forlorn band of men in Judaea knew when they buried the jar, that man's road is to be sought beyond himself. *No man there is who can tell the whole tale.* After the small passage of 2,000 years who would deny this truth?

Part Four. Human Life

The outlines in the three divisions and fifteen sections of Part Four treat stages in the development of human life on Earth; human health and diseases; and human behaviour and experience.

Several points should be noted about the relations of Part Four to preceding and subsequent parts.

The fundamental physical and chemical properties of matter are dealt with in Part One. The treatment of the Earth in Part Two encompasses those properties of the Earth that are supportive of human life. Much fundamental biological knowledge concerning human life is involved in the treatment—in Part Three, Life on Earth—of what is common to all animal life; the last section of Part Three deals with mankind's place in the biosphere.

Knowledge of the biomedical and psychological aspects of human life is not wholly separable from, and is germane to, the subjects covered in Parts Five through Ten, which treat human society, the fine arts, technology, religion, the history of peoples and civilizations, and man as logician, mathematician, scientist, historian, and philosopher.

The biological, medical, and psychological sciences have been themselves the object of historical and analytical studies concerned with their nature, methods, and interrelations. These studies are set forth in Sections 10/34, 10/35, and 10/36 of Part Ten. The instrumentation involved in these sciences is dealt with in Section 723 of Part Seven.

Division I. Stages in the Development of Human Life on Earth 143

II. The Human Organism: Health and Disease 146

III. Human Behaviour and Experience 159

Division I. Stages in the Development of Human Life on Earth

The outlines in the two sections of Division I present studies in historical comparative anatomy that place *Homo sapiens* within a general taxonomy; the theory of human evolution; and studies, in genetics and physical anthropology, of human heredity and the races of mankind.

Section 411. Human Evolution 143

412. Human Heredity: the Races of Mankind 145

Section 411. Human Evolution

A. The evolutionary process

B. Human evolutionary relationships with living and fossil primates

1. The primates

a. Distinguishing characteristics of the primates

b. The natural history of primate life

c. Evolution and paleontology

d. Classification of the primates: the two main groups or suborders, the prosimians (principally lemurs, lorises, and tarsiers) and the anthropoids (monkeys, apes, and man)
[see also 313.F.25.c.]

2. Distinguishing characteristics of the Hominidae

a. Morphological characteristics

b. Inferred behavioral characteristics

c. Contrasting adaptations of Hominidae and Pongidae

C. The fossil record of the Hominidae

1. The discovery and recognition of the hominid fossil record

2. Classification of the Hominidae

- a. *Australopithecus*
- b. *Homo habilis*
- c. *Homo erectus*
- d. *Homo sapiens*
 - i. Fossil remains of early *Homo sapiens*: e.g., Vértesszőllős man, Ngaloba man, Border Cave man, Swanscombe man, Omo hominids
 - ii. The Neanderthals
 - iii. The Cro-Magnons
 - iv. *Homo sapiens* of Africa
 - v. *Homo sapiens* of Asia and Australasia

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with human evolution

Evolution, Human
Life

MICROPAEDIA: Selected entries of reference information

General subjects

<i>cultural stages:</i>	Lantian man	<i>tools and tool</i>	Magdalenian
Mesolithic Period	Makapansgat	<i>industries:</i>	culture
Neolithic Period	Olduvai Gorge	Abbevillian	Maglemosian
Paleolithic Period	Omo remains	industry	industry
<i>hominid fossils:</i>	Peking man	Acheulean industry	Mousterian
Amud remains	Petralona skull	Aterian industry	industry
Chad	Pitldown man	Aurignacian	Oldowan industry
australopithecine	Ramapithecus	culture	Osteodontokeratic
Chancelade	Saccopastore skulls	Azilian industry	tool industry
skeleton	Sterkfontein	Chopper	Perigordian
Ferassie	Swanscombe skull	chopping-tool	industry
skeletons, La	Telanthropus	industry	Solutrean industry
Hadar remains	capensis	Clactonian	Stillbay industry
Heidelberg jaw	<i>hominids:</i>	industry	stone-tool industry
Iceman	Australopithecus	Ertebølle industry	<i>other:</i>
Java man	Cro-Magnon	Fauresmith	evolution
Kabwe man	hominid	industry	Gigantopithecus
Kafzeh	<i>Homo erectus</i>	flake tool	human evolution
Kanapoi fossil	<i>Homo habilis</i>	Ibero-Maurusian	missing link
Koobi Fora	<i>Homo sapiens</i>	industry	
remains	<i>Homo</i>	Levalloisian	
Krapina remains	transvaalensis	stone-flaking	
Laetolil remains	Neanderthal	techniques	

Biographies

See Section 10/36 of Part Ten

INDEX: See entries under all of the terms above

Section 412. Human Heredity**A. Heredity in humans**

1. The biological basis of human heredity: genetic reproduction
2. Inheritance of behavioral traits
 - a. Fraternal and identical twins and the inferences that can be made from twin studies
 - b. Genetic explanations for abnormalities: chromosome variations, mutation
3. Applications of human genetics
4. Specific behavioral traits affected by inheritance
5. Consanguinity and its effects

B. The nature and origin of human physical variation

1. Aspects of human diversity
2. Measures of "race"
 - a. Old measures; *e.g.*, colour, hair form, body measurements, features such as eyes and nose
 - b. Modern measures; *e.g.*, blood groups and genetic evidence

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with human heredity: the races of mankind

Evolution, Human
Genetics and Heredity, The Principles of
Life

MICROPAEDIA: Selected entries of reference information

General subjects

<i>human heredity</i> :	consanguinity	founder principle	pedigree
assortative mating	dominance	genetic drift	recessiveness
character	eugenics	heterospecific	
climatic adaptation		mating	

Biographies

See Sections 10/34 and 10/36 of Part Ten

INDEX: See entries under all of the terms above

Division II. The Human Organism: Health and Disease

[For Part Four headnote see page 143.]

The outlines in the four sections of Division II treat the structures and functions of the human body; human health; the manifestation, recognition, and treatment of human disease; and the practice of medicine.

The outline referred to in Section 421 deals with the structures and the functions of the several organ systems, the proper coordination and regulation of which constitute the health of the human body.

The outline in Section 422 begins with an enumeration of the stages in human life and the definitions of normality in human health. It then treats of the various ways that the body maintains itself and recovers from injury. The Section concludes with a listing of other significant influences on human health.

The outline in Section 423 first treats the general characteristics, causes, and classifications of human disease. It then treats the concepts, principles, and methods of the medical art, in the two stages of diagnosis and therapy. The outline encompasses the symptoms, diagnosis, and treatment of diseases that affect the body as a whole, and of diseases that affect each of the organ systems dealt with in their healthy state in Section 421.

The outline in Section 424 deals with issues relating to the professionalization of the practice of medicine—not only those internal to the profession but also those arising from the educational, economic, social, political, and legal dimensions of institutionalized medicine.

- Section 421. The Structures and Functions of the Human Body 146
- 422. Human Health 150
- 423. Human Diseases 151
- 424. The Practice of Medicine and the Care of Health 158

Section 421. The Structures and Functions of the Human Body

- A. The structures and functions of the cardiovascular system
 - 1. The heart
 - 2. The blood vessels: arteries, veins, and capillaries
 - 3. Human blood
 - a. Components of blood: plasma, red blood cells (erythrocytes), white blood cells (leukocytes), platelets (thrombocytes)
 - b. Blood groups
 - c. Bleeding and blood clotting
 - 4. Blood circulation: the central pump, the systemic circulation, the pulmonary circulation
- B. The structures and functions of the lymphatic system: lymphocytes, lymphatic vessels, lymph nodes, and the lymph
- C. The structures and functions of the respiratory system
 - 1. The upper portion of the respiratory tract: nasal cavity, pharynx, larynx, and trachea
 - 2. The lungs and bronchi
 - 3. The regulation, control, and dynamics of breathing
- D. The structures and functions of the digestive system
 - 1. Structure of the components of the digestive tract
 - a. Mouth and related structures
 - b. Pharynx and esophagus
 - c. Stomach
 - d. The small intestine and the small bowel mucosa
 - e. Large intestine, rectum, and anus
 - f. Associated glands and structures: pancreas, liver, gallbladder, and bile ducts
 - 2. The digestive process
- E. The structures and functions of the endocrine system

Principal Parts of THE HUMAN BODY

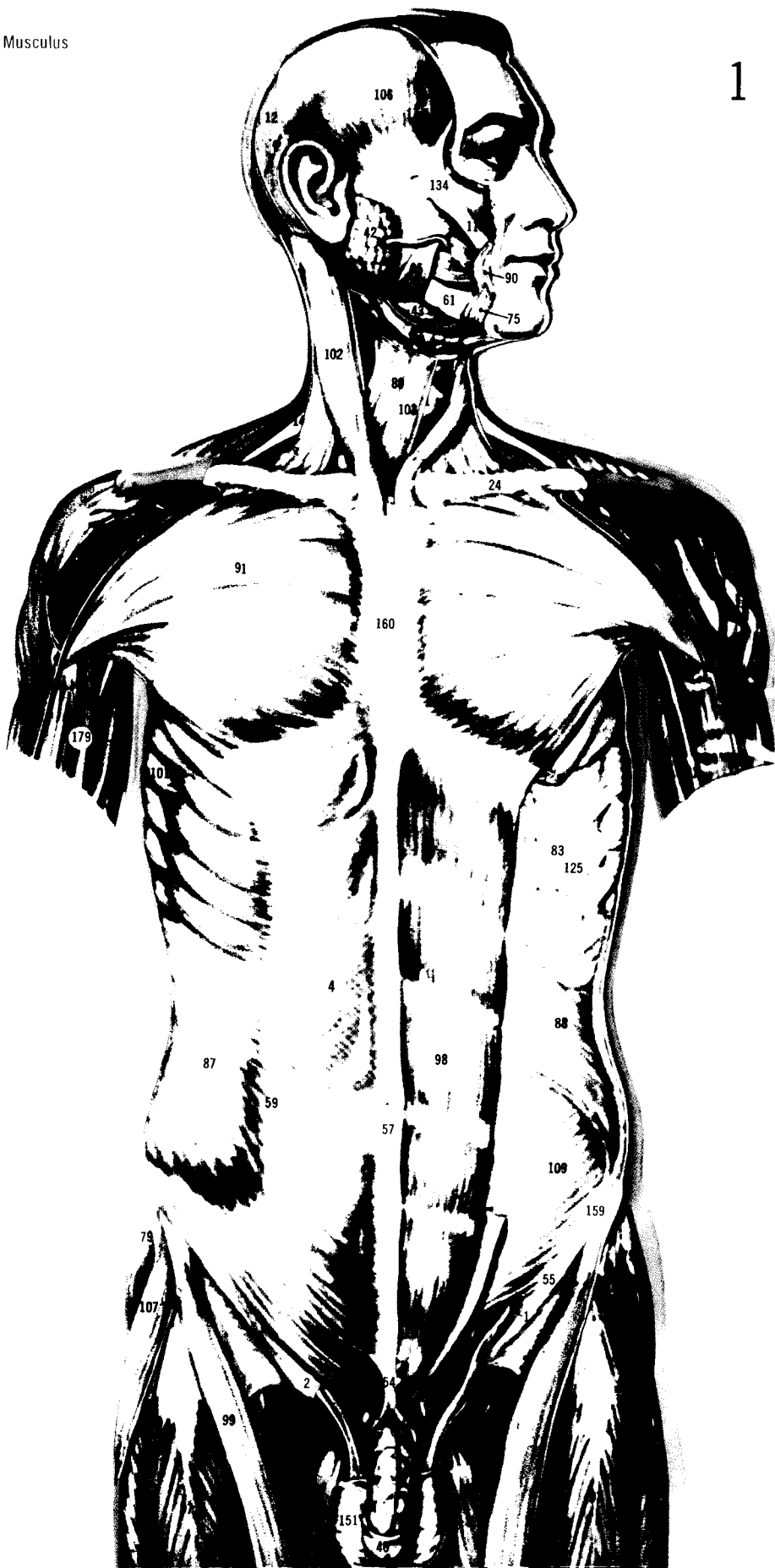
PLATE

This Plate on gross anatomy comprises 14 Views, 12 of which are transparent, showing all principal parts of the human anatomy. Below is a list in English (insofar as this is possible) of the names of the parts illustrated. The number immediately following the name is the code number for that part; the other number or numbers indicate the View or Views on which it is shown. A key to the Plate, with Latin names, is given on the last page.

- Abdominal oblique muscle, external, 87: 1, 8
 Abdominal oblique muscle, internal, 88: 1
 Adductor longus muscle, 68: 6, 7, 14
 Adductor brevis muscle, 67: 7
 Adrenal gland: see Suprarenal gland
 Aorta, 3: 5, 6, 10, 11, 14
 Aponeurosis of external abdominal oblique muscle, 4: 1
 Appendix, vermiform, 5: 4, 12, 13
 Atrium, left, 19: 11
 Axillary artery, 6: 5, 6, 14
 Axillary vein, 178: 3, 10, 11
 Biceps brachii muscle, 69: 5, 6, 10, 11
 Bile duct, common, 35: 4, 5, 10, 11, 13
 Brachial artery, 7: 5, 6, 14
 Brachial muscle, 70: 14
 Brachial plexus, 140: 5, 6, 7, 14
 Brachial vein, 179: 3, 8, 10, 11
 Brachiocephalic trunk, 164: 5, 14
 Brachiocephalic vein, 180: 3, 4, 10, 11
 Brachioradialis muscle, 71: 12, 13, 14
 Breastbone, 160: 1, 2, 8, 9
 Bronchus, left, 20: 5, 14
 Buccinator muscle, 72: 1
 Carotid artery, common, 8: 5, 14
 Celiac trunk, 165: 5, 10, 12, 14
 Cephalic vein, 183: 3, 4, 8, 9, 11, 12, 13, 14
 Cerebellum, 22: 11, 14
 Cerebrum, 23: 11, 14
 Cheekbone, 134: 1
 Collarbone, 24: 1, 2, 7, 8, 9, 14
 Colon, ascending, 25: 3, 4, 12, 13
 Colon, descending, 26: 3, 4, 12, 13
 Colon, sigmoid, 27: 3, 4, 12, 13
 Colon, transverse, 28: 3, 4, 11
 Coracobrachialis muscle, 73: 5, 14
 Corpus callosum, 32: 11, 14
 Deltoid muscle, 74: 5, 6, 8, 9, 14
 Depressor anguli oris muscle, 75: 1, 10
 Diaphragm, 34: 2, 3, 4, 5, 6, 9, 10, 11, 14
 Digastric muscle, 76: 3
 Ductus deferens, 36: 5, 6
 Duodenum, 37: 5, 12, 13
 Epigastric vessels, deep, 169: 5, 8, 9
 Esophagus, 122: 5, 6, 12, 13, 14
 Extensor carpi radialis longus muscle, 77: 14
 Falx cerebri, 38: 12, 13
 Femoral artery, 9: 5, 6, 14
 Femoral nerve, 114: 7, 14
 Femoral vein, 184: 5, 6, 14
 Femur, 39: 7
 Flexor carpi radialis muscle, 78: 14
 Fossa ovalis, 40: 8
 Frontal bone, 126: 3, 7
 Gall bladder, 200: 3, 4, 10, 11
 Gastric vessels, 170: 11
 Gastro-omental vessels, 171: 10
 Glans penis, 46: 1
 Gluteus medius muscle, 79: 1, 5, 6, 7, 14
 Gluteus minimus muscle, 80: 7
 Gracilis muscle, 81: 6, 7, 14
 Heart: see Atrium; Pericardium; Ventricle
 Humerus, 48: 7
 Ileum, 49: 12
 Iliac artery, common, 10: 5, 6, 14
 Iliac artery, external, 11: 5, 6, 14
 Iliac artery, internal, 12: 5, 6, 14
 Iliac spine, anterior superior, 159: 1, 2, 7, 8, 14
 Iliacus muscle, 82: 7, 14
 Iliac vein, common, 185: 5, 6, 14
 Iliac vein, external, 186: 5, 6, 14
 Iliac vein, internal, 187: 5, 6, 14
 Iliohypogastric nerve, 115: 7
 Ilioinguinal nerve, 116: 7
 Inguinal ligament, 55: 1, 2, 3, 5, 6, 8, 13, 14
 Inguinal ring, deep, 1: 1, 2
 Inguinal ring, superficial, 2: 1
 Innominate artery: see Brachiocephalic trunk
 Innominate vein: see Brachiocephalic vein
 Intercostal muscle, external, 83: 1
 Intercostal muscle, internal, 84: 2, 9
 Intestine, large: see Colon
 Intestine, small, 50: 3, 4, 10, 11
 Ischium, 127: 7
 Jaw, lower, 61: 1, 2, 3, 4, 5, 6, 7, 11, 14
 Jaw, upper, 62: 2, 3, 4, 5, 6, 7, 11, 12, 13, 14
 Jugular vein, internal, 188: 3, 4, 5, 10
 Kidney, 149: 5, 6, 14
 Lacrimal gland, 41: 2
 Larynx, 51: 4, 7, 11, 14
 Ligament of the liver, falciform, 53: 3, 9
 Ligament of the liver, round, 56: 2, 9
 Ligament of the penis, fundiform, 54: 1
 Line, arcuate, 58: 2
 Line, semilunar, 59: 1, 2, 8, 9
 Linea alba, 57: 1, 2, 8
 Liver, 47: 3, 4, 9, 10, 11
 Lumbosacral plexus, 141: 7
 Lung, 146: 3, 4, 5, 6, 10, 11, 14
 Mammary vessels, internal: see Thoracic vessels, internal
 Masseter muscle, 85: 1
 Median nerve, 117: 5, 6, 14
 Medulla oblongata, 63: 11, 14
 Mesenteric artery, inferior, 14: 5, 6, 14
 Mesenteric artery, superior, 15: 14
 Mesenteric vein, inferior, 189: 13
 Mesenteric vein, superior, 190: 5
 Mesenteric vessels, inferior, 173: 12, 13
 Mesenteric vessels, superior, 174: 5, 12, 13
 Mesentery, 65: 4, 11, 12
 Mesocolon, transverse, 66: 11, 12
 Mylohyoid muscle, 86: 2, 3
 Nasal concha, inferior, 29: 4, 7, 11, 14
 Nasal concha, middle, 30: 4, 7, 11, 14
 Nasal concha, superior, 31: 4, 7, 11, 14
 Nasal septum, 152: 5, 6, 12, 13
 Obturator nerve, 118: 7
 Occipital bone, 128: 4, 5, 7
 Omentum, greater, 123: 10
 Omentum, lesser, 124: 3, 4, 9, 10, 11
 Omohyoid muscle, 89: 1, 2, 9
 Orbicularis oris muscle, 90: 1
 Ovarian vessels, 175: 14
 Ovary, 135: 14
 Pancreas, 136: 5, 12, 13
 Parietal bone, 129: 3, 7
 Parotid gland, 42: 1, 2
 Pectoralis major muscle, 91: 1, 2, 5, 8, 9, 14
 Pectoralis minor muscle, 92: 2, 5, 9, 10, 11
 Penis, 137: 2, 3, 5
 Pericardium, 138: 10
 Phrenic nerve, 119: 10
 Platysma muscle, 139: 8, 9
 Pons, 144: 11, 14
 Portal vein, 191: 5, 11, 12, 13
 Pronator teres muscle, 93: 14
 Prostate, 145: 6
 Psoas major muscle, 94: 7, 14
 Pterygoid muscle, internal, 95: 2
 Pubis, 130: 3, 6, 7, 13, 14
 Pulmonary artery, 16: 5, 10, 11, 14
 Pulmonary vein, 192: 11, 14
 Pylorus, 147: 12, 13
 Quadratus lumborum muscle, 96: 14
 Quadriceps femoris muscle, 97: 3, 4, 5, 6, 14
 Rectum, 148: 7, 14
 Rectus abdominis muscle, 98: 1, 2
 Renal artery, 17: 6, 14
 Renal vein, 193: 6, 14
 Rib, 125: 1, 2, 7, 9
 Sacrum, 131: 7
 Saphenous hiatus: see Fossa ovalis
 Saphenous vein, greater, 194: 8, 9
 Sartorius muscle, 99: 1, 2, 9
 Scalene muscle, anterior, 100: 14
 Scrotum, 151: 1, 2, 5
 Seminal duct: see Ductus deferens
 Seminal vesicle, 202: 6
 Serratus muscle, anterior, 101: 1
 Shoulder blade, 150: 7
 Sinus, frontal, 153: 2, 3, 4, 5, 6, 7, 11, 12, 13, 14
 Sinus, inferior sagittal, 156: 12, 13
 Sinus, maxillary, 154: 2, 3
 Sinus, sphenoidal, 158: 4, 5, 6, 7, 11, 12, 13, 14
 Sinus, straight, 155: 12, 13
 Sinus, superior sagittal, 157: 12, 13
 Skull, 33: 2
 Sphenoid bone, 132: 7
 Spinal cord, 64: 7, 14
 Spleen, 52: 5, 12, 13
 Splenic artery, 13: 5
 Splenic vessels, 172: 12, 13
 Sternohyoid muscle, 103: 1, 2, 9
 Sternomastoid muscle, 102: 1, 2, 8, 9, 10
 Sternothyroid muscle, 104: 2, 9
 Stomach, 196: 3, 4, 10, 11
 Styloglossus muscle, 105: 3
 Subclavian artery, 18: 5, 6, 14
 Subclavian vein, 195: 3, 4, 10, 11
 Submandibular gland, 43: 1, 2
 Suprarenal gland, 44: 5, 6, 14
 Temporal bone, 133: 3, 7
 Temporal muscle, 106: 1
 Tensor fasciae latae muscle, 107: 1, 5, 6, 14
 Tentorium cerebelli, 161: 11, 14
 Testicle, 162: 5
 Testicular vessels, 176: 5, 6
 Thoracic vessels, internal, 177: 9, 10
 Thyrohyoid muscle, 108: 2
 Thyroid cartilage, 21: 3
 Thyroid gland, 45: 3, 4, 10, 11
 Tongue, 60: 3, 4, 5, 6, 7, 11, 14
 Transversus abdominis muscle, 109: 1, 2
 Transversus thoracis muscle, 110: 2, 9
 Trapezius muscle, 111: 5, 6, 10, 14
 Triceps brachii muscle, 112: 5, 6, 14
 Turbinate bones: see Nasal concha
 Ulnar nerve, 120: 5, 6, 14
 Umbilical fold, medial, 142: 9
 Umbilical fold, median, 143: 9
 Ureter, 166: 5, 6, 13, 14
 Urinary bladder, 201: 3, 4, 5, 6, 12, 13
 Uterus, 167: 14
 Vagina, 168: 14
 Vagus nerve, 121: 14
 Vena cava, inferior, 181: 5, 6, 11, 14
 Vena cava, superior, 182: 4, 5, 10, 11
 Ventricle, left, 198: 5, 10, 11
 Ventricle, right, 197: 5, 10, 11
 Vertebra, 199: 6, 7, 11, 14
 Windpipe, 163: 5, 6, 14
 Womb: see Uterus
 Zygomaticus major muscle, 113: 1, 10

A.—Arteria; L.—Ligamentum; M. Musculus
 N.—Nervus; V.—Vena

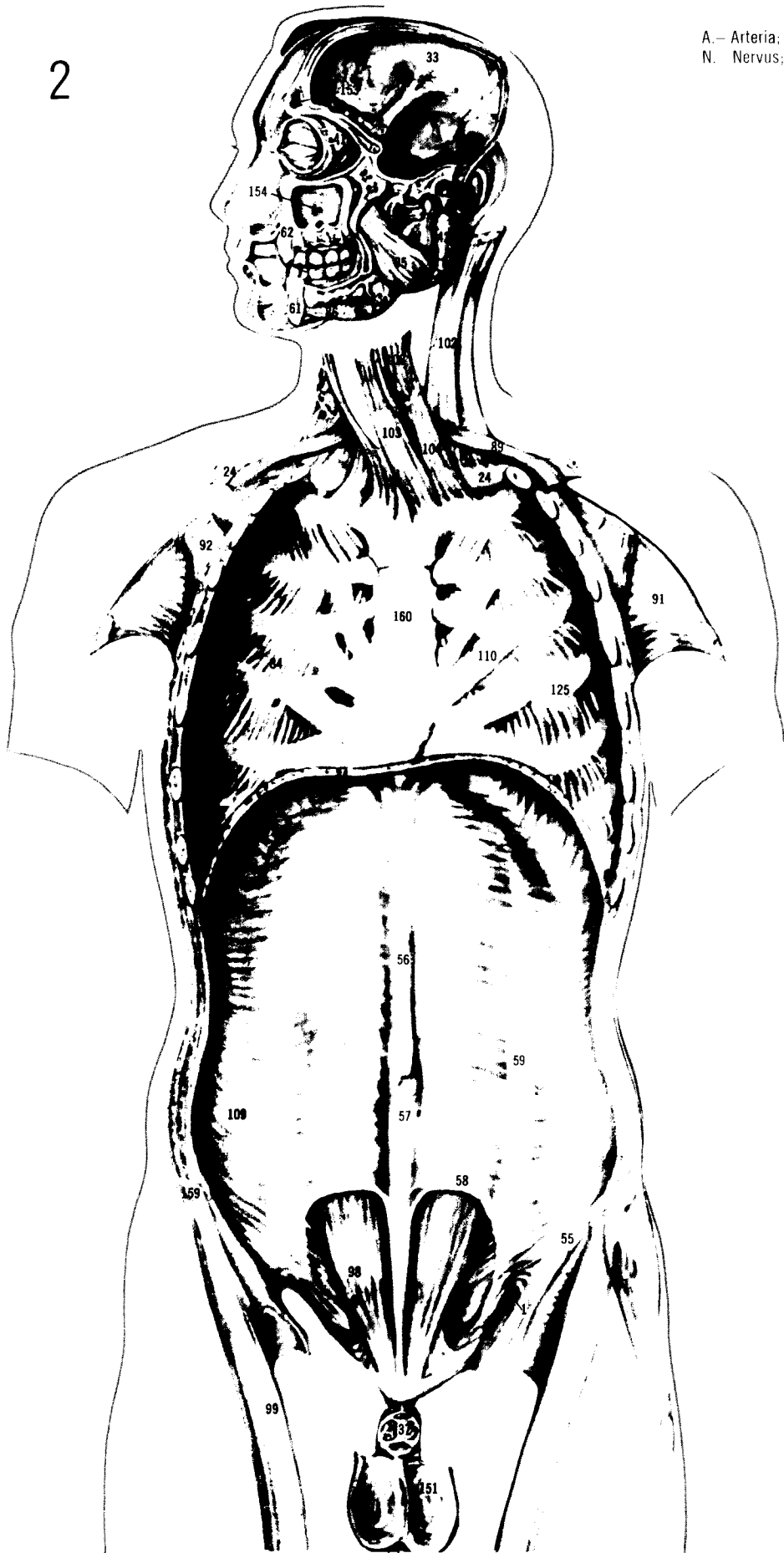
1



- 1. Anulus inguinalis profundus
- 2. Anulus inguinalis superficialis
- 3. Aponeurosis m. obliquus externus abdominis
- 4. Clavicula
- 5. Glandula parotis; ductus parotideus
- 6. Glandula submandibularis
- 7. Glans penis
- 8. L. fundiforme penis
- 9. L. inguinale
- 10. Linea alba; umbilicus
- 11. Linea semilunaris
- 12. Mandibula
- 13. M. biceps brachii
- 14. M. buccinator
- 15. M. deltoideus
- 16. M. depressor anguli oris
- 17. M. gluteus medius
- 18. M. intercostalis externus
- 19. M. masseter
- 20. M. obliquus externus abdominis
- 21. M. obliquus internus abdominis
- 22. M. omohyoideus
- 23. M. orbicularis oris
- 24. M. pectoralis major
- 25. M. quadriceps femoris (rectus)
- 26. M. rectus abdominis
- 27. M. sartorius
- 28. M. serratus anterior
- 29. M. sternocleidomastoideus
- 30. M. sternohyoideus
- 31. M. temporalis
- 32. M. tensor fasciae latae
- 33. M. transversus abdominis
- 34. M. trapezius
- 35. M. triceps brachii
- 36. M. zygomaticus major
- 37. N. medianus
- 38. Os costale
- 39. Os parietale
- 40. Os zygomaticum
- 41. Scrotum
- 42. Spina iliaca anterior superior
- 43. Sternum
- 44. V. comitantes
 - a. brachialis
 - b. femoralis

2

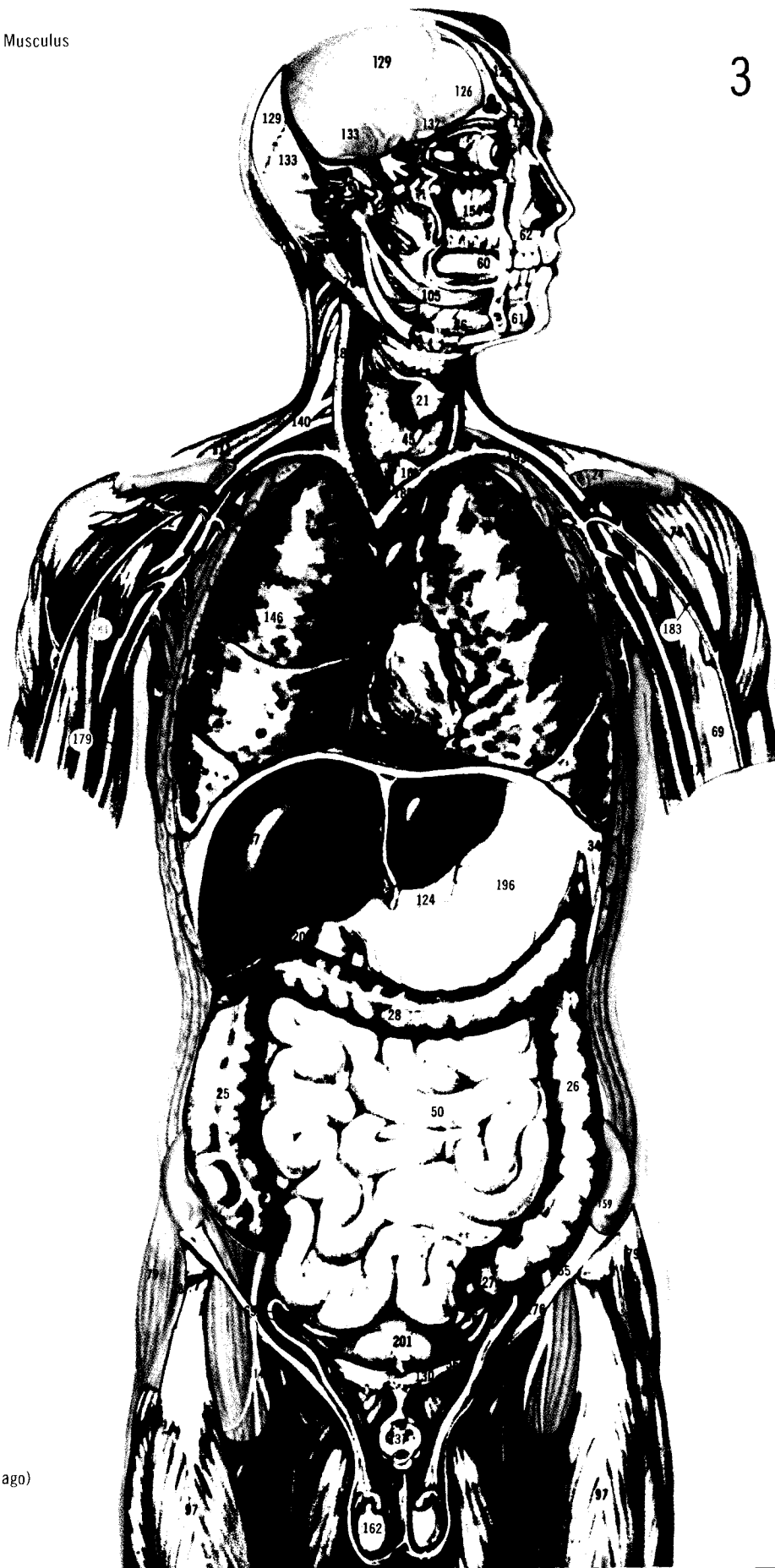
A.— Arteria; L.— Ligamentum; M.— Musculus
N.— Nervus; V.— Vena



1. Anulus inguinalis profundus
24. Clavicula
33. Cranium
34. Diaphragma
41. Glandula lacrimalis
42. Glandula parotis
43. Glandula submandibularis
55. L. inguinale
56. L. teres hepatis
57. Linea alba
58. Linea arcuata
59. Linea semilunaris
61. Mandibula
62. Maxilla
84. M. intercostalis internus
86. M. mylohyoideus
89. M. omohyoideus
91. M. pectoralis major
92. M. pectoralis minor
95. M. pterygoideus medialis
98. M. rectus abdominis
99. M. sartorius
102. M. sternocleidomastoideus
103. M. sternohyoideus
104. M. sternothyroideus
108. M. thyrohyoideus
109. M. transversus abdominis
110. M. transversus thoracicus
125. Os costale
137. Penis
151. Scrotum
153. Sinus frontalis
154. Sinus maxillaris
159. Spina iliaca anterior superior
160. Sternum

Arteria; L. – Ligamentum; M. – Musculus
 – Nervus; V. – Vena

3



- Aorta
- A. carotis communis
- A. femoralis
- Cartilago thyroidea
- Clavicula
- Colon ascendens
- Colon descendens
- Colon sigmoideum
- Colon transversum
- Diaphragma
- Ductus deferens
- Glandula thyroidea
- Hepar (hígado, figado)
- Intestinum tenue
- L. falciforme hepatis
- L. inguinale
- Lingua
- Mandibula
- Maxilla
- M. biceps brachii
- M. coracobrachialis
- M. deltoideus
- M. digastricus
- M. gluteus medius
- M. mylohyoideus
- M. pectoralis minor
- M. quadriceps femoris (rectus)
- M. styloglossus
- M. tensor fasciae latae
- M. trapezius
- M. triceps brachii
- M. medianus
- Omentum minus
- Os frontale
- Os parietale
- Os pubis
- Os sphenoidale
- Os temporale
- Penis
- Plexus brachialis
- Pulmo
- Scrotum
- Sinus frontalis
- Sinus maxillaris
- Spina iliaca anterior superior
- Testis
- Vasa epigastrica inferiora
- Vasa testicularia
- V. axillaris
- V. comitans a. brachialis
- V. brachiocephalica
- V. cephalica
- V. femoralis
- V. jugularis interna
- V. subclavia
- Ventriculus (estómago, estômago)
- Ventriculus dexter
- Vesica fellea (vesicula biliar)
- Vesica urinaria

Principal Parts of THE HUMAN BODY

KEY TO PLATE, VIEWS 1-14

On the list below, the number at left is a code number for the part of the body named.
The number or numbers at right indicate the View or Views on which that part of the body is shown.

Abbreviations: A. (Arteria); L. (Ligamentum); M. (Musculus); N. (Nervus); and V. (Vena).

- | | | |
|--|--|--|
| 1. Annulus inguinalis profundus, 1,2 | 61. Mandibula, 1,2,3,4,5,6,7,11,14 | 132. Os sphenoidale, 7 |
| 2. Annulus inguinalis superficialis, 1 | 62. Maxilla, 2,3,4,5,6,7,11,12,13,14 | 133. Os temporale, 3,7 |
| 3. Aorta, 5,6,10,11,14 | 63. Medulla oblongata, 11,14 | 134. Os zygomaticum, 1 |
| 4. Aponeurosis m. obliquus externus abdominis, 1 | 64. Medulla spinalis, 7,14 | 135. Ovarium (ovary), 14 |
| 5. Appendix vermiformis, 4,12,13 | 65. Mesenterium, 4, 11, 12 | 136. Pancreas, 5,12,13 |
| 6. A. axillaris, 5,6,14 | 66. Mesocolon transversum, 11,12 | 137. Penis, 2,3,5 |
| 7. A. brachialis, 5,6,14 | 67. M. adductor brevis, 7 | 138. Pericardium, 10 |
| 8. A. carotis communis, 5,14 | 68. M. adductor longus, 6,7,14 | 139. Platysma, 8,9 |
| 9. A. femoralis, 5,6,14 | 69. M. biceps brachii, 5,6,10,11 | 140. Plexus brachialis, 5,6,7,14 |
| 10. A. iliaca communis, 5,6,14 | 70. M. brachialis, 14 | 141. Plexus lumbosacralis, 7 |
| 11. A. iliaca externa, 5,6,14 | 71. M. brachioradialis, 12,13,14 | 142. Plica umbilicalis medialis, 9 |
| 12. A. iliaca interna, 5,6,14 | 72. M. buccinator, 1 | 143. Plica umbilicalis mediana, 9 |
| 13. A. lienalis (a. splenica), 5 | 73. M. coracobrachialis, 5,14 | 144. Pons, 11,14 |
| 14. A. mesenterica inferior, 5,6,14 | 74. M. deltoideus, 5,6,8,9,14 | 145. Prostata, 6 |
| 15. A. mesenterica superior, 14 | 75. M. depressor anguli oris, 1,10 | 146. Pulmo (lung), 3,4,5,6,10,11,14 |
| 16. A. pulmonalis, 5,10,11,14 | 76. M. digastricus, 3 | 147. Pylorus, 12,13 |
| 17. A. renalis, 6,14 | 77. M. extensor carpi radialis longus, 14 | 148. Rectum, 7, 14 |
| A. splenica: see 13 | 78. M. flexor carpi radialis, 14 | 149. Ren (kidney), 5,6,14 |
| 18. A. subclavia, 5,6,14 | 79. M. gluteus medius, 1,5,6,7,14 | 150. Scapula, 7 |
| 19. Atrium sinistrum, 11 | 80. M. gluteus minimus, 7 | 151. Scrotum, 1,2,5 |
| 20. Bronchus principalis, 5,14 | 81. M. gracilis, 6,7,14 | 152. Septum nasi, 5,6,12,13 |
| 21. Cartilago thyroidea, 3 | 82. M. iliacus, 7,14 | 153. Sinus frontalis, 2,3,4,5,6,7,11,12,13,14 |
| 22. Cerebellum, 11,14 | 83. M. intercostalis externus, 1 | 154. Sinus maxillaris, 2,3 |
| 23. Cerebrum, 11,14 | 84. M. intercostalis internus, 2,9 | 155. Sinus rectus, 12,13 |
| 24. Clavicula, 1,2,7,8,9,14 | 85. M. masseter, 1 | 156. Sinus sagittalis inferior, 12,13 |
| 25. Colon ascendens, 3,4,12,13 | 86. M. mylohyoideus, 2,3 | 157. Sinus sagittalis superior, 12,13 |
| 26. Colon descendens, 3,4,12,13 | 87. M. obliquus externus abdominis, 1,8 | 158. Sinus sphenoidalis, 4,5,6,7,11,12,13,14 |
| 27. Colon sigmoideum, 3,4,12,13 | 88. M. obliquus internus abdominis, 1 | 159. Spina iliaca anterior superior, 1,2,7,8,14 |
| 28. Colon transversum, 3,4,11 | 89. M. omohyoideus, 1,2,9 | Spleen: see 52 |
| 29. Concha nasalis inferior, 4,7,11,14 | 90. M. orbicularis oris, 1 | Spln: see 52 |
| 30. Concha nasalis media, 4,7,11,14 | 91. M. pectoralis major, 1,2,5,8,9,14 | 160. Sternum, 1,2,8,9 |
| 31. Concha nasalis superior, 4,7,11,14 | 92. M. pectoralis minor, 2,5,9,10,11 | Stomach: see 196 |
| Cor (heart): see 19,138,197,198 | 93. M. pronator teres, 14 | 161. Tentorium cerebelli, 11,14 |
| 32. Corpus callosum, 11,14 | 94. M. psoas major, 7,14 | Tongue: see 60 |
| 33. Cranium, 2 | 95. M. pterygoideus medialis, 2 | 162. Testis, 5 |
| 34. Diaphragma, 2,3,4,5,6,9,10,11,14 | 96. M. quadratus lumborum, 14 | 163. Trachea, 5,6,14 |
| 35. Ductus choledochus, 4,5,10,11,13 | 97. M. quadriceps femoris, 3,4,5,6,14 | 164. Truncus brachiocephalicus, 5,14 |
| 36. Ductus deferens, 5,6 | 98. M. rectus abdominis, 1,2 | 165. Truncus coeliacus, 5,10,12,14 |
| 37. Duodenum, 5,12,13 | 99. M. sartorius, 1,2,9 | 166. Ureter, 5,6,13,14 |
| Esophagus: see 122 | 100. M. scalenus anterior, 14 | 167. Uterus, 14 |
| 38. Falx cerebri, 12,13 | 101. M. serratus anterior, 1 | 168. Vagina, 14 |
| 39. Femur, 7 | 102. M. sternocleidomastoideus, 1,2,8,9,10 | 169. Vasa epigastrica inferior, 5,8,9 |
| 40. Fossa ovalis (hiatus saphenus), 8 | 103. M. sternohyoideus, 1,2,9 | 170. Vasa gastrica, 11 |
| Gall Bladder: see 200 | 104. M. sternothyroideus, 2,9 | 171. Vasa gastro-omentalis, 10 |
| Gaster: see 196 | 105. M. styloglossus, 3 | 172. Vasa lienalis (vasa splenica), 12,13 |
| 41. Glandula lacrimalis, 2 | 106. M. temporalis, 1 | 173. Vasa mesenterica inferior, 12,13 |
| 42. Glandula parotidea, 1,2 | 107. M. tensor fasciae latae, 1,5,6,14 | 174. Vasa mesenterica superior, 5,12,13 |
| 43. Glandula submandibularis, 1,2 | 108. M. thyrohyoideus, 2 | 175. Vasa ovarica, 14 |
| 44. Glandula suprarenalis, 5,6,14 | 109. M. transversus abdominis, 1,2 | Vasa splenica: see 172 |
| 45. Glandula thyroidea, 3,4,10,11 | 110. M. transversus thoracis, 2,9 | 176. Vasa testicularis, 5,6 |
| 46. Glans penis, 1 | 111. M. trapezius, 5,6,10,14 | 177. Vasa thoracicae internae, 9,10 |
| Heart: see 19,138,197,198 | 112. M. triceps brachii, 5,6,14 | 178. V. axillaris, 3,10,11 |
| 47. Hepar (liver), 3,4,9,10,11 | 113. M. zygomaticus major, 1,10 | 179. V. comitans a. brachialis, 3,8,10,11 |
| Hiatus saphenus: see 40 | 114. N. femoralis, 7,14 | 180. V. brachiocephalica, 3,4,10,11 |
| 48. Humerus, 7 | 115. N. iliohypogastricus, 7 | 181. V. cava inferior, 5,6,11,14 |
| 49. Ileum, 12 | 116. N. ilio-inguinalis, 7 | 182. V. cava superior, 4,5,10,11 |
| 50. Intestinum tenue, 3,4,10,11 | 117. N. medianus, 5,6,14 | 183. V. cephalica, 3,4,8,9,11,12,13,14 |
| Kidney: see 149 | 118. N. obturatorius, 7 | 184. V. femoralis, 5,6,14 |
| 51. Larynx, 4,7,11,14 | 119. N. phrenicus, 10 | 185. V. iliaca communis, 5,6,14 |
| 52. Lien (spleen; spleen), 5,12,13 | 120. N. ulnaris, 5,6,14 | 186. V. iliaca externa, 5,6,14 |
| 53. L. falciforme hepatis, 3,9 | 121. N. vagus, 14 | 187. V. iliaca interna, 5,6,14 |
| 54. L. fundiforme penis, 1 | 122. Oesophagus (esophagus), 5,6,12,13,14 | 188. V. jugularis interna, 3,4,5,10 |
| 55. L. inguinale, 1,2,3,5,6,8,13,14 | 123. Omentum majus, 10 | 189. V. mesenterica inferior, 13 |
| 56. L. teres hepatis, 2,9 | 124. Omentum minus, 3,4,9,10,11 | 190. V. mesenterica superior, 5 |
| 57. Linea alba, 1,2,8 | 125. Os costate, 1,2,7,9 | 191. V. portae hepatis, 5,11,12,13 |
| 58. Linea arcuata, 2 | 126. Os frontale, 3,7 | 192. V. pulmonalis, 11,14 |
| 59. Linea semilunaris, 1,2,8,9 | 127. Os ischii, 7 | 193. V. renalis, 6,14 |
| 60. Lingua (tongue), 3,4,5,6,7,11,14 | 128. Os occipitale, 4,5,7 | 194. V. saphena magna, 8,9 |
| Liver: see 47 | 129. Os parietale, 3,7 | 195. V. subclavia, 3,4,10,11 |
| Lung: see 146 | 130. Os pubis, 3,6,7,13,14 | 196. Ventriculus (gaster; stomach), 3,4,10,11 |
| | 131. Os sacrum, 7 | 197. Ventriculus dexter, 5,10,11 |
| | | 198. Ventriculus sinister, 5,10,11 |
| | | 199. Vertebra, 6,7,11,14 |
| | | 200. Vesica biliaris (vesica fellea;
gall bladder), 3,4,10,11 |
| | | 201. Vesica urinaria, 3,4,5,6,12,13 |
| | | 202. Vesicula seminalis, 6 |

1. The glands and tissues making up the system and their secretions
 - a. The thyroid
 - b. The adrenal glands
 - c. The pituitary
 - d. Hypothalamus
 - e. Pancreatic islets
 - f. Parathyroid glands
 - g. Gastrointestinal mucosa
 - h. Thymus, pineal gland, kidneys, and other possible endocrine organs or hormones
 2. The effects of the endocrine system upon reproductive processes
[see also F., below]
 - a. Glands affected by endocrine secretions: the testes, the ovaries, the placenta
 - b. Female processes under endocrine control: the menstrual cycle, gestation, parturition, the secretion of milk, and the termination of menstrual life
- F. The structures and functions of the reproductive system
1. The male reproductive system
 2. The female reproductive system
- G. The structures and functions of the excretory system
1. The structures: kidneys, ureters, urinary bladder, urethra
 2. The excretory process
- H. The structures and functions of the supportive-protective system
1. The composition and properties of bone
 2. The connective tissues
 3. The joints
 4. The bursae
 5. The sinuses
 6. The muscular system
 7. The structure and properties of muscle
 - a. Striated, skeletal, or voluntary muscle
 - b. Nonstriated, smooth, or involuntary muscle
 - c. Cardiac muscle
 - d. The contraction of muscle fibres
[see 323.D.]
 8. The integument and derivatives: skin, hair, and nails
- I. The body cavities and their membranes: the thoracic cavity, the abdominal cavity
- J. The structure and functions of the nervous system
1. The central nervous system: the brain and spinal cord, the cerebrospinal fluid
 2. The peripheral nervous system: cranial nerves, spinal nerves, and that part of the autonomic system that is outside the brain and spinal cord
 3. The autonomic nervous system: the sympathetic and parasympathetic systems
 4. The eye and the process of vision
 5. The ear and the process of audition
 6. Other sensory receptors
 - a. Cutaneous (skin) senses: touch, heat, cold, and pain
 - b. Kinesthetic (motion) sense
 - c. Vestibular sense (equilibrium): acceleration, rotation, orientation, and balance

d. Taste (gustatory) sense

e. Smell (olfactory) sense

K. The composition and properties of body fluids and tissues
[see 332.D.]**Suggested reading in the *Encyclopædia Britannica*:**

MACROPAEDIA: Major articles dealing with the structures and functions of the human body

Biochemical Components of Organisms Blood Circulation and Circulatory Systems	Digestion and Digestive Systems Endocrine Systems Excretion and Excretory Systems Integumentary Systems	Muscles and Muscle Systems Nerves and Nervous Systems Nutrition Reproduction and Reproductive Systems	Respiration and Respiratory Systems Sensory Reception Supportive and Connective Tissues
---	--	--	---

MICROPAEDIA: Selected entries of reference information

General subjects

<i>bones and skeletal system:</i> bone bone marrow cartilage joint osteoblast osteoclast osteocyte osteon periosteum skeleton	<i>cardiovascular system—heart:</i> atrium coronary circulation diastole heart systole ventricle	cecum chewing chyme colon defecation digestion duodenum esophagus feces flatulence gallbladder gastric gland ileum intestinal gas large intestine liver pancreas Paneth's cell peristalsis pharynx plica circularis pylorus rectum small intestine stomach swallowing villus	follicle-stimulating hormones gastrin glucagon growth hormone hormone insulin Langerhans, islets of luteinizing hormone neurohormone ovary oxytocin parathyroid gland pineal gland pituitary gland progesterone prolactin relaxin renin steroid hormone testis testosterone thymus thyroid gland
<i>cardiovascular system—blood:</i> ABO blood group system agglutinin blood blood cell formation blood typing coagulation complement erythrocyte hemoglobin hemolysis leukocyte lymphocyte plasma platelet Rh blood-group system serum albumin	<i>cardiovascular system—other:</i> blood pressure cardiovascular system pulmonary circulation pulse systemic circulation	<i>endocrine system:</i> adrenal gland adrenocorticotrophic hormone androgen calcitonin corticoid endocrine system enterogastrone epinephrine and norepinephrine estrogen	<i>excretory system:</i> excretion kidney loop of Henle renal artery renal capsule renal collecting tubule renal pelvis renal pyramid ureter urethra urinary bladder
<i>cardiovascular system—blood vessels:</i> aorta artery capillary vein vena cava	<i>cavities and membranes:</i> abdominal cavity peritoneum pleura sinus thoracic cavity		
	<i>connective tissues:</i> collagen connective tissue elastic fibre ligament mast cell reticular fibre tendon		
	<i>digestive system:</i> anal canal anus argentaffin cell bile bilirubin		

urination	biceps muscle	external auditory canal	uterus
urine	extensor muscle	inner ear	vagina
<i>integument and its derivatives:</i>	flexor muscle	sound reception	vulva
dermis	gluteus muscle	tympanic membrane	<i>reproductive system—male:</i>
epidermis	iliocostalis muscle	vestibulocochlear nerve	bulbourethral gland
hair	latissimus dorsi	<i>nervous system—eye and vision:</i>	ductus deferens
mammary gland	levator muscle	aqueous humour	ejaculation
nail	pectoralis muscle	cone	epididyme
perspiration	sphincter muscle	eye	erection
sebaceous gland	<i>nervous system—autonomic:</i>	eyelid	penis
sweat gland	adrenergic nerve fibre	focusing	prostate gland
<i>lymphatic system:</i>	autonomic nervous system	iris	scrotum
adenoids	cranial nerve	lens	semen
lymph	facial nerve	macula lutea	seminal vesicle
lymph node	ganglion	optic nerve	sperm
lymph nodule	spinal nerve	retina	spermatogenic cord
lymphoid tissue	vagus nerve	rhodopsin	spermatogenesis
Peyer's patch	<i>nervous system—central:</i>	rod	testis
spleen	brain	tear duct and gland	<i>reproductive system—other:</i>
thymus	cerebellum	<i>nervous system—other:</i>	artificial insemination
tonsil	cerebral cortex	nervous system	orgasm
<i>mouth, teeth, and gums:</i>	cerebral fissure	neuron	placenta
canine tooth	cerebrospinal fluid	neurotransmitter	sexual intercourse
cementum	cerebrum	proprioception	umbilical cord
dentine	hypothalamus	smell	<i>respiratory system:</i>
enamel	lateralis	taste	diaphragm
gum	medulla oblongata	<i>reproductive system—female:</i>	larynx
mouth	meninges	clitoris	lung
palate	pons	fallopian tube	nose
periodontal membrane	spinal cord	menopause	pulmonary alveolus
permanent tooth	thalamus	menstruation	respiration
premolar	<i>nervous system—ear and hearing:</i>	oogenesis	trachea
primary tooth	auricle	ovary	<i>other:</i>
saliva	bone conduction	ovulation	bursa
salivary gland	ear	ovum	human body
tongue	eustachean tube	puerperium	mucus
tooth		uterine cervix	reticuloendothelial system
<i>muscles:</i>			
abdominal muscle			
abductor muscle			
adductor muscle			

Biographies

See Section 10/34 of Part Ten

INDEX: See entries under all of the terms above

Section 422. Human Health

- A. Stages in the human life cycle
 - 1. Fertilization: the beginning of life
[see also 331.E.]
 - 2. Prenatal development
[see also 338.B.]
 - 3. Birth
 - 4. Postnatal development
[see also 338.B.]
 - 5. Reproduction
[see also 337]
 - 6. Aging
 - 7. Dying and death
- B. Definitions and ranges of normality in human health
- C. Bodily mechanisms for the maintenance of human health during stress
 - 1. The maintenance of the internal environment and the adaptation of cells to severe stress
 - 2. Defenses against disease
 - a. Maintenance of integrity of skin and mucosal linings
 - b. Role of the phagocytic cells of the body
 - c. Inflammation: the response to biological insult
 - d. The immune response
 - 3. Role of the blood in the prevention of hemorrhage
 - 4. Healing: the processes of regeneration and organization in the repair of tissues
 - 5. The alarm reaction: preparation through the effects of certain hormones for either flight or resistance
[see 421.E.1.b.]
- D. Other regimes affecting standard values in human health
 - 1. Nutrition and diet
 - a. Functions of food
 - b. Classes of food
 - c. Recommended intakes of nutrients to meet standards of physiological and metabolic requirements
 - d. Feeding behaviour
 - e. Therapeutic diets
 - 2. Exercise and physical conditioning
 - a. Exercise needs: maintenance of health, avoidance of exercise injuries, and assessment of exercise adequacy
 - b. Physiological responses to exercise and the effects of physical conditioning
 - 3. The state of sleep and its effects
 - a. The nature of sleep: criteria for and problems in defining sleep
 - b. Psychophysiological variations in sleep; *e.g.*, REM, NREM, light and deep sleep, dreaming
 - c. Effects of general and selective sleep deprivation

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with human health

Death
Exercise and Physical Conditioning
Immunity
Nutrition

MICROPAEDIA: Selected entries of reference information

General subjects

<i>baths and spas:</i>	<i>life cycle—prenatal:</i>	<i>protective</i>	reticuloendothelial
bath	embryo	<i>mechanisms of the</i>	system
furo	fertilization	<i>body:</i>	tumour necrosis
sauna	fetus	antibody	factor
spa	implantation	antigen	<i>other:</i>
Turkish bath	in vitro	coagulation	dieting
<i>exercise:</i>	fertilization	homeostasis	health
aerobics	pregnancy	human leukocyte	immunization
exercise	<i>life cycle—other:</i>	antigen	nutrition
jogging	adolescence	immunity	preventive
physical	adulthood	inflammation	medicine
education	aging	interferon	sleep
<i>life cycle—birth:</i>	death	interleukin	vegetarianism
natural childbirth	infancy	phagocytosis	
parturition	middle age		
presentation	old age		

Biographies

See Section 10/35 of Part Ten

INDEX: See entries under all of the terms above

Section 423. Human Diseases

- A. Characteristics, causes, and classifications of human disease
- B. The detection and diagnosis of disease
- C. The treatment of disease: therapeutics
 1. Aspects of medical treatment: factors for consideration in the formulation of a therapeutic regimen
 2. Major therapeutic techniques
 - a. Surgical treatment
 - b. Biological therapy
 - c. Pharmacodynamic therapy
 - d. Chemotherapy
 - e. Substitution therapy
 - f. Radiation therapy
 - g. Physical therapy
 - h. Occupational therapy
 - i. Shock therapy
 - j. Burn treatment
 - k. Organ and tissue transplants
 1. Psychological therapy
[see 436.D.4.]

- D. The symptoms, diagnosis, and treatment of diseases of the body as a whole
 - 1. Physiological shock
 - 2. Metabolic diseases and disorders
 - 3. Nutritional diseases: disorders related to nutritional deficiencies and excesses
 - 4. Diseases and disorders of fluid and electrolyte balance
 - 5. Infectious or contagious diseases: the impairment of health by living invaders of the body
 - 6. Diseases and disorders present at the time of birth
 - 7. Childhood diseases
 - 8. Disorders and injuries caused by physical agents: electrical shock; exposure to extremes of temperature, radiation, and pressure; motion sickness; wounds
 - 9. Dehydration and associated disorders
 - 10. Poisoning
 - 11. Allergic diseases and anaphylactic shock
- E. The symptoms, diagnosis, and treatment of diseases affecting any organ or tissue of the body: tumours and cancers, hyperplasia, atrophy
- F. Diseases of particular bodily systems
 - 1. The cardiovascular system
 - a. The heart and the great vessels
 - b. The blood vessels
 - c. Blood circulation
 - d. The blood and blood-forming tissues
 - 2. The lymphatic system
 - a. Disorders of lymphatic vessels and their drainage
 - b. Disorders of lymphoid tissue
 - 3. The respiratory system
 - a. Infectious diseases of the respiratory system
 - b. Allergic lung diseases
 - c. Bronchopulmonary diseases
 - d. Diseases of the nonpulmonary structures
 - e. Disorders in the dynamics of respiration
 - 4. The digestive system
 - a. The mouth, pharynx, and associated structures
 - b. The esophagus
 - c. The stomach and duodenum
 - d. The small intestine and appendix
 - e. The large intestine
 - f. The digestive glands
 - g. Disorders in the digestion and absorption of foods
 - 5. The endocrine system
 - a. The pituitary
 - b. The thyroid
 - c. The parathyroids
 - d. The adrenals
 - e. The gonads and placenta

- f. The pancreas
- g. Other endocrine glands: pineal gland, thymus
- 6. The reproductive system
 - a. Genetic and congenital abnormalities
 - b. Infections and sexually transmitted diseases
 - c. The male reproductive system
 - d. The female reproductive system
 - e. Pregnancy
- 7. The excretory system
[see also 10/35.B.1.d.]
 - a. Functional aspects: disorders of urine production and micturition
 - b. The kidneys and tubules
 - c. The urinary tract: ureters, bladder, and urethra
- 8. The supportive-protective system
 - a. The skeletal system and bone
 - b. Connective tissue: bone and periosteum, cartilage, tendon, and ligament
 - c. The joints
 - d. The bursae
 - e. The sinuses and the body cavities and their membranes
 - f. Muscle
 - g. The skin
- 9. The nervous system
[see also 10/35.B.1.f.]
 - a. Neurological manifestations secondary to other diseases, neurochemical disorders, and development defects
 - b. Disorders of the peripheral nerves
 - c. Disorders of the spinal cord and autonomic nervous system
 - d. Disorders of the central nervous system
 - e. Other disorders of the general nervous system
 - f. Disorders of the eye and vision
 - g. Disorders of the ear and hearing
 - h. Disorders of other sensory receptors
 - i. Disorders of speech
 - j. Headache

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with human diseases

Blood	Digestion and	Integumentary	Respiration and
Cancer	Digestive Systems	Systems	Respiratory
Childhood	Disease	Metabolism	Systems
Diseases and	Endocrine Systems	Muscles and	Sensory Reception
Disorders	Excretion and	Muscle Systems	Supportive and
Circulation and	Excretory	Nerves and	Connective
Circulatory	Systems	Nervous Systems	Tissues
Systems	Immunity	Nutrition	Transplants, Organ
Diagnosis and	Infectious Diseases	Poisons and	and Tissue
Therapeutics		Poisoning	

MICROPAEDIA: Selected entries of reference information

General subjects*diagnosis—laboratory**tests:*

amniocentesis
 basal metabolic rate
 blood analysis
 blood count
 Bromsulphalein test
 cardiac catheterization
 electrocardiography
 electroencephalography
 electromyography
 endoscopy
 enzyme analysis
 glucose tolerance test
 kidney function test
 liver function test
 Pap smear
 patch test
 Rubin's test
 serological test
 skin test
 thyroid function test
 tuberculin test
 urinalysis

*diagnosis—**radiography and ultrasound:*

angiocardiology
 angiography
 brain scanning
 cholecystography
 contrast medium
 diagnostic imaging
 echocardiography
 echoencephalography
 myelography
 phonocardiography
 radiology
 tomography
 ultrasound
 urography

diagnosis—other:

autopsy
 diagnosis
 gynecological examination
 knee-jerk reflex
 lumbar puncture
 sphygmomanometer
 stethoscope

disorders—allergic and immunological:

AIDS
 allergy
 anaphylaxis
 angioedema

asthma
 autoallergic disease
 autoantibody
 autoimmunity
 drug allergy
 hay fever
 hypersensitivity
 reagin
 serum sickness

*disorders—blood**diseases:*

agranulocytosis
 anemia
 aplastic anemia
 erythroblastosis fetalis
 folic-acid-deficiency anemia
 hemoglobinopathy
 hemophilia
 hereditary spherocytosis
 iron-deficiency anemia
 leukemia
 leukocytosis
 leukopenia
 methemoglobinemia
 pernicious anemia
 polycythemia
 purpura
 septicemia
 sickle-cell anemia
 thalassemia
 thrombocytopathy
 uremia

disorders—cancers:

breast cancer
 cancer
 carcinogen
 carcinoma
 Ewing's tumour of bone
 Hodgkin's disease
 Kaposi's sarcoma
 laryngeal cancer
 leukemia
 multiple myeloma
 neuroblastoma
 osteosarcoma
 renal carcinoma
 sarcoma
 thyroid tumour
 tumour

*disorders—**cardiovascular:*

air embolism
 aneurysm
 angioma
 aorta, coarctation of the

aortic insufficiency
 aortic stenosis
 arteriosclerosis
 arteriovenous fistula
 arteritis
 atrial fibrillation
 bradycardia
 cardiac arrhythmia
 coronary heart disease
 embolism
 endocarditis
 heart block
 heart failure
 heart malformation
 hypertension
 hypotension
 infarction
 milk leg
 mitral insufficiency
 mitral stenosis
 myocardial infarction
 patent ductus arteriosus
 pericarditis
 pulmonary heart disease
 pulmonary stenosis
 purpura
 Raynaud's disease
 rheumatic fever
 shock
 stroke
 syncope
 tachycardia
 thrombophlebitis
 varicose vein
 ventricular fibrillation
 ventricular septal defect
 Wegener's granulomatosis

disorders—cavity and membrane:

mediastinitis
 peritonitis
 pleurisy
 pneumothorax
 polyp
 pyothorax
 sinus squeeze
 ulcer

*disorders—congenital and hereditary**metabolic diseases:*

acatalasia
 alkaptonuria

Andersen's disease
 cystic fibrosis
 cystinosis
 cystinuria
 de Toni-Franconi syndrome
 Fabry's disease
 Forbes' disease
 galactosemia
 Gaucher's disease
 glucose-6-phosphate dehydrogenase deficiency
 glycogen storage disease
 gout
 Hartnup disease
 Hers' disease
 homocystinuria
 Hunter's syndrome
 Hurler's syndrome
 iminoglycinuria
 lipid storage disease
 McArdle's disease
 maple syrup urine disease
 Maroteaux-Lamy syndrome
 metachromatic leukodystrophy
 methemoglobinemia
 Niemann-Pick disease
 phenylketonuria
 Pompe's disease
 porphyria
 Sanfilippo's syndrome
 Tay-Sachs disease
 tyrosinemia
 von Gierke's disease
 Wilson's disease

disorders—other congenital and hereditary:

achondroplasia
 acrocephalosyndactyly
 agenesia
 albinism
 Albright's syndrome
 angioma
 atresia and stenosis
 cerebral palsy
 chromosomal disorder
 cleft palate

- cleidocranial
 dysostosis
 congenital disorder
 craniosynostosis
 cretinism
 cryptorchidism
 cutis laxa
 digit malformation
 Down syndrome
 Dupuytren's
 contracture
 dwarfism
 dysplasia
 erythroblastosis
 fetalis
 Fallot, tetralogy of
 harelip
 heart
 malformation
 hemophilia
 hereditary
 spherocytosis
 hermaphroditism
 intussusception
 Klinefelter's
 syndrome
 mandibulofacial
 dysostosis
 Marfan's syndrome
 microcephaly
 Morquio's
 syndrome
 muscular
 dystrophy
 neural tube defect
 neurofibromatosis
 osteochondroma
 osteogenesis
 imperfecta
 patent ductus
 arteriosus
 pectus excavatum
 peromelia
 pseudohermaphroditism
 respiratory distress
 syndrome
 Rett syndrome
 Siamese twin
 sickle-cell anemia
 teratology
 thalassemia
 trisomy 13
 trisomy 18
 Turner's syndrome
 urogenital
 malformation
 vitiligo
 von Willebrand's
 disease
*disorders—connective
 tissue:*
 amyloidosis
- Dupuytren's
 contracture
 herniated disk
 lupus
 erythematosus
 tendinitis
*disorders—ear and
 hearing:*
 deafness
 ear squeeze
 earwax impaction
 labyrinthitis
 Ménière's disease
 otitis media
 presbycusis
 stirrup fixation
disorders—endocrine:
 acromegaly
 Addison's disease
 adrenogenital
 syndrome
 Albright's
 syndrome
 chromophobe
 adenoma
 cretinism
 cryptorchidism
 Cushing's
 syndrome
 diabetes insipidus
 diabetes mellitus
 dwarfism
 Fröhlich's
 syndrome
 gigantism
 granulomatous
 thyroiditis
 Graves' disease
 Hashimoto's
 disease
 hyperglycemia
 hyperparathyroidism
 hypoglycemia
 hypothyroidism
 myxedema
 parathyroid
 adenoma
 pheochromocytoma
 Plummer's disease
 Riedel thyroiditis
 Sheehan's
 syndrome
 Stein-Leventhal
 syndrome
 thyroid tumour
 thyroiditis
*disorders—excretory
 system:*
 Bright's disease
 cystitis
 enuresis
 hematuria
 kidney failure
- kidney stone
 nephroblastoma
 nephrosclerosis
 nephrotic
 syndrome
 pyelonephritis
 renal carcinoma
 renal cyst
 renal
 osteodystrophy
 uremia
 urethritis
 urinary tract
 obstruction
*disorders—eye and
 vision:*
 amblyopia
 astigmatism
 blepharitis
 blindness
 cataract
 colour blindness
 conjunctivitis
 detached retina
 double vision
 exophthalmos
 glaucoma
 hyperopia
 keratitis
 lens dislocation
 myopia
 night blindness
 nystagmus
 ophthalmoplegia
 optic atrophy
 optic neuritis
 presbyopia
 ptosis
 retinitis
 pigmentosa
 retrolental
 fibroplasia
 scleritis
 strabismus
 sty
 trachoma
 uveitis
 visual-field defect
*disorders—
 gastrointestinal:*
 cestodiasis
 cholera
 coccidiosis
 colic
 colitis
 constipation
 diarrhea
 dysentery
 enteritis
 fasciolopsiasis
 gastritis
 gastroenteritis
- hookworm disease
 ileitis
 indigestion
 intestinal
 diverticulum
 intestinal
 obstruction
 intestinal squeeze
 intussusception
 megacolon
 myiasis
 nausea
 pancreatitis
 peptic ulcer
 proctitis
 salmonellosis
 trichinosis
 trichomoniasis
 vomiting
*disorders—hepatic
 and biliary:*
 cholecystitis
 cirrhosis
 clonorchiasis
 fatty liver
 gallstone
 hepatitis
 jaundice
 leishmaniasis
*disorders—infectious
 diseases caused
 by bacteria
 and related
 organisms:*
 anthrax
 bacteremia
 bartonellosis
 bejel
 bouton-neuse fever
 brucellosis
 chancroid
 cholera
 diphtheria
 dysentery
 glanders
 gonorrhoea
 granuloma
 inguinale
 impetigo
 Legionnaires'
 disease
 leprosy
 leptospirosis
 listeriosis
 Lyme disease
 lymphogranuloma
 venereum
 mastitis
 melioidosis
 osteomyelitis
 paresis
 plague
 psittacosis

puerperal fever	<i>disorders—infectious</i>	tetanus	chlorine deficiency
pyelonephritis	<i>diseases caused by</i>	tetany	cobalt deficiency
Q fever	<i>various agents:</i>	trichinosis	copper deficiency
rat-bite fever	conjunctivitis	<i>disorders—nervous</i>	fluorine deficiency
rheumatic fever	endocarditis	<i>system:</i>	iodine deficiency
Rocky Mountain	infection	Alzheimer's disease	kwashiorkor
spotted fever	meningitis	amyotrophic	magnesium
salmonellosis	otitis media	lateral	deficiency
scarlet fever	pharyngitis	sclerosis	malnutrition
scrub typhus	pneumonia	analgesia	manganese
septicemia	scrub typhus	aphasia	deficiency
streptobacillary	septic arthritis	apraxia	obesity
fever	sexually	ataxia	osteomalacia
sty	transmitted	cerebral palsy	pellagra
syphilis	disease	chorea	phosphorus
tetanus	splenitis	coma	deficiency
toxic shock	tonsillitis	convulsion	rickets
syndrome	zoonosis	dementia	scurvy
trachoma	<i>disorders—infectious</i>	dyslexia	tropical sprue
trench fever	<i>diseases caused by</i>	encephalitis	vitamin A
tuberculosis	<i>viruses:</i>	epilepsy	deficiency
tularemia	AIDS	focal seizure	vitamin A excess
typhoid	chicken pox	grand mal	vitamin B ₂
typhus	Colorado tick fever	herpes zoster	deficiency
whooping cough	common cold	hydrocephalus	vitamin B ₁₂
yaws	dengue	hyperactivity	deficiency
<i>disorders—infectious</i>	encephalitis	kernicterus	vitamin D excess
<i>diseases caused by</i>	herpes simplex	kuru	vitamin E
<i>fungi:</i>	herpes zoster	listeriosis	deficiency
actinomycosis	influenza	meningitis	vitamin K
aspergillosis	kuru	microcephaly	deficiency
blastomycosis	measles	multiple sclerosis	<i>disorders—oral:</i>
candidiasis	mononucleosis	neural tube defect	canker sore
cryptococcosis	mumps	neuralgia	caries
histoplasmosis	pappataci fever	neuritis	gingivitis
Madura foot	poliomyelitis	paralysis	glossitis
mycosis	pox disease	paresis	periodontitis
nocardiosis	rabies	Parkinson's disease	thrush
ringworm	Rift Valley fever	petit mal	tooth squeeze
sporotrichosis	roseola infantum	Pick's disease	<i>disorders—poisoning:</i>
thrush	rubella	poliomyelitis	antimony
<i>disorders—infectious</i>	smallpox	psychomotor	poisoning
<i>diseases caused by</i>	wart	seizure	arsenic poisoning
<i>parasites:</i>	yellow fever	rabies	botulism
ascariasis	<i>disorders—lymphatic</i>	Rett syndrome	cadmium
cestodiasis	<i>system:</i>	sciatica	poisoning
Chagas' disease	Hodgkin's disease	senile dementia	fish poisoning
clonorchiasis	lymphedema	sleeping sickness	food poisoning
coccidiosis	lymphogranuloma	spinal curvature	lead poisoning
dysentery	venereum	syringomyelia	medicinal
echinococcosis	sporotrichosis	tic	poisoning
fasciolopsiasis	tonsillitis	Tourette's	mercury poisoning
filariasis	<i>disorders—muscle:</i>	syndrome	mushroom
hookworm	cramp	vertigo	poisoning
kala-azar	dermatomyositis	<i>disorders—nutritional</i>	poison
malaria	lumbago	<i>diseases:</i>	shellfish poisoning
onchocerciasis	muscle tumour	anorexia	venom
paragonimiasis	muscular	anorexia nervosa	<i>disorders—pregnancy</i>
schistosomiasis	dystrophy	beriberi	<i>related:</i>
sleeping sickness	myasthenia gravis	bulimia	abortion
toxoplasmosis	myositis	calcium deficiency	ectopic pregnancy
trichinosis	myotonia	celiac disease	hydatidiform mole
trichomoniasis			

- miscarriage
 placenta accreta
 placenta praevia
 placentae abruptio
 placental
 infarction
 preeclampsia and
 eclampsia
 premature birth
 and postmature
 birth
*disorders—pressure
 injuries and other
 disorders caused by
 physical agents:*
 acceleration
 stress
 acoustic trauma
 air embolism
 altitude sickness
 barotrauma
 burn
 deceleration
 injury
 decompression
 sickness
 ear squeeze
 ebullism
 electrical shock
 frostbite
 heatstroke
 hypothermia
 intestinal squeeze
 motion sickness
 nitrogen narcosis
 radiation injury
 snakebite
 spatial
 disorientation
 sunburn
 thoracic squeeze
 wound
*disorders—
 reproductive:*
 amenorrhea
 cervical erosion
 cervicitis
 chlamydia
 cryptorchidism
 dysmenorrhea
 dyspareunia
 endometriosis
 galactorrhea
 gynecomastia
 hermaphroditism
 hydrocele
 impotence
 leukorrhea
 oligomenorrhea
 orchitis
 premenstrual
 syndrome
 priapism
 prostatic disorder
 pseudohermaph-
 roditism
 puerperal fever
 Stein-Leventhal
 syndrome
 uterine bleeding
 vaginitis
 vesiculitis
 vulvitis
*disorders—
 respiratory system:*
 alveolar
 proteinosis
 asbestosis
 atelectasis
 berylliosis
 black lung
 bronchiectasis
 bronchitis
 byssinosis
 common cold
 cough
 emphysema
 hyperventilation
 hypoxia
 influenza
 laryngeal cancer
 laryngitis
 Legionnaires'
 disease
 lung congestion
 lung infarction
 nasal polyp
 nasal tumour
 paragonimiasis
 pharyngitis
 pickwickian
 syndrome
 pneumoconiosis
 pneumonia
 psittacosis
 respiratory distress
 syndrome
 silicosis
 tracheitis
 tuberculosis
 whooping cough
*disorders—sexually
 transmitted
 diseases:*
 AIDS
 chancre
 chancroid
 chlamydia
 gonorrhoea
 granuloma
 inguinale
 herpes simplex
 lymphogranuloma
 venereum
 proctitis
 syphilis
disorders—skeletal:
 achondroplasia
 acromegaly
 bone lesion
 callus
 cervical
 spondylosis
 cleidocranial
 dysostosis
 craniosynostosis
 dislocation
 dwarfism
 dysplasia
 Ewing's tumour of
 bone
 flatfoot
 fluorosis
 fracture
 gigantism
 hamartoma
 listeriosis
 mastoiditis
 metatarsalgia
 Morquio's
 syndrome
 multiple myeloma
 neurogenic
 arthropathy
 osteoarthritis
 osteochondroma
 osteogenesis
 imperfecta
 osteomyelitis
 osteoporosis
 osteosarcoma
 Paget's disease of
 bone
 parathyroid
 adenoma
 rheumatoid
 arthritis
 septic arthritis
 spondylolisthesis
 spondylosis
disorders—skin:
 acne
 baldness
 bedsore
 blister
 boil
 carbuncle
 corn
 cutis laxa
 erythema
 exfoliative
 dermatitis
 hemangioma
 herpes simplex
 herpes zoster
 hives
 hyperhidrosis
 ichthyosis
 impetigo
 itching
 keratosis
 leishmaniasis
 mole
 nevus
 pemphigus
 pinta
 pseudoxanthoma
 elasticum
 psoriasis
 ringworm
 scabies
 scleroderma
 ulcer
 vitiligo
 wart
disorders—other:
 asthenia
 atrophy
 childhood diseases
 and disorders
 cyst
 dehydration
 disease
 diverticulum
 edema
 empyema
 fetal alcohol
 syndrome
 fever
 gangrene
 hamartoma
 headache
 hernia
 hiccup
 hypophospha-
 temia
 Kawasaki
 syndrome
 lesion
 potassium
 deficiency
 progeria
 prolapse
 Reye's syndrome
 sarcoidosis
 Sjögren's
 syndrome
 sodium deficiency
 splenitis
 splenomegaly
 sudden infant
 death syndrome
 tumour
infectious agents:
 adenovirus
 bacterium
 prion
 virus

<i>treatments—</i>	cryosurgery	antidepressant	occupational
<i>prosthetic devices:</i>	gastrectomy	artificial	therapy
artificial heart	heart transplant	respiration	physical therapy
contact lens	hysterectomy	blood transfusion	pseudolaryngeal
denture	kidney transplant	chemotherapy	speech
eyeglasses	microsurgery	desensitization	radiation therapy
hearing aid	radial keratotomy	dialysis	respiratory therapy
pacemaker	skin graft	diathermy	therapeutics
prosthesis	surgery	hydropathy	
<i>treatments—surgery:</i>	transplant	hydrotherapy	
abortion	vasectomy	hyperbaric	
amputation	<i>treatments—</i>	chamber	
cesarean section	<i>therapeutics:</i>	massage	
coronary bypass	acupuncture	moxa treatment	

Biographies

See Section 10/35 of Part Ten

INDEX: See entries under all of the terms above

Section 424. The Practice of Medicine and the Care of Health

- A. Medical education
- B. Fields of specialized medical research; the related disciplines of osteopathy, dentistry, and nursing [see 10/35.C.]
- C. The practice of medicine
 - 1. The kinds of medical practice in various countries
 - a. General practice and first-contact care: the general practitioner versus the specialist, clinic and health centre practice
 - b. Hospital and specialist practice: general surgery, pediatrics, anesthetics, pathology, teaching practice
 - c. Governmental practice: public health service, military practice, space medicine
 - d. Research
 - 2. Maintenance of professional standards
 - a. The ethical basis of medical practice; *e.g.*, the Hippocratic oath, problems relating to euthanasia and abortion
 - b. Licensure requirements for practice: the wide variation among countries
 - c. Legal restrictions on practice
 - d. Professional organizations and the maintenance of standards
- D. Public health services and administration
- E. Hospital services and facilities
- F. Environmental sanitation and health: the control of air, water, and soil pollution [see 737.C.1.]
- G. Efforts directed toward the prevention of malnutrition: the recognition and attempted solution of problems relating to nutrient requirements, world food supply, and world population
- H. The prevention and control of infection
 - 1. Vaccination and immunization
 - 2. The quarantine and isolation of infected victims
 - 3. Destruction of infectious agent or carrier; *e.g.*, aseptic and antiseptic precautions, control of disease carriers, disinfection
 - 4. The use of therapeutic agents and prophylactic medication
 - 5. The prevention and control of epidemics

I. Industrial and social medicine

1. The scope of industrial and occupational medicine
2. Health and safety laws: the regulation of working hours; restrictions on female and child labour; the elimination of health, safety, and fire hazards; the control of foods and drugs; pollution control
[see 552.D.]

J. The economics of health and disease

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the practice of medicine and the care of health

Birth Control
Medicine
Occupational Diseases and Disorders

MICROPAEDIA: Selected entries of reference information

General subjects

<i>agencies and programs:</i>	chiropractic	<i>medical ethics:</i>	blood bank
Food and Drug Administration	dental auxiliary	abortion	contraception
International Fund for Agricultural Development	dentistry	euthanasia	flying doctor service
Medicare	epidemiology	Hippocratic oath	health maintenance organization
National Health Service	hematology	medical jurisprudence	hospice
National Institutes of Health	industrial medicine	<i>preventive medicine:</i>	hospital
World Health Organization	midwifery	immunization	medical association
<i>health-care fields:</i>	nursing	preventive medicine	planned parenthood
aerospace medicine	optometry	quarantine	public health
	osteopathy	<i>other:</i>	social security
	paramedical personnel	American Medical Association	
	pharmacy	birth control	
	plastic surgery		
	psychiatry		
	surgery		

Biographies

See Section 10/35 of Part Ten

INDEX: See entries under all of the terms above

Division III. Human Behaviour and Experience

[For Part Four headnote see page 143.]

The outlines in the six sections of Division III set forth the discoveries and theories in the psychological sciences concerning human capacities, human behaviour, and human experience.

Section 431 is concerned with the questions of the definition and origins of human behaviour and experience. It also indicates the stages in the development of a person's behaviour and experience.

The outline in Section 432 deals with the capacities by which humans receive, organize, and interpret information about the current environment that influences behaviour. It treats the following subjects: attention; sensation; perception; the perception of time, of space, and of movement; perceptual illusions and hallucinations; and parapsychological phenomena.

Section 433 is concerned with current internal states that affect behaviour and conscious experience. It treats the determinants and manifestations of activation level; motivational states; emotional states; and transient states affecting behaviour and experience, such as sleep, dreams, hypnosis, fatigue, and intoxication.

Section 434 is concerned with persisting capacities that influence human behaviour and conscious experience. The outline treats the nature and assessment of human abilities and attitudes; sensorimotor abilities; intellectual abilities; and the distribution of intelligence.

Section 435 is concerned with the development of a person's potentials by learning and thinking. The outline treats diverse general theories of learning; deals separately with psychomotor, perceptual, and conceptual learning; and then treats memory and forgetting and the theories about and the types of the higher thought processes.

The outline in Section 436 sets forth those parts of psychology, psychopathology, and psychotherapy that consider the functioning, the integration, and the disintegration of the person as a whole. It treats diverse definitions and theories of personality and the self; theories of personality adjustment and maladjustment; and the kinds of mental disorders and their psychiatric treatment.

- Section 431. Human Nature and Experience: General Considerations 160
- 432. Influence of the Current Environment on a Person's Behaviour and Conscious Experience: Attention, Sensation, and Perception 161
 - 433. Current Internal States Affecting a Person's Behaviour and Conscious Experience 163
 - 434. Persisting Capacities and Inclinations That Influence Human Behaviour and Conscious Experience 164
 - 435. Development of a Person's Potentials: Learning and Thinking 165
 - 436. Personality and the Self: Integration and Disintegration of the Person as a Whole 166

Section 431. Human Nature and Experience: General Considerations

- A. The relative contribution of opposing factors in human behaviour and conscious experience, the degree to which these factors interact to produce human behaviour and conscious experience
1. Mankind as radically distinct from nature and mankind as homogeneous and continuous with the rest of nature
 - a. Behavioral capacities and performances that humans have in common with other primates and higher mammals
 - b. Behavioral capacities and performances held to be distinctive of humans; *e.g.*, propositional language, cumulative transmission of culture
 - c. The explanation of allegedly distinctive human traits in accordance with the principle of phylogenetic continuity: the evolutionary development of mankind
[see also 341 and 411]
 2. The relative weights of genetic and environmental factors: the nature–nurture controversy
 - a. Elements of genetic endowment; *e.g.*, physiological and psychological characteristics, reflexes and instincts
 - b. Environmental conditions; *e.g.*, ecological factors, cultural conditioning, personal socialization experiences
 3. Cognitive, conative, and affective dimensions of behaviour and experience
 - a. The cognitive dimension: sensation and perception; memory and imagination; concept formation, ideation, and reasoning
 - b. The conative dimension: desires, needs, cravings, drives; motivation and purpose; the voluntary and the involuntary
 - c. The affective dimension: the emotions, the pleasant and the unpleasant; the sentiments
 4. The observed elements of behaviour and the inferred dispositional tendencies: actions and powers; habits, inclinations, and capacities
 5. Emergent problems in the study of human behaviour and experience: the data and hypotheses of parapsychology; the comparison of human and artificial, machine-created intelligence
- B. Stages in the development of human behaviour
1. General aspects of human development
 2. Prenatal growth and development
 3. Birth: effects of the birth experience on the person's subsequent history
 4. Infancy: the first 18 months
 5. Early childhood and childhood: one to 12 years
 6. Adolescence: puberty to adulthood
 7. Young adulthood and maturity
 8. Old age and death
[see also 338.E.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major article dealing with human nature and experience: general considerations
Behaviour. The Development of Human

MICROPAEDIA: Selected entries of reference information

General subjects

adolescence	emotion	instinct	puberty
adulthood	etiquette	intelligence	reflex
attitude	habit	memory	sibling rivalry
behaviour genetics	human behaviour	middle age	thanatology
child development	imitation	old age	thought
culture	infancy	psychological	
creativity	insight	development	

Biographies

See Sections 10/35 and 10/36 of Part Ten

INDEX: See entries under all of the terms above

Section 432. Influence of the Current Environment on a Person's Behaviour and Conscious Experience: Attention, Sensation, and Perception

A. Attention to the environment: awareness of internal and external events
[see 341]

1. The problem of defining attention
2. Development of theories of attention: influence of stimulus-response and behaviourist studies
3. Classification of attentive phenomena: influence of adaptive processes on modes and degrees of attention
4. Determinants of attention: temperament, health, social suggestion, novelty, interests, and unconscious influences
5. Physiological mechanisms of attention
6. Analysis of attentive phenomena in terms of information theory

B. Sensation: the reception of information about the environment

1. The senses in general
[see 421.J. and 423.F.9.]
2. Vision
 - a. The work of the retina
 - b. The transduction process: the conversion of the retinal image into a set of messages in the brain
 - c. Perceptual processes of vision
 - d. Responses of the cerebral cortex to visual stimuli
3. Audition
 - a. The mechanisms of the external, middle, and inner ear: functions and processes involved in the transmission of sound and its conversion into neural messages
 - b. The work of the auditory nerve and the auditory pathways of the central nervous system: encoding, processing, and discrimination of pitch, loudness, localization, and duration of sound
 - c. The measurement of auditory phenomena: diagnosis and correction of hearing disorders
 - d. The function of the semicircular canals in maintaining equilibrium: the vestibular systems
[see B.6., below]
4. Cutaneous senses: the punctate nature and discriminatory capacity of skin to respond to pressure, pain, heat, and cold
 - a. The variety of nerve terminals exhibiting a broad range of sensitivity to different stimuli

- b. Localization of skin sensations: the nature of dermatomes
 - c. The concept of adequate stimulation and paradoxical cold: adaptation to pressure and thermal situations; itch, tickle, and vibration
 - d. The sensory experience of pain: its cause and function; external signs and qualities, theories of pain, modes of treatment
5. Kinesthesia: the function and types of sensory structures and the role of kinesthetic feedback in movement control and orientation
 6. Vestibular senses: the role of the vestibular receptors and the semicircular canals of the inner ear in maintaining equilibrium
 7. The taste sense: the form and location of taste buds, the neural pathways, types of taste receptors, factors affecting taste
 8. The olfactory sense: the form, location, and nerve supply of olfactory receptors; olfactory qualities; odour-inducing factors; factors affecting odour sensitivity; effects on behaviour
- C. Perception: the process of translating sensory stimulation into organized experience
1. Contemporary theories and new concerns: the influence of Gestalt and behaviourist theories
 2. Central problems of continuing concern
 3. Principles of perceptual organization
 - a. The Gestalt principle of *Prägnanz*, or good form, and the laws of grouping under it: closure, good continuation, similarity, proximity, and common fate; the significance of the phi phenomenon
 - b. Context effects: the influence of surrounding stimuli and of previously experienced stimuli on the observer
 - c. Perceptual constancy: the tendency of objects to appear stable in size, shape, brightness, or colour despite changing conditions of stimulation
 4. Differences in perceptual functioning among individuals, among classes of individuals, and within individuals
- D. The perception of time
1. Sequential activities related to time perception
 2. Perception of sequence and duration
 3. Factors affecting time perception; *e.g.*, type of activity, level of motivation, personality traits, drugs, sensory deprivation, hypnosis
- E. The perception of space
1. The nature of space perception: orientation to the environment
 2. Perception of depth and distance: gross tactual-kinesthetic, eye muscle, visual, and auditory cues
 3. Interrelations among the senses
 4. Social and interpersonal aspects of space perception: territorial behaviour, reason in perception, and nativistic and empiricistic considerations
- F. The perception of movement
1. Visual cues for perceiving self-motion and motion of objects
 2. Nonvisual cues: auditory, kinesthetic, and vestibular cues
- G. Perceptual illusions and hallucinations
1. Types of illusory experience
 2. Hallucinations
 - a. Neurological factors in hallucinations
 - b. Types of hallucinatory experience
- H. Theories of parapsychological phenomena
1. Extrasensory perception: telepathy, clairvoyance, precognition, and prophecy
 2. Parapsychological phenomena of a nonperceptual nature: psychokinesis

3. Theories of perceptual and of nonperceptual parapsychological phenomena: physical theories, field theories, and theories of the collective unconscious; projection hypothesis

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the influence of the current environment on a person's behaviour and conscious experience: attention, sensation, and perception

Attention
Perception, Human

MICROPAEDIA: Selected entries of reference information

General subjects

<i>parapsychological phenomena:</i>	consciousness	synesthesia	sensation
extrasensory perception	delirium	time perception	sense
parapsychological phenomenon	eidetic image	<i>sensation:</i>	smell
precognition	hallucination	chemoreception	sound reception
telepathy	illusion	flavour	thermoreception
<i>perception:</i>	movement	mechanoreception	<i>other:</i>
autokinetic effect	perception	pain	attention
	space perception	photoreception	circadian rhythm
		proprioception	stress
		receptor	human behaviour

Biographies

See Sections 10/35 and 10/36 of Part Ten

INDEX: See entries under all of the terms above

Section 433. Current Internal States Affecting a Person's Behaviour and Conscious Experience

- A. Motivational states: needs and desires that channel a person's behaviour and experience
1. Diverse theories of motivation: psychoanalytic, drive, arousal, incentive, and hedonic theories
 2. Specific human needs and motives, *with special attention to* achievement, anxiety, aggression, and sexual behaviour and deviations
 3. Situational and interactional factors: stresses in stimulus field, cognitive evaluation, balance and congruity, and cognitive dissonance
 4. Recent developments and practical applications of motivation theory: emphasis on reinforcement and instinct, the use of token systems
- B. Emotional states: bodily conditions and feelings accompanying motivation and arousal conditions
1. The nature of emotion
 2. Diverse conceptions of emotion: the roles of the nervous system
 3. Expression of emotions: the startle response; facial, vocal, and postural manifestations
- C. Transient states affecting behaviour and experience
1. Sleep
 2. Dreams
 3. Hypnosis and related states of altered consciousness
 4. Fatigue
 5. Transient states caused by altered body chemistry
[see also 321.C.4.c]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the current internal states affecting a person's behaviour and conscious experience

Emotion, Human

Motivation, Human

Sex and Sexuality

Sleep and Dreams

MICROPAEDIA: Selected entries of reference information

General subjects

<i>emotional states:</i>	<i>sexual behaviours</i>	transvestism	insomnia
anxiety	<i>and problems:</i>	voyeurism	narcolepsy
emotion	bisexuality	<i>transient states—</i>	sleep
empathy	dyspareunia	<i>chemically induced:</i>	snoring
feeling	exhibitionism	alcoholism	<i>transient states—</i>
temperament	frigidity	antidepressant	<i>other:</i>
<i>motivational states:</i>	homosexuality	drug abuse	combat fatigue
agonism	impotence	hallucinogen	fatigue
conflict	masochism	narcotic	hypnosis
drive	masturbation	sedative-hypnotic	<i>other:</i>
libido	pedophilia	drug	consciousness
motivation	rape	stimulant	introspection
scatologia	sadism	tranquilizer	unconscious
sex	sexual dysfunction	<i>transient states—</i>	
sexual motivation	sodomy	<i>sleep and sleep</i>	
	transsexualism	<i>disorders:</i>	
		dream	

Biographies

See Sections 10/35 and 10/36 of Part Ten

INDEX: See entries under all of the terms above

Section 434. Persisting Capacities and Inclinations That Influence Human Behaviour and Conscious Experience

A. The nature of human capacities

[see 435.A.]

B. The assessment of human abilities: psychological measurement

1. Types of testing instruments and methods
2. Development of standardized tests
3. Assessment of test results

C. Sensorimotor abilities: bodily skills and mechanical abilities

D. Intellectual abilities: theories of intelligence

E. The distribution of intelligence

1. Problems concerning the establishment of intelligence standards and intelligence distribution
2. Retardation
3. The gifted
4. Group differences in intelligence: the measurement and interpretation of differences in age, socioeconomic class, race, sex, and other factors

F. Personal propensities and idiosyncrasies affecting behaviour and experience

G. Attitudes

1. The nature of attitudes

2. The functions of attitudes
3. The development of attitudes
4. The measurement of attitudes: the use and validity of questionnaires, interviews, sampling techniques, opinionnaires, and content analysis

H. Persuasion and change of attitude

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the persisting capacities and inclinations that influence human behaviour and conscious experience

Intelligence, Human
Psychological Tests and Measurement

MICROPAEDIA: Selected entries of reference information

General subjects

aptitude test	genius	intelligence test	psychological
creativity	gifted child	mental age	testing
differential	human behaviour	mental retardation	sensorimotor skill
psychology	intelligence	prodigy	

Biographies

See Sections 10/35 and 10/36 of Part Ten

INDEX: See entries under all of the terms above

Section 435. Development of a Person's Potentials: Learning and Thinking

- A. Diverse theories of human learning
 1. Modern learning theories
 2. Major issues in learning theories
 3. Transfer of training
- B. Psychomotor learning
- C. Perceptual learning
- D. Conceptual learning and concept formation
- E. Memory: retention and forgetting of learned habits and content
- F. Abnormalities of memory: amnesia, paramnesia and confabulation, hypermnesia—enhancement of memory
- G. The higher thought processes
 1. The psychology of higher thought processes
 2. The role of language in the higher thought processes
 3. Meaning
 4. Types of thinking: realistic and autistic

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the development of a person's potentials: learning and thinking

Learning and Cognition, Human
Memory
Thought and Thought Processes

MICROPAEDIA: Selected entries of reference information

General subjects

amnesia	conditioning	memory	recognition
association	discrimination	mnemonic	suggestion
attitude	generalization	perceptual learning	thought
brainwashing	imitation	psychomotor	training, transfer of
cognition	insight	learning	
concept formation	learning		

Biographies

See Sections 10/35 and 10/36 of Part Ten

INDEX: See entries under all of the terms above

Section 436. Personality and the Self: Integration and Disintegration of the Person as a Whole

A. Definitions of personality

1. Physiological theories of personality: theories based on body humours, somatotypes, physiognomy, and phrenology
2. Psychoanalytic theories of personality: the importance of id, ego, superego, life and death instincts, and the collective unconscious
3. Social analytic theories of personality: the importance of drive to power, need achievement, and functional autonomy
4. Eclectic theories of personality: role theories, factor analysis of personality traits

B. Measurement of personality

1. Methods of assessment
2. Evaluating assessment techniques

C. Personality functioning and adjustment

1. The subjective aspect of personality: development of awareness of self
2. Strains and challenges put on adequate personality functioning: physical, psychological, and social stresses; *e.g.*, frustration, conflict, personal inadequacy, deprivation of accustomed gratification
3. Responses to environmental strains on personality functioning: reactions, defense mechanisms, and adjustment dynamisms for coping with environmental demands

D. Persisting disturbances of personality integration or functioning: mental disorders

1. Major categories of mental disorders: organic mental disorders, schizophrenia, paranoid disorders, affective disorders, anxiety disorders, obsessive-compulsive disorders, posttraumatic stress disorders, somatoform disorders, dissociative disorders, personality disorders, psychosexual disorders, disorders of infancy or childhood
2. Prevalence of mental disorders: epidemiology
3. Causation of mental disorders
4. Psychiatry, the treatment of mental disorders: pharmacotherapies, psychotherapies, other therapies

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and a biography dealing with personality and the self: integration and disintegration of the person as a whole

Freud
Mental Disorders and
Their Treatment
Personality

MICROPAEDIA: Selected entries of reference information

General subjects

<i>personality—tests:</i>	<i>psychiatric</i>	paranoia	psychodrama
association test	<i>disturbances:</i>	personality disorder	psychopharma-
projective test	affective disorder	phobia	cology
Rorschach Test	anxiety	psychoneurosis	psychosurgery
<i>personality—theories:</i>	autism	psychosis	psychotherapy
anal stage	delusion	psychosomatic	sensitivity training
analytic psychology	depression	disorder	shock therapy
defense mechanism	fetishism	pyromania	<i>other:</i>
ego	hypochondriasis	schizophrenia	Bedlam
humour	hysteria	<i>therapies:</i>	counseling
id	kleptomania	aversion therapy	human behaviour
inferiority complex	lycanthropy	behaviour therapy	mental hygiene
introvert and	manic-depressive	biofeedback	sibling rivalry
extrovert	psychosis	child psychiatry	stress
Oedipus complex	mental disorder	group therapy	
oral stage	multiple	lobotomy	
personality	personality	nondirective	
self	obsessive-compulsive	psychotherapy	
superego	disorder	psychoanalysis	

Biographies

See Sections 10/35 and 10/36 of Part Ten

INDEX: See entries under all of the terms above

Introduction to Part Five:

Man the Social Animal

by *Harold D. Lasswell*

We are part of society when we share in comprehensive arrangements for living with one another and for managing the environment. The simplest societies are the primitive bands who to this day live in jungles and deserts, and on isolated mountains and beaches around the globe. The most complex technological societies bind the world's cities together as part of an evolution that, barring catastrophe, is forming a planetary society of mankind.

Whether primitive or civilized, all societies must cope with the parallel problems that are generated by the urgencies of human nature and the necessities of a common life. Arrangements are made for kinship and procreation; for safety, health, and comfort; for producing and consuming commodities and services. Arrangements also develop latent talent into skills of communication, body movement, and environmental management. Institutions specialize in the gathering and dissemination of news and images of the natural and social environment. Some institutions give respect or disrespect to individuals and groups on a temporary or permanent basis, and distinguish between what is considered to be responsible or irresponsible conduct. Government, law, and politics seek to resolve the conflicting demands that arise within or among communities.

At first glance we are less likely to be impressed by the parallels than by the differences among societies. The differences are conspicuous, if we consider, say, a horde of big-city commuters as compared with a band of technologically handicapped people who are continually in search of the next meal. An anthropologist who lived with such a band a few years ago in the rain forests of eastern Bolivia reported that apart from the hammocks they slept in, three-foot digging sticks, and cumbersome long bows and arrows, these naked seminomads carried no material objects with them. Modern urban dwellers usually feel some contempt for these bearers of an Old Stone Age culture and speculate on a possible weakness of the brain to account for their lack of technological progress. Such speculations are dismissed by modern anthropologists as without foundation. As we get acquainted with primitive societies it dawns upon us that they have met some of the same problems that we have by adopting solutions whose ingenuity equals or even excels our own. This may apply, for instance, to arrangements for transmitting political authority from one generation to the next, or for preventing violently aggressive behaviour.

Societies do indeed differ from one another in the degree that they encourage specialization. In the simplest societies everybody does everything, with exceptions that are closely linked to differences of sex and age. On the other hand, many tribes use professional specialists, such as warriors, medicine men, blacksmiths, potters, weavers, musicians, and carvers. The world that we call civilized appeared with the invention of writing. Literacy provides a means of stor-

ing and retrieving information without relying exclusively on the memory of the old. Records and education multiply the number of learned professions. Urban civilization marks the emergence of such institutions as the territorial state, formal legislative codes of law, regular taxes, bureaucratized civil and military services, monumental public works, complex systems of taxation, and official records.

One way to bring out the degrees of likeness and difference among societies, whether primitive or civilized, is to compare the priorities that are given to institutions of the same kind. No one doubts that every society must concern itself to some extent with food. It is only in bands of the kind mentioned above that near-total preoccupation with hunger deemphasizes, although without abolishing, all other interests. Where existence is less hard the accumulation of wealth may become the principal value sought, as among some merchant cities and trading tribes. War and preparation for war may take top priority as it did for millennia among the shepherds of Inner Asia and the river-valley agriculturalists who were conquered by herdsman-warriors. Some agricultural societies emphasize worship and encourage forms of knowledge, like astronomy, that enhance religion. In some societies, notably in East India, the accent is on ritual purity or impurity, and every kin group is assigned a position in the respect system of caste and class.

While priorities may remain stable for generations in a given society, this is not necessarily the case. At one time the peoples of Scandinavia were warriors and brigands. Today we perceive them as among those who are most involved with the values of civil society. In the United States, the early colonizers of New England were heavily oriented toward religion, morality, and political freedom. More recently, the most general trend has been toward secular activities, especially those connected with wealth. Throughout the contemporary world, "development" often carries the connotations of economic modernization, political independence, scientific education and research, personal freedom, and social justice.

Besides allocating priorities, every society strikes a temporary or durable balance between the accumulation and the immediate enjoyment of every value. The modes of accumulation depend on the value in question. Investment in wealth production, for instance, may involve adding fertilizers to the soil, or building an infrastructure of roads and bridges, or inculcating the values of saving and investment. Expanded educational opportunity implies that more per capita hours of teaching and learning, and more physical equipment, are made available, and that the importance of education is successfully communicated. If health opportunities are to be multiplied, it is necessary to add facilities and to spread the practice of personal hygiene. A society cultivates public enlightenment with installations for scien-

tific and scholarly purposes, and for mass communication. Human relations improve as the roles of love, friendship, and loyalty expand in “an era of good feeling,” and as social discrimination wanes. Levels of responsible conduct typically rise as opportunities become more available for worship and more people join in formulating and applying moral standards. During a given period the institutions of government, law, and politics sometimes accumulate more support.

The examples mentioned above refer to the “positive” accumulation of a valued outcome. Accumulations may be “negative,” as when disasters destroy property, spread epidemics, or interfere with education.

All societies necessarily make arrangements for the sharing of wealth, power, and other values. Among individuals and groups these arrangements exhibit all degrees of equality and inequality. Wealth and income are sometimes widely distributed. By contrast, they may be monopolized in the hands of a few. Political participation may be dispersed or concentrated. Opportunities may be equalized or monopolized for health, education, and information; or for respect, affection, and responsible conduct.

Characteristic of every society is the attempt to maintain itself by controlling the minds of young and old. People not only hunt or plow, trade or fight. They are also likely to believe in what they do and how they do it. It is not necessarily true that in a system of inequality those who occupy any particular station, however exalted or lowly, entertain any doubts about the justification of the system. A stable society carries on within the framework of a common map of perception, belief, and identity. In such a setting the individual learns from earliest infancy to think, feel, and act in ways that bring positive rather than negative consequences from the social and natural environment. Socialization is the process by which private motivations are channeled into acceptable public acts.

In civilized societies reliance on the results of early education is heavily supplemented by government, law, and politics. The legal system is made up of several sets of authoritative and controlling prescriptions. One set is constitutive. It prescribes “who decides what and how.” It centralizes or decentralizes formal and effective power, and it separates power among agencies and groups. Structures may be differentiated to plan, to promote, to legislate, to execute, or to review and appraise. Regulation defines the degree of protection given to the fundamental institutions of every sector of society. Tradition alleges that a legal order is blind to values and practices that lie outside the established beliefs, faiths, and loyalties (“ideologies”) of the society with which it is involved. In consequence, legal systems may defend widely different balances between value accumulation and enjoyment, and sharply contrasting patterns of equality and inequality in the sharing of political power, wealth, respect, or any other value. The legal order may protect economic systems whose structures are capitalistic, socialistic, or cooperative; family systems that permit one or more members of the sexes to marry and raise children; religious faiths that exalt monotheism and polytheism; and so on through the infinite variety of human practices.

One set of prescriptive norms is supervisory. Individuals and groups may be given wide latitude to make private

contractual agreements or to seek redress of private wrongs. Nonetheless, the decision makers of the community are prepared to play a supervisory role by enforcing common norms if an unsettled private controversy is brought to their notice by the parties. Prescriptions also lay down the principles and procedures to be followed if the body politic organizes and administers a continuing enterprise, of which services of transportation, communication, banking, insurance, and housing are examples. A legal system includes correctional or sanctioning measures to obtain compliance with prescribed norms. Value deprivations are imposed on those who have failed or are expected to fail to comply. Deprivations range in severity from capital punishment, confiscation of property, or life imprisonment, to a light fine or reprimand.

A legal system is stabilized when the effective elements in society perceive themselves as relatively better off by continuing the system than by adopting alternative arrangements. To some extent a legal order may exhibit cyclical fluctuations, as when deviations are tolerated within limits which, if exceeded, generate reform activities that restore the former situation with little change. In a capitalist economy “creeping monopoly” may invade trade unions, employers’ associations, or natural resource and industrial enterprises. In a socialist economy “black markets” may introduce “creeping competition.” In either case, cyclical movements may restore the original relationship before they have quietly stabilized a structural innovation, or prepared the way for violent revolutionary change.

If the view is correct that worldwide interdependence is increasing, the traditional blindfold of legal systems must be put aside long enough to give explicit consideration to competing value goals and practices around the globe. Interdependence implies that whether they like it or not, the members of an emerging planetary society must take one another into account. Being taken into account implies that beliefs, faiths, and loyalties, as well as overt behaviours, are examined by public and private decision makers. The demand to be better informed about the social environment creates an enormous opportunity and responsibility for those who study society.

We expect anthropologists to provide us with knowledge of primitive societies and other specialists to focus on the processes and institutions of civilized society. Political scientists and legal scholars concentrate on government, law, and politics. Economists specialize in the production and distribution of wealth. The role of educators is relatively clear. So, too, is the role of sociologists who concern themselves with a sector of society, such as the family, social class and caste, professions and occupations, communication, public health, or comparative morals and religion.

Social scientists are continually under pressure to provide a map of the past and probable future impact of the forces that shape society. They are asked, for instance, to explain the causes of war and other forms of violence, and to suggest strategies that lead to “victory” in a specific conflict or to show how war itself may be eliminated as an instrument of public policy. Social scientists are asked for explanations of why an economy experiences inflation, or how it generates changing levels of employment and unemployment. Specialists are expected to discover the sources of alienation that separate young and old or threaten the

unity of a family, a school, a church, a political party, or a national state. These examples suggest the wide-ranging demands that confirm the importance of adding to our knowledge of society.

We recognize the existence of a problem when we perceive that our goals are inconsistent with one another or when there are discrepancies between what we want and what we have or expect. In public policymaking, the first step is to answer the question, "Whose values are to be realized?" The social scientist who participates in tackling or solving a policy problem has an option: he may adopt the criteria of a "client" or he may rely on his own values.

The study of social institutions is sometimes affected by diverging norms of professional responsibility. No conflict need arise if a social scientist is personally committed to a line of research that happens to be popular with influential members of the body politic. No anxiety or guilt is felt if the findings are applied by current decision makers. A frequent example is the study of administrative agencies according to their "dollar efficiency" or according to the accuracy and speed of communication between central offices and field stations.

In contrast to this harmonious relationship is the inner and perhaps visible turmoil of social scientists whose research interests are unacceptable to many members of the current establishment. The researchers may want to study the effect of military expenditures on society. The problem may be to find how a given level of military outlay modifies the structure of the civilian economy and influences both the production and delivery of services specialized for health, education, public information, family welfare, and other social outcomes. If the information gathered in the course of a given project is classified as secret, no scientist can lawfully report his findings. Perhaps the investigator will violate the letter of the law in the hope of mobilizing an effective demand for change. But it may be that such a strategy will backfire. Instead of arousing community protest against authority, the revelations may result in established leaders successfully taking advantage of an alleged "breach of security" to suppress inquiry and discussion.

Another complication affecting the social investigator is the degree of genuine consent that he must obtain from those whom he proposes to study. Physicians, surgeons, and biologists confront similar questions when they plan to give a test, run an experiment, administer a drug, or perform an operation. Is it always necessary to explain to a prospective subject the risks he will run? Is the investigator professionally or legally bound to make sure that the language of explanation can be understood by the individual concerned? If a social scientist plans to study the facts of life in a prison or a mental hospital, should he reveal his purpose, even when it would be easier to gain confidence by posing as a fellow prisoner or a fellow patient? Similar issues rise in connection with field studies of primitive tribes, of peasant communities, of foreign societies, and of many other social settings.

In recent times, professional opinion has emphasized the importance of obtaining "shared participation" in the pursuit of knowledge. Many investigators willingly accept the challenge of cultivating group demand for a project and for a hand in data gathering and analysis. At every stage, arrangements are made for laymen to work side by

side with professional sociologists, social psychologists, political scientists, and other investigators. As a result, some communities have learned to study themselves, assessing the degree to which they are involved in ethnic and other forms of discrimination. Unusual groups have joined in self-study. For instance, murderers and persons who have survived as targets of murderous assault have cooperated in scientific research on the causes and consequences of murder, and on possible strategies of prevention. Instead of resenting the role of "guinea pig" in science, it is typical for those who choose to participate in programs of self-observation to improve their individual insight while contributing to the enhancement of society's stock of knowledge.

Whether the client or the investigator is the source of the value criteria adopted for a policy problem, questions of value priority are bound to arise. The relative importance of political, economic, and other aims cannot be satisfactorily settled in programs of national or regional development unless the full range of possible goals is considered. It is essential to take timing into account. When a new nation-state first secedes from an empire, political power has top priority. The "ex-colony" tries to ensure its independence of external control, to obtain support from outside powers, and to unify its people. Economic development occupies a high priority position. Other targets, such as health, education, the expressive arts, and environmental protection, seem to be less urgent. The allocation of manpower and facilities to various institutions depends on the priority of the specific outcomes in which these institutions specialize.

Social scientists have an indirect influence on priorities by asking questions about them, and also by presenting a factual map of past trends, causes, and future contingencies. Scientists often devise small-scale pretests in order to try out solutions that may eventually be applied on a larger scale.

In adapting to the needs of this interdependent world, the scientists of society require of themselves that they measure the direction and intensity of the value demands of political, economic, ethnic, and all other identifiable groups anywhere on the globe. Acknowledging the perils of a divided and militant world, the most compelling task is to discern and make public the conditions under which a world public order of government and law could become a more perfect instrument of human dignity, security, and welfare. Many small-scale programs show how to reduce the human cost of transforming today's inadequate institutions into more effective systems of communication and organization.

For the first time in history it can be truly asserted that the scientists of society have been provided with technological instruments of sufficient sophistication to assist in meeting the demands that are made upon them. Retrieval and dissemination make it possible to map past, present, and future events. Social analysts know that the key question for the future is to resolve whether or not the spectacularly changing technology of knowledge, and especially knowledge of society, will be in the hands of a limited class or caste that seeks to serve its own advantage. The alternative is to share the control of information widely among all territorial and pluralistic groups. Unless individuals and groups are able to obtain access to com-

prehensive stocks of information, they will be blind judges of public policy. Without adequate access, their criticism will be dismissed as exercises in ignorance and bias. Critics will be in no position to develop realistic alternatives to the plans of governmental or private monopolists of knowledge. "Knowledge is power"; if there is to be self-control, there must be prompt and total access to information.

The chief novelty about the computer and other technically advanced means of processing and transmitting information is that, in principle, everyone can be given prompt access to a selective "map of the whole." An image of the total deployment of man in space or of the total activities

of a corporate enterprise can be made available to everyone from the highest official to the humblest worker. The salient facts can be made vivid, concise, and substantially accurate in images that may be supplemented in whatever detail is desired. The range of possible expenditures for any political, economic, or social program can be summarized and related to its potential impact on society.

Human society has attained an unparalleled height of danger and opportunity. The study of society shares in both. The unprecedented accumulation of knowledge enables us to recognize that the scale of our problems is also without precedent.

Part Five. Human Society

All studies of mankind take account of the effect of the social nature of humans. This is true of the treatment in Part Four of human evolution, health, and general nature and behaviour. It is also true of the treatments, in subsequent parts, of art, technology, religion, history, and the sciences and philosophy.

A special set of interrelated sciences, however, takes society and social behaviour as its direct subject of inquiry. The outlines in the six divisions and the twenty-five sections of Part Five are concerned with the complementary work of these social sciences.

The social sciences have themselves been the object of historical and analytical study. These studies are presented in the articles referred to in Section 10/36 of Part Ten. The outline in that section covers the history of the social sciences generally, and the nature, scope, methods, and interrelations of anthropology, sociology, economics, and political science.

The social sciences have become increasingly interdependent and interpenetrating, and no regulative agreement exists about how their distinction should be understood. Nevertheless, the diverse domains are, in practice, distinguishable. The breakdown of Part Five into six divisions reflects the currently operative distinction between cultural and social anthropology, the several branches of sociology, economics, political science, jurisprudence and law, and educational philosophy and science.

- Division I. Social Groups: Peoples and Cultures 173
 - II. Social Organization and Social Change 186
 - III. The Production, Distribution, and Utilization of Wealth 191
 - IV. Politics and Government 202
 - V. Law 208
 - VI. Education 215

Division I. Social Groups: Peoples and Cultures

The outlines in the four sections of Division I set forth anthropological accounts of the development and the variety of sociocultural forms.

- Section 511. Peoples and Cultures of the World 173
 - 512. The Development of Human Culture 178
 - 513. Major Cultural Components and Institutions of Human Societies 179
 - 514. Language and Communication 180

Section 511. Peoples and Cultures of the World

- A. In the Arctic
 - 1. In the eastern Arctic
 - 2. In the western Arctic
- B. In North America
 - 1. In the sub-Arctic
 - 2. On the Northwest Coast
 - 3. In California
 - 4. On the Plateau
 - 5. In the Great Basin
 - 6. In the Southwest
 - 7. On the Plains
 - 8. In the eastern woodlands
 - 9. In the Southeast

- C. In Middle America
 - 1. In northern Mexico
 - 2. In Mesoamerica
 - 3. In Central America and the northern Andes
 - 4. In the Caribbean
- D. In South America
 - 1. In the central and southern Andes
 - 2. In the tropical forest
 - 3. Among the South American nomads
- E. In Europe
 - 1. On the Atlantic fringe
 - 2. On the plain
 - 3. Along the Mediterranean
 - 4. On the Alpine climax
- F. In the Middle East and North Africa
 - 1. In the Maghrib: northwestern Africa
 - 2. In the Mashriq: northeastern Africa and southwest Asia
 - 3. In Iran
 - 4. In Turkey
- G. In Asia
 - 1. In Siberia
 - 2. In Central Asia
 - 3. In East Asia
 - 4. In South Asia
 - 5. In Southeast Asia
- H. In sub-Saharan Africa
 - 1. In the western Sudan
 - 2. In the eastern Sudan
 - 3. On the Guinea coast
 - 4. In the Congo
 - 5. In central and lower East Africa
 - 6. In the East African Horn
 - 7. In southern Africa
- I. In Oceania
 - 1. In Australia
 - 2. In Melanesia
 - 3. In Polynesia
 - 4. In Micronesia

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the peoples and cultures of the world

Africa	Eastern Africa
American Peoples, Native	Europe
Arctic, The	North Africa
Asia	Pacific Islands
Asian Peoples and Cultures	Transcaucasia
Australia	West Indies
Central Africa	Western Africa
Central Asia	
Culture, The Concept and Components of	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>Africa—Congo:</i>	Baule	Baster	Tembu
Ambo	Dan	Bergdama	Tonga
Azande	Edo	Chaga	Toro
Bemba	Efik	Chewa	Tsonga
Bulu	Ekoi	Ganda	Tswana
Chokwe	Ewe	Gusii	Turkana
Duala	Fanti	Ha	Tutsi
Fang	Fon	Haya	Venda
Ila	Ga	Hehe	Xhosa
Kaonde	Guro	Herero	Zaramo
Kongo	Ibibio	Hutu	Zulu
Kuba	Idoma	Kamba	<i>Africa—Sudan:</i>
Lozi	Igbira	Karamojong	Baga
Luba	Igbo	Khoikhoïn	Bagirmi
Lunda	Ijo	Kikuyu	Bambara
Mangbetu	Isoko	Kipsikis	Bamileke
Maravi	Itsekiri	Lango	Bamum
Mbundu	Kissi	Lovedu	Banda
Mbuti	Kpelle	Luguru	Baqqārah
Mongo	Kru	Luhya	Bari
Ovimbundu	Lamba	Luo	Baya
Tabwa	Mamprusi	Luvale	Bobo
Yaka	Mbembe	Makonde	Bongo
Yao	Mende	Manyika	Dagomba
Yaunde	Nupe	Masai	Dinka
<i>Africa—Ethiopian</i>	Temne	Mfengu	Dogon
<i>and Somalian:</i>	Tiv	Mpondo	Fali
Afar	Urhobo	Nandi	Fulani
Amhara	Yako	Ndebele	Fur
Gurage	Yoruba	Ngoni	Grusi
Konso	<i>Africa—Malagasy:</i>	Nguni	Guang
Oromo	Antaimoro	Nkole	Gurma
Saho	Antandroy	Nsenga	Hausa
Sidamo	Bara	Nyakyusa	Igala
Somali	Betsileo	Nyamwezi	Kabābish
Tigray	Merina	Nyika	Kanuri
Tigre	Sakalava	Nyoro	Lala
<i>Africa—Guinea</i>	Tanala	Pedi	Lotuko
<i>Coast:</i>	Tsimihety	San	Lugbara
Adangme	<i>Africa—southern and</i>	Sandawe	Madi
Akan	<i>lower eastern:</i>	Shona	Malinke
Anyi	Acholi	Soga	Mande
Ashanti	Anuak	Sotho	Mossi
Baga	Bantu peoples	Swazi	Ngbandi

Nilot	Balochi	Balinese	Fleming and
Nuba	Bhīl	Batak	Walloon
Nuer	Bhutia	Bisaya	Germanic peoples
Sara	Brahui	Buginese	Gypsy
Senufo	Chakma	Cebuano	Hungarian
Serer	Chenchu	Cham	Mari
Songhai	Chin	Dayak	Mordvin
Tuareg	Dafla	Dusun	Sami
Tukulor	Durrāni	Ifugao	Slav
Wolof	Ghilzay	Igorot	Sorb
Zerma	Gond	Ilocano	Szekler
<i>Arctic:</i>	Gurung	Jakun	Tatar
Aleut	Ḥazāra	Javanese	Vlach
Chukchi	Ho	Kachin	Wend
Dolgan	Indus civilization	Karen	See also
Eskimo	Jāt	Kayan	Section 514
Even	Kadar	Kenyah	<i>Middle America and</i>
Evenk	Khāsi	Khmer	<i>northern Andes:</i>
Itelmen	Khond	Kubu	Achagua
Ket	Koch	Lampung	Amuzgo
Khanty and Mansi	Koli	Madurese	Arawak
Komi	Korku	Magindanao	Cakchiquel
Koryak	Kota	Malay	Caquetío
Nenets	Kurumba	Manggarai	Cayapa
Nivkh	Lepchā	Maranao	Cenú
Sami	Limbu	Miao (Hmong)	Chatino
Yakut	Magar	Minahasan	Chinantec
Yukaghir	Marma	Minangkabau	Chocho
<i>Asia—Central and</i>	Mina	Mon	Chocó
<i>East:</i>	Mishmi	Montagnard	Chol
Ainu	Mizo	Moro	Chontal
Ami	Munda	Muong	Chortí
Buryat	Nāga	Murut	Ciboney
Chahar	Newar	Ngada	Colorado
Chuang	Nūristāni	Palaung	Cuicatec
Daghur	Pahārī	Pangasinan	Cumanagoto
Hani	Pashtun	Rejang	Cuna
Hui	Rai	Samal	Goajiro
Kalmyk	Sansi	Sasak	Guaymí
Kazak	Santhāl	Semang	Huastec
Khalkha	Savara	Senoi	Huichol and Cora
Kyrgyz	Sinhalese	Shan	Ixcatec
Oyrat	Tamāng	Sikanese	Jicaque
Pai	Tamil	Sundanese	Kekchí
Puyi	Tharu	Tagalog	Lacandón
Sanka	Toda	Tai	Lenca
She	Vedda	Tasaday	Maya
Tajik	<i>Asia—South</i>	Tau Sug	Mayo
Tibetan	<i>Siberian:</i>	Tenggerese	Mazatec
T'u-chia	Buryat	Toradja	Mesoamerican
Tung	Khakass	Wa	civilization
Turkic peoples	Khanty and Mansi	<i>Europe:</i>	Miskito
Turkmen	Nenets	Abkhaz	Mixe-Zoquean
Tuvan	Oyrat	Balt	Mixtec
Uighur	Tofalar	Bashkir	Nahua
Uzbek	Tuvan	Basque	Otomí
Yao	Uighur	Bulgar	Páez
Yi	Yakut	Caucasian peoples	Palenque
<i>Asia—South:</i>	<i>Asia—Southeast:</i>	Celt	Patángoro
Afridi	Achinese	Chuvash	Pijao
Andamanese	Arakanese	Circassian	Popoloca
Badaga	Atoni	Finnic peoples	Puruhá

Quiché	Illinois	Atsina	Beaver
Sumo	Kickapoo	Blackfoot	Beothuk
Taino	Mahican	Cheyenne	Carrier
Tairona	Malecite	Comanche	Chipewyan
Tarasco	Massachuset	Crow	Cree
Tepehuan	Menominee	Hidatsa	Dogrib
Tojolabal	Miami	Kansa	Ingalik
Totonac	Mohawk	Kiowa	Kutchin
Tzeltal	Mohegan	Mandan	Micmac
Tzotzil	Montauk	Omaha	Montagnais and
Tzutujil	Nanticoke	Osage	Naskapi
Yaqui	Narraganset	Oto	Sekani
Yucatec Maya	Nauset	Ponca	Slave
Zapotec	Neutral	Sarcee	Tahltan
<i>Middle East and</i>	Nipmuc	Sioux	Tanaina
<i>North Africa:</i>	Ojibwa	Tonkawa	Tanana
Arab	Oneida	Wichita	<i>Oceania:</i>
Armenian	Ottawa	<i>North America—</i>	Aranda
Bakhtyārī	Pamlico	<i>Plateau:</i>	Australian
Balochi	Passamaquoddy	Flathead	Aborigine
Baqqārah	Pennacook	Kutenai	Chamorro
Bedouin	Penobscot	Modoc and	Hawaiian
Beja	Pequot	Klamath	Kariera
Berber	Potawatomi	Nez Percé	Maori
Cuman	Powhatan	Sahaptin	Trobriander
Druze	Sauk	Salish	<i>South America—</i>
Harātīn	Seneca	Yakima	<i>central and southern</i>
Kabābīsh	Shawnee	<i>North America—</i>	<i>Andean:</i>
Kabyle	Susquehanna	<i>Southeast:</i>	Andean
Kurd	Tionontati	Apalachee	civilization
Lur	Tuscarora	Caddo	Araucanian
Rif	Wampanoag	Calusa	Atacama
Shawia	Wappinger	Catawba	Aymara
Teda	Wendat	Cherokee	Chavín
Tuareg	Wenrohronon	Chickasaw	Chimú
Turkmen	Winnebago	Chitimacha	Diaguitta
<i>North America—</i>	<i>North America—</i>	Choctaw	Inca
<i>Californian:</i>	<i>Great Basin:</i>	Creek	Mapuche
Cahuilla	Bannock	Natchez	Quechua
Chumash	Mono	Seminole	<i>South America—</i>
Diegueño	Paiute	<i>North America—</i>	<i>nomadic:</i>
Juaneño	Shoshoni	<i>Southwest:</i>	Abipón
Luiसेño	Ute	Apache	Chono
Maidu	Washo	Chiricahua	Guató
Mission Indians	<i>North America—</i>	Hopi	Makú
Miwok	<i>Northwest</i>	Jicarilla Apache	Mataco
Pomo	<i>Coast:</i>	Karankawa	Mbayá
Serrano	Bella Coola	Mescalero	Ona
Shastan	Chinook	Mimbres	Puelche
Wintun	Coast Salish	Mojave	Purí and
Yana	Haida	Navajo	Coroado
Yokuts	Hupa	Papago	Querandí
Yuki	Kwakiutl	Pima	Sirionó
<i>North America—</i>	Nootka	Pueblo Indians	Tehuelche
<i>Eastern Woodland:</i>	Tlingit	Shoshoni	Warrau
.Abnaki	Tsimshian	Southwest	Yámana
Cayuga	Wiyot	Indian	Yaruro
Conoy	Yurok	Yuman	<i>South America—</i>
Delaware	<i>North America—</i>	Zuni	<i>tropical forest:</i>
Erie	<i>Plains:</i>	<i>North America—</i>	Apapocuva
Fox	Arapaho	<i>Sub-Arctic:</i>	Bororo
Huron	Arikara	Algonquin	Botocudo
	Assiniboin		

Canelo
Carajá
Ge
Guaraní
Jívaro

Maxakali
Mura
Shavante
Sherente

Shipibo
Tucuna
Tupian
Tupinambá

Witoto
Yanomami

Biographies

See Section 10/36 of Part Ten

INDEX: See entries under all of the terms above

Section 512. The Development of Human Culture

A. Diverse theories of culture: conceptions involved in the analysis of culture

1. Definitions of culture
2. Culture and personality
3. Cultural comparisons: ethnocentrism, cultural relativism
4. Cultural adaptation and change
5. Cultural patterns
6. Cultural institutions
[see 513]

B. Types of cultures

1. Cultures of primitive and nonurban societies
 - a. Cultures of nomadic and settled hunters and gatherers
 - b. Horticultural societies: societies in which primitive agriculture is supplemental to hunting and gathering
 - c. Cultures of pastoralists and herdsmen: distribution and characteristics
 - d. Cultures of peasants and settled agriculturists
2. Cultures of civilized societies: theories of their origin and evolution
3. The development of modern industrial civilization: mass society

C. Processes of cultural change

[see Division II, below]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the development of human culture

Culture, The Concept and Components of
Modernization and Industrialization

Social Sciences, The
Social Structure and Change

MICROPAEDIA: Selected entries of reference information

General subjects

acculturation
age-area hypothesis
cultural evolution
culture
culture-and-
personality
studies
culture area

environmentalism
folk society
Gemeinschaft and
Gesellschaft
hunting and
gathering society
hydraulic
civilization

industrialization
Kulturkreis
Mesolithic Period
modernization
Neolithic Period
nomadism
Paleolithic Period

peasant
primitive culture
region
social Darwinism
survival
transhumance
urban revolution

Biographies

See Section 10/36 of Part Ten

INDEX: See entries under all of the terms above

Section 513. Major Cultural Components and Institutions of Human Societies

- A. Systems of relationship based upon marriage and descent: kinship
1. General aspects of kinship
 2. Laws and customs regarding mate selection, sexual behaviour, marriage and divorce, legitimacy
[see also 553.B.]
 3. Rules of residence; *e.g.*, virilocal, uxorilocal, neolocal
 4. Descent systems: unilineal, cognatic, and variant forms
 5. Control of resources, inheritance, and succession: the family as a centre for transmission of economic, religious, political, and other powers and goods
 6. Kinship and social change: kinship as an evolving social institution
- B. Other social structures
1. The varieties of groups and other associations within societies
 2. Organization by status: class systems, caste systems, systems characterized by slavery or serfdom
- C. Types of economic systems
1. The economic systems of primitive or nonurban peoples
 - a. Production, division of labour, role differentiation
 - b. Exchange of goods, distribution of wealth
 - c. Property and property rights
 2. The economic systems of developed nations
[see Division III. below]
- D. Other elements common to all cultures but differing in expression or practice between cultures
1. Education and socialization: formal and informal enculturation
 2. Religious belief, folklore
[for religious belief, see 811]
 3. Legal systems
[see 551.B.]
 4. Artistic expression: literature, visual arts, performing arts; crafts
[see 611, 612, and 613]
 5. Linguistic systems
[see 514]
 6. Recreation, sports and games
 7. Passage and purification rites: birth, puberty, marriage, death

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with major cultural components and institutions of human societies

Culture, The Concept and Components of
 Family and Kinship
 Inheritance and Succession
 Social Sciences, The
 Sports, Major Team and Individual

MICROPAEDIA: Selected entries of reference information

General subjects

<i>kinship</i> :	clan	joint family	nuclear family
avoidance	cross-cousin	kin	patriarchy
relationship	descent	kinship	phratry
avunculate	extended family	kinship terminology	tribe
band	family	lineage	
blood brotherhood	gens	matriarchy	

<i>marital and sexual relationships:</i>	exchange marriage	<i>primitive economic systems:</i>	number game
betrothal	exogamy and endogamy	barter	serfdom
bridewealth	group marriage	gift exchange	slavery
circumcision	henogamy	kula	social class
clitoridectomy	incest	potlatch	social group
concupinage	levirate	silent trade	social status
couvade	residence	<i>other:</i>	Sporting Record
divorce	seigneur, droit du	card game	sports and games
dowry	sororate	caste	See also Sections
dual organization	tree marriage	children's game	522 and 523

Biographies

See Section 10/36 of Part Ten

INDEX: See entries under all of the terms above

Section 514. Language and Communication

- A. Communication as a foundation of human culture and as the essential element in social and cultural interaction, the role of communication in the modification of human behaviour
- B. Nonverbal communication
 1. Communication by means of bodily gestures and posture, by facial expression
 2. Laughter and nonword sounds as communication
 3. The use of signals, signs, symbols, icons, and cultural artifacts
 4. Cybernetic communication: computer languages, human language-computer interfaces, and artificial intelligence and expert systems
 5. Parapsychological forms of communication: telepathy
[see 432.H.]
- C. The nature of language
 1. Definitions of language
 2. Ways of studying language: phonetics, grammar, semantics
 3. Language variants: dialects, slang, and specialized variants (*e.g.*, jargon, pidgins, creoles)
 4. Speech: the psychological and physiological bases
 5. Meaning and style in language: structural and lexical meanings; semantic flexibility; language and conceptualization; style
 6. Language and culture: transmission of language; language and social differentiation; control of language for cultural ends; language learning and literacy; written language and spoken language
 7. Linguistic change and language typology
 8. Cryptology: codes, ciphers, and other means of encrypting language
- D. The structure of speech and language
 1. The phonetics of speech (articulatory, acoustic, linguistic); phonetic transcription; experimental phonetics
 2. The physiology of speech: regulators (respiratory and brain functions); the larynx; voice production (including synthetic voice production)
 3. Speech disorders
- E. Written language: systems of notation
 1. The nature, origin, and evolution of writing: from pictures to the alphabet

2. Types of writing systems: logographic, syllabic, consonantal, alphabetic, featural
 3. Systems of writing: hieroglyphic, cuneiform, alphabetic, ideographic
 4. Adjuncts to writing: punctuation, shorthand
 5. Calligraphy and the art of handwriting: early Semitic, Arabic, Greek, Latin, Indic, East Asian
- F. Linguistics: the scientific study of language and language development
[see also 10/36 H.]
1. The development of linguistic theory
 2. Synchronic linguistics: structural, transformational-generative grammar, tagmemics, stratificational grammar, the Prague school
 3. Diachronic linguistics: linguistic change, comparative method, language classification
 4. Dialectology and the study of linguistic geography
 5. Semantics: the study of language and meaning
 6. The study of writing
 7. The classification of language
- G. Language and society
1. Attitudes toward language: taboos in language use, myths about the origin of language, the relation of language and thought
 2. The connection of language with history, the role of language in the transmission of culture
 3. The role of language in cross-cultural relations
 4. The use of language as a political instrument
 5. The role of language in unifying social and occupational groups
- H. Languages of the world
1. Indo-European languages
 - a. Anatolian
 - b. Indo-Iranian
 - c. Greek
 - d. Italic
 - e. Romance
 - f. Germanic
 - g. Armenian
 - h. Tocharian
 - i. Celtic
 - j. Baltic
 - k. Slavic
 - l. Albanian
 2. Uralic languages
 - a. Finno-Ugric
 - b. Samoyedic
 3. Altaic languages
 - a. Turkic
 - b. Mongolian
 - c. Manchu-Tungus
 4. Dravidian languages
 - a. South Dravidian

- b. Central Dravidian
- c. North Dravidian
- 5. Austroasiatic languages
 - a. Mon-Khmer
 - b. Munda
- 6. Sino-Tibetan languages
 - a. Chinese
 - b. Tibetic
 - c. Burmic
 - d. Baric
 - e. Karenic
- 7. Hmong-Mien (Miao-Yao) language
- 8. Tai languages
 - a. Southwestern Tai
 - b. Central Tai
 - c. Northern Tai
- 9. Paleo-Siberian languages
 - a. Nivkh
 - b. Yukaghir
 - c. Chukchi
 - d. Koryak
 - e. Itelmen
 - f. Ket
- 10. Caucasian languages
 - a. South Caucasian
 - b. North Caucasian
- 11. Afro-Asiatic languages
 - a. Semitic
 - b. Egyptian
 - c. Berber
 - d. Cushitic
 - e. Chadic
- 12. Korean language
- 13. Japanese language
- 14. Austronesian languages
 - a. Formosan
 - b. Western Malayo-Polynesian
 - c. Central Malayo-Polynesian
 - d. South Halmahera-West New Guinea
 - e. Oceanic
- 15. Papuan languages
- 16. Australian Aboriginal languages
- 17. African languages
 - a. Niger-Congo
 - b. Chari-Nile and Nilo-Saharan
 - c. Khoisan

18. Indian languages of North America
 - a. Eskimo-Aleut
 - b. Na-Dené
 - c. Macro-Algonquian
 - d. Macro-Siouan
 - e. Hokan
 - f. Penutian
 - g. Aztec-Tanoan
19. Indian languages of Meso-America
 - a. Uto-Aztecan
 - b. Tequistlatec
 - c. Tlapanec
 - d. Oto-Pamean
 - e. Popolocan
 - f. Mixtecan
 - g. Zapotecan
 - h. Chinantecan
 - i. Mixe-Zoque
 - j. Totonacan
 - k. Mayan
 - l. Misumalpan
20. Indian languages of South America and the Caribbean
 - a. Arawakan
 - b. Cariban
 - c. Macro-Chibchan
 - d. Macro-Ge
 - e. Macro-Pano-Tacanan
 - f. Quechumaran
 - g. Tucanoan
 - h. Tupian
21. Language isolates
 - a. Sumerian
 - b. Etruscan
 - c. Basque
22. Pidgins and creoles
23. Constructed languages
 - a. Special international or universal languages, including Esperanto and Interlingua; Basic English
 - b. Machine languages: *e.g.*, Fortran, Algol
[see 735.D.3.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with language and communication

Communication	Linguistics
Cryptology	Names
Humour and Wit	Speech
Language	Writing
Languages of the World	

MICROPAEDIA: Selected entries of reference information

General subjects

alphabets and other writing systems:
 alphabet
 Arabic alphabet
 Aramaic alphabet
 Armenian alphabet
 Brāhmī
 Braille
 Canaanite inscriptions
 Chinese writing system
 cuneiform writing
 Cypriot syllabary
 Cyrillic alphabet
 demotic script
 Devanāgarī
 Eggjum Stone
 Ethiopic alphabet
 Etruscan alphabet
 Glagolitic alphabet
 Gothic alphabet
 Grantha alphabet
 Greek alphabet
 Gregg shorthand
 Gupta script
 Gurmukhi alphabet
 Hangul
 Hebrew alphabet
 hieroglyph
 Hittite hieroglyphic writing
 Iguvine Tables
 Indic writing systems
 kana
 Kensington Stone
 Kharoṣṭī
 Kōk Turki alphabet
 Latin alphabet
 Linear A and Linear B
 Mayan hieroglyphic writing
 Myazedi inscription
 Nabataean alphabet
 North Semitic alphabet
 ogham writing
 Pahlavi alphabet
 Palmyrenian alphabet
 Phoenician alphabet

pictography
 Pitman shorthand
 Rosetta Stone
 runic alphabet
 Sarada script
 shorthand
 Sinaitic inscriptions
 South Semitic alphabet
 Speedwriting
 stenotypy
 syllabary
 Syriac alphabet
 Ugaritic alphabet writing
grammar, syntax, and vocabulary:
 abbreviation
 agglutination
 auxiliary
 gender
 grammar
 honorific
 mood
 morpheme
 name
 patronymic
 punctuation
 slang
 speculative grammar
 surname
 syntax
 tense
 voice
languages—
African:
 African languages
 Bantu languages
 Central Sudanic languages
 Eastern Sudanic languages
 Khoikhoi languages
 Khoisan languages
 Kwa languages
 Meroitic language
 Niger-Congo languages
 Nilotic languages
 Nubian languages
 San languages
 Swahili language
 West Atlantic languages
 Xhosa language
 Zulu language

languages—
Afro-Asiatic (Hamito-Semitic):
 Afro-Asiatic languages
 Akkadian language
 Amharic language
 Arabic language
 Aramaic language
 Berber languages
 Chadic languages
 Coptic language
 Cushitic languages
 Eblaite language
 Egyptian language
 Ge'ez language
 Hausa language
 Hebrew language
 Phoenician language
 Semitic languages
 South Arabic language
 Syriac language
languages—Altaic:
 Altaic languages
 Chuvash language
 Evenk language
 Kazak language
 Kyrgyz language
 Manchu language
 Manchu-Tungus languages
 Mongol language
 Mongolian languages
 Tatar language
 Turkic languages
 Turkish language
 Turkmen language
 Uighur language
 Ural-Altaic languages
 Uzbek language
languages—
Austroasiatic:
 Austroasiatic languages
 Khmer language
 Mon-Khmer languages
 Munda languages
 Nicobarese languages
 Vietnamese language
languages—
Austronesian:
 Austronesian languages

Cebuano
 Fijian language
 Formosan languages
 Javanese language
 Malagasy languages
 Malay language
 Melanesian languages
 Micronesian languages
 Oceanic languages
 Philippine languages
 Polynesian languages
 Tagalog language
languages—
Caucasian:
 Avar-Andi-Dido languages
 Caucasian languages
 Georgian language
 Kartvelian languages
 Laz language
 Mingrelian language
 Nakh languages
languages—
Dravidian:
 Dravidian languages
 Kannada language
 Malayalam language
 Tamil language
 Telugu language
languages—Indo-European (Baltic):
 Baltic languages
 Latvian language
 Lithuanian language
 Old Prussian language
languages—
Indo-European (Celtic):
 Breton language
 Brythonic languages
 Celtic languages
 Cornish language
 Goidelic languages
 Irish language
 Pictish language

- Scottish Gaelic language
 Welsh language
languages—
Indo-European
(Germanic):
 Afrikaans language
 Danish language
 English language
 Faroese language
 Frisian language
 German language
 Germanic languages
 Gothic language
 Icelandic language
 Luxemburgian language
 Middle English language
 Netherlandic language
 Norwegian language
 Old English language
 Old Norse language
 Old Saxon language
 Scandinavian languages
 Scots language
 Swedish language
 Swiss German language
 Yiddish language
languages—
Indo-European
(Greek):
 Demotic Greek language
 Greek language
 Katharevusa Greek language
 Koine
languages—
Indo-European
(Indo-Iranian):
 Apabhraṃśa language
 Assamese language
 Avestan language
 Balochi language
 Bengali language
 Bihārī languages
 Burushaski language
 Dardic languages
 Dari language
 Gujarati language
 Hindi language
 Hindustani language
 Indian languages
 Indo-Aryan languages
 Indo-Iranian languages
 Iranian languages
 Kashmiri language
 Marāṭhī language
 Oṛiyā language
 Ossetic language
 Pahari languages
 Pahlavi language
 Pāli language
 Parthian language
 Pashto language
 Persian language
 Prakrit languages
 Punjābī language
 Romany language
 Sanskrit language
 Sindhi language
 Sinhalese language
 Urdu language
languages—
Indo-European
(Romance and Italic):
 Catalan language
 Franco-Provençal dialect
 French language
 Italian language
 Italic languages
 Ladino language
 Latin language
 Mozarabic language
 Occitan language
 Oscan language
 Osco-Umbrian languages
 Portuguese language
 Rhaetian dialects
 Romance languages
 Romanian language
 Sabellic dialects
 Sardinian language
 Spanish language
 Umbrian language
 Vulgar Latin
languages—
Indo-European
(Slavic):
 Belarusian language
 Bulgarian language
 Czech language
 Lekhitic languages
 Macedonian language
 Old Church Slavonic language
 Polish language
 Russian language
 Serbo-Croatian language
 Slavic languages
 Slovak language
 Slovene language
 Sorbian languages
 Ukrainian language
languages—
Indo-European
(other):
 Albanian language
 Anatolian languages
 Armenian language
 Hittite language
 Indo-European languages
 Indo-Hittite languages
 Luvian language
 Lydian language
 Raetian language
 Tocharian languages
languages—
international and artificial:
 Basic English
 Esperanto
 Ido
 Interlingua
 Novial
 Volapük
languages—
Meso-American
Indian:
 American Indian languages
 Cakchiquel language
 Maya languages
 Mixe-Zoque languages
 Nahua language
 Oto-Manguan languages
 Quiché language
 Uto-Aztecan languages
 Yucatec language
languages—North American Indian:
 Algonquian languages
 American Indian languages
 Cherokee language
 Eskimo-Aleut languages
 Hokan languages
 Hopi language
 Macro-Algonquian languages
 Macro-Siouan languages
 Na-Dené languages
 Navajo language
 Penutian languages
 Siouan languages
languages—pidgin and auxiliary:
 Chinese Pidgin English creole
 Gullah
 Haitian Creole
 lingua franca
 Melanesian Pidgin
 Papiamentu
 pidgin
 Sranantonga
languages—
Sino-Tibetan:
 Burmese language
 Cantonese language
 Chinese languages
 Kan-Hakka languages
 Karen languages
 Mandarin language
 Miao-Yao (Hmong-Mien) languages
 Min languages
 Pinyin romanization
 Sino-Tibetan languages
 Tibetan language
 Wade-Giles romanization
 Wu language
languages—South American Indian:
 American Indian languages
 Arawakan languages

Quechuan languages	<i>languages—Uralic:</i>	glossematics	consonant
Tupí-Guaraní languages	Estonian language	glottochronology	inflection
<i>languages—Tai:</i>	Finnish language	Grimm's law	International Phonetic Alphabet
Shan language	Finno-Ugric languages	historical linguistics	intonation
Tai languages	Hungarian language	immediate constituent analysis	nasal palatalization
Thai language	Karelian language	koine linguistics	phoneme
<i>languages—unaffiliated (extinct):</i>	Mari language	morphology	phonetics
Elamite language	Mordvin language	Neogrammarian	phonology
Etruscan language	Permian languages	neurolinguistics	rounding
Hattic language	Sami languages	Prague school	stop
Hurrian language	Ural-Altai languages	psycholinguistics	suprasegmental
Sumerian language	Uralic languages	semantics	tone
<i>languages—unaffiliated (living):</i>	<i>linguistics:</i>	semiotics	velarization
Andamanese language	anthropological linguistics	sociolinguistics	voice
Australian Aboriginal languages	comparative linguistics	structuralism	vowel
Basque language	computational linguistics	stylistics	<i>other:</i>
Japanese language	dialect	synchronic linguistics	communication
Ket language	dialectology	transformational grammar	cryptology
Korean language	diglossia	Verner's law	humour
Maori language	ethnolinguistics	<i>phonetics:</i>	name
Paleo-Siberian languages	etymology	accent	semaphore
Papuan languages	general semantics	allophone	sign language
	generative grammar	articulation	speech
		click	symbol
Biographies			
Apollonius	Grimm, Jacob	Levita, Elijah	Sibawayh
Dyscolus	Ludwig Carl and Wilhelm Carl	Pike, Kenneth L.	Trubetskoy, Nikolay
Bloomfield, Leonard	Halliday, M.A.K.	Priscian	Sergeyevich
Chomsky, Noam	Harris, Zellig S.	Rask, Rasmus	Ulfilas
Cyril and Methodius, Saints	Humboldt, Alexander von	Sapir, Edward	Vaugelas, Claude Favre, seigneur de
Donatus, Aelius	Jakobson, Roman	Saussure, Ferdinand de	Whorf, Benjamin Lee
Firth, John R.	Jespersen, Otto	Scaliger, Joseph Justus	
	Kimhi, David	Schleicher, August	

INDEX: See entries under all of the terms above

Division II. Social Organization and Social Change

[For Part Five headnote see page 173.]

The outlines in the four sections of Division II present general sociological theories of social order and social change, and sociological studies of basic social institutions, social processes, and social problems.

- Section 521. Social Structure and Change 186
- 522. The Group Structure of Society 188
- 523. Social Status 189
- 524. Human Populations: Urban and Rural Communities 190

Section 521. Social Structure and Change

- A. The structure of society: diverse theories of social structure and organization, various types of social structure

- B. The social effects of bureaucratic and industrial specialization
1. The social effects of industrialization and modernization
 2. The social effects of organizational specialization: bureaucracy
 3. The social effects of industrial specialization and automation
[see also 712.C.]
- C. Social control
1. The process of socialization: the transmission of patterns of normative behaviour by family, peer groups, and education
 2. Theories of alienation: definitions, causes, manifestations, and proposed solutions
 3. The regulation of behaviour that departs from social norms
 - a. By punishment, rehabilitation, and reform of criminals
 - b. By psychological therapy
 - c. By persuasion
- D. Factors operative in social change
1. The role of ideology in social change
 2. Contact with other cultures as a factor in social change
 3. The influence of environment as a factor in social change
 4. The role of demographic factors in social change
 5. The role of art in social change: art as an ideological instrument
 6. Religion as a factor for and against social change
 7. The role of intellectual factors in social change
 8. The relationship of economic factors to social stability
 9. Technological factors in social change
 10. The role of collective behaviour in social change
 11. The role of public opinion in social behaviour
- E. Social movements and social change
1. Characteristics of social movements
 2. Selected types of social movements
 - a. Movements centred on religious concepts or personalities
 - b. Humanitarian and reform movements
 - c. Interest group movements
 - d. Revolutionary movements
 - e. Nationalist movements
[see also 541.C.3.b.vii.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with social structure and change

Collective Behaviour	Public Opinion
Crime and Punishment	Social Sciences, The
Modernization and Industrialization	Social Structure and Change
Propaganda	Work and Employment

MICROPAEDIA: Selected entries of reference information

General subjects

<i>punishment and rehabilitation:</i>	Auburn system	commutation	exile and
amnesty	Baumes Laws	deportation	banishment
	Borstal system	Elmira system	

indeterminate sentence	punishment	social change	collective
mark system	recidivism	social Darwinism	behaviour
ostracism	reformatory	social movement	folkway
parole	torture	temperance	norm
penal colony	workhouse	movement	public opinion
Pennsylvania system	<i>social change:</i>	<i>social norms</i>	role
prison	civil disobedience	<i>and associated phenomena:</i>	social structure
probation	sanction	assimilation	
	satyāgraha		
	sit-in		

Biographies

See Section 10/36 of Part Ten

INDEX: See entries under all of the terms above

Section 522. The Group Structure of Society

- A. The various types of groups: patterns of group relations
 1. Classifications of groups
 2. The modern family: its organization and functions
 3. Special-interest groups
[see also 541.B.3.]
 4. Minorities and ethnic groups
- B. The social effects of racial and ethnic prejudice
- C. Special social concerns
 1. Adolescence
 2. Old age
 3. Women's social and legal status
 4. Cultural minorities
[see A.4., above]
 5. Poverty
 6. Criminality and delinquency
 7. Sexual orientation
 8. Prostitution
 9. Drug and alcohol abuse
 10. Suicide
- D. Social service: organized public and private activities to alleviate human wants and needs
 1. The background of social and welfare services: modern and historical influences
 2. Fields of service
 - a. Family welfare
 - b. Child welfare
 - c. Youth welfare
 - d. Group welfare
 - e. Disaster relief
 - f. Community development
 - g. Medical and psychiatric social services
 - h. School social services
[see also 561.C.4.]
 - i. Correctional services: probation, parole, and delinquency control

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the group structure of society

Alcohol and Drug Consumption	Social Sciences, The
Crime and Punishment	Social Welfare
Family and Kinship	
Sex and Sexuality	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>family and marriage:</i>	polyandry	<i>social legislation and</i>	crime
adoption	polygamy	<i>social services:</i>	delinquency
betrothal	surrogate	affirmative action	drug abuse
bridewealth	motherhood	almoner	habitual offender
divorce	<i>interest groups and</i>	almshouse	old age
dowry	<i>social movements:</i>	child welfare	organized crime
exchange marriage	black nationalism	philanthropic	poverty
exogamy and	Civil Rights	foundation	prostitution
endogamy	Movement	prohibition	racial segregation
family	ethnic group	service club	racism
group marriage	interest group	social service	suicide
henogamy	lobbying	social settlement	white-collar crime
joint family	minority	social welfare	<i>other:</i>
levirate	temperance	program	assimilation
marriage	movement	woman suffrage	charisma
nuclear family	women's liberation	<i>social problems:</i>	Gemeinschaft and
parent	movement	alcoholism	Gesellschaft
		child abuse	

Biographies

See Section 10/36 of Part Ten

INDEX: See entries under all of the terms above

Section 523. Social Status**A. Social differentiation and stratification**

1. The concepts of differentiation and stratification: distinctions and interrelationships
2. Factors producing social, economic, and cultural differences: sex differentiation, age differentiation, racial differentiation, intellectual differentiation, social and cultural factors [see 521.D.]
3. The process of stratification: its relationship to differentiation
 - a. Economic differentiation: the basis of stratification
 - b. Class, status, and power as forms of stratification
 - c. The relation of the individual to society: the effects of differentiation and stratification

B. Varieties of social stratification and social mobility

1. The relation of social class to caste, status, elites, and other concepts
2. Theories of social class: divergent conceptions of the importance of classes in social structures and of the nature of class relationships
3. Types and characteristics of and comparisons among modern social classes: upper class, working class, and middle class; the special case of the peasant class
4. Social mobility
5. The idea of a classless society: approximations to an equality of conditions
6. Social immobility: slavery, serfdom, and forced labour

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with social status

Slavery
Social Sciences, The

MICROPAEDIA: Selected entries of reference information

General subjects

<i>labour and servitude:</i>	serfdom	caste	racial segregation
abolitionism	slavery	clan	social class
contract labour	statute labour	ethnic group	social mobility
forced labour	<i>social differentiation,</i>	family	social status
freedman	<i>stratification, and</i>	ghetto	
labour, division of	<i>segregation:</i>	kinship	
migrant labour	age set	minority	
peonage	apartheid		

Biographies

See Section 10/36 of Part Ten

INDEX: See entries under all of the terms above

Section 524. Human Populations: Urban and Rural Communities

A. The composition and change of human populations

1. Determinants of population
 - a. Human fertility and its control
 - b. Mortality: death rates and longevity
 - c. Migration and refugee movements
2. Historical changes in population
3. Theories of population
 - a. Premodern beliefs: pronatalism versus birth control
 - b. Mercantilist theory
 - c. Laissez-faire theory
 - d. Malthusian theory
 - e. Marxist theory
 - f. Modern theories of population; *e.g.*, optimum population size, optimum rate of population growth, relationship between population and demographic movements
 - g. Ecological theories concerning the relationship between human population growth and the conservation of natural resources
4. Governmental policies influencing population growth and composition
5. The future of the world's population: population projections and problems of the population explosion

B. Development of modern cities

1. Characteristics of urbanization
2. History of urbanization
3. Patterns of urban planning
 - a. Methods and materials of urban planning and redevelopment
 - b. Social aspects of urban planning and redevelopment
4. Trends in urbanization
 - a. Megalopolis: the coalescence of several metropolitan areas into a contiguous agglomeration of people and activity

- b. Suburbanization: the growth of politically separate but economically dependent residential communities surrounding large cities
- c. Regional integration: economic and cultural interaction between the city and its hinterland
- d. The role of technology in extending the dominance and influence of urban concentrations
- e. Problems of urban growth and population control
- f. Problems of environmental change: pollution, climatic change

C. Development of modern rural societies

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with human populations: urban and rural communities

Birth Control	Modernization and Industrialization
Cities	Population
Climate and Weather	Social Sciences, The

MICROPAEDIA: Selected entries of reference information

General subjects

age distribution	human migration	pollution	urban renewal
birth control	metropolitan area	population	urbanization
census	mortality	refugee	vital rates
city	new town	rural society	zoning
contraception	planned	urban climate	
demography	parenthood	urban planning	

Biographies

See Section 10/36 of Part Ten

INDEX: See entries under all of the terms above

Division III. The Production, Distribution, and Utilization of Wealth

[For Part Five headnote see page 173.]

The outlines in the seven sections of Division III deal with the economic order in human society.

Section 531. Economic Concepts, Issues, and Systems 191

532. The Consumer and the Market: Pricing and the Mechanisms for Distributing Goods 192

533. The Organization of Production and Distribution 194

534. The Distribution of Income and Wealth 198

535. Macroeconomics 199

536. Economic Growth and Planning 201

Section 531. Economic Concepts, Issues, and Systems

A. Some basic concepts of economics

1. The concept of economic activity as a process of choosing among scarce resources
2. The concept of division of labour
3. The concepts of diminishing returns and optimization
4. The concept of marginality
5. The concept of capital
6. The concept of competition
7. The concept of comparative advantage
8. The concepts of growth and development

B. Levels of economic analysis

1. Microeconomics: the economic decisions of individuals, households, and firms

2. Sectoral economics: the economic arrangements of industries, groups, and regions
 3. Macroeconomics: the economy as a whole
- C. The comparison of different economic systems
1. Archetypal economic systems
 - a. The pure private enterprise economy: a theoretical model
 - b. The centrally planned economy: the pure socialist model
 - c. The mixed economy with various degrees of economic planning
 2. Western-type market economies
 3. Soviet- and socialist-type economic systems
 4. Mixed economies in developing countries
 5. Other economic systems
 - a. Primitive economic systems
 - b. Feudal economic systems

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with economic concepts, issues, and systems

Economic Systems	Government Finance
Economic Theory	International Trade

MICROPAEDIA: Selected entries of reference information

General subjects

<i>economic concepts:</i>	marginal utility	communism	potlatch
capital	microeconomics	economic system	silent trade
diminishing	supply and	socialism	<i>other:</i>
returns, law of	demand	<i>primitive economic</i>	bourgeoisie
distribution theory	<i>economic systems:</i>	<i>activities:</i>	Gosplan
labour, division of	capitalism	barter	labour, hours of
laissez-faire	command	gift exchange	mercantilism
macroeconomics	economy	kula	proletariat
margin			

Biographies

See Section 10/36 of Part Ten

INDEX: See entries under all of the terms above

Section 532. The Consumer and the Market: Pricing and the Mechanisms for Distributing Goods

- A. Scarcity, utility, and value: their roles in pricing, their relationship to the consumer
- B. The satisfaction of material wants: the behaviour of consumers
 1. National consumption levels in the private sector: trends in expenditures for goods and services
 2. Factors influencing consumers' tastes and spending
 3. The protection of consumer interests
- C. Markets as an economic institution in a mixed economy
 1. Markets classified by reference to competition and monopoly
 - a. Purely competitive markets as distinguished from markets of imperfect competition: monopoly, oligopoly, and monopolistic competition
 - b. Influences affecting the behaviour of sellers under various competitive conditions
 - c. The concept of workable competition
 - d. Government regulation of monopolistic practices

2. Major types of markets
 - a. Markets for primary commodities
 - b. Markets for manufactured goods
 - c. Markets for money and capital: the market for short-term loans, the securities market
 - d. The market for labour and services
[see 533.C.1.]
3. The counterpart of the market under full-scale economic planning: markets under socialism
4. The historical development of markets: the market in economic theory, the relationship of the market to social welfare and politics
5. Markets in international trade
[see 533.F.]
6. The function of the market in the establishment of equilibrium between supply and effective demand

D. The price system in capitalist economies

1. The price system as a means of organizing economic activity: the determination of what is to be produced, how goods are to be produced, and who gets the product
2. Limitations on and failures of the price system: areas in which the price system does not function
 - a. Control of prices by business: price-fixing
[see C.1.a., above]
 - b. Government-established price controls and subsidies: regulations concerning public utilities and bank interest rates
[see 534.B.4.b., and 534.B.6.b.]
 - c. Economic relationships not susceptible to control by prices: "externalities," such as air pollution and highway congestion
[see also 737.C.1.]
 - d. Imperfect knowledge on the part of buyers as to alternative uses of their buying power
[see B.2., above]
3. The role of the public sector in the distribution of goods and services: government budgets
[see 534.B.1.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the consumer and the market: pricing and the mechanisms for distributing goods

Economic Theory	Markets
Government Finance	Social Sciences, The
International Trade	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>consumer protection:</i>	credit card	bazaar	market
antitrust law	demand curve	black market	marketing board
Better Business	indifference curve	cartel	monopolistic
Bureau	marginal utility	cobweb cycle	competition
consumerism	producer goods	commodity	monopoly
fair-trade law	propensity to	exchange	price
<i>consumption:</i>	consume	commodity	price
consumer good	supply and	trade	discrimination
consumer's surplus	demand	futures	price maintenance
consumption	<i>market organization</i>	hedging	rebate
consumption	<i>and pricing:</i>	marginal-cost	
function	auction	pricing	

Biographies

See Section 10/36 of Part Ten

INDEX: See entries under all of the terms above

Section 533. The Organization of Production and Distribution

- A. The organization of the production of goods
 1. Analysis of costs and output in the short run: the production function, substitution, the relationship of marginal cost to market price, marginal product
 2. Analysis of costs and output in the long run for profit maximization and cost minimization
- B. The organization of the distribution of goods
 1. The relation between the productive process and the incomes derived from it [see also 534.A.2. and A.3.b.]
 2. The earnings of land, labour, and capital employed in the productive process
- C. The inputs of the productive process
 1. Labour as an input in the productive process
 - a. The labour force: size, quality, and deployment of work force
 - b. Methods of fixing rates of pay
 - c. The structure of pay: differences in the earnings of various occupations
 - d. Changes in the general level of pay
 - e. Employment and unemployment
 - f. The economic and social status of temporary, seasonal migrant labourers
 - g. The organization of unions
 - h. The influence of the union on the supply of labour, wages, and output
 - i. Capital elements in labour: education and training
 - j. The economic role of managers and entrepreneurs
 2. Land and raw materials as inputs
 3. Energy as an input
 4. Capital as an input in the productive process
- D. Institutional arrangements that facilitate production and output
 1. The nature and characteristics of money
 - a. The basic functions of money
 - b. The various forms of money
 - c. The quantity theory of money: views of classical and neoclassical monetary theorists, views of Keynesian income theorists
 2. The monetary functions of commercial banks and central banks
 - a. Historical development of banking systems
 - b. The structure of modern national banking systems
 - c. Principles and functions of commercial banking systems
 - d. Principles and functions of central banking systems
 - e. The money market: various national and international markets for short-term funds
 - f. International monetary institutions: proposals for future monetary cooperation and an international currency unit [see also 535.B.2.]
 - g. The market for long-term funds: savings institutions, the stock and bond markets, credit unions, mortgage institutions, farm cooperative banks, insurance institutions, mutual funds, pension funds
 - h. The nature and functions of government credit agencies
 3. The use of economic statistics in the determination of production and output
 - a. National income statistics

- b. Price statistics: the use and construction of indexes of retail and wholesale prices
 - c. Economic forecasting
- 4. The business corporation
- E. Agricultural economics
 - 1. The relationship between agricultural and economic development
 - 2. Efforts to control prices and production in agriculture: government price supports, subsidies, and acreage limitations
 - 3. The behaviour of farm prices and the consequences for the incomes of farmers
 - 4. The effect of technology on world agriculture: the increase in acreage and in crop yields
 - 5. The organization of farming: types of farms
- F. The geographical distribution of resources and markets: international trade
 - 1. Classical and contemporary theories of international and interregional trade
 - 2. National and regional factors influencing trade
 - a. Tariffs, embargoes, and quotas imposed to obtain revenue, protect domestic industry, and secure a favourable balance of payments
 - b. Changes in the conditions of production: costs, labour, and technology
 - c. Price movements
 - d. National domestic taxes and subsidies
[see also 534.B.4.]
 - 3. International trade arrangements
- G. The role of government in production and distribution
 - 1. The theory of public expenditures: the role of taxation in the budgetary process and problems of effective tax administration
 - 2. The justification of the government's claim to share in resource use: problems of balancing resource consumption between the public and private sectors
 - 3. The growth in government spending in the 19th and 20th centuries: the rise in military and social welfare expenditures
 - 4. Government operation of basic industries
- H. Methods of business organization
 - 1. The keeping of accounts
 - a. Accounting as an information system
 - b. Various types of company financial statements; *e.g.*, the balance sheet, the income statement
 - c. Principles of accounting measurement: asset and cost measurement
 - d. Cost accounting: formulation of budgetary plans, performance reports, profit analyses
 - 2. The management of business funds
 - a. Short-term and intermediate-term financial operations: planning and control, the cash budget, accounts receivable, inventories
 - b. Long-term financial operations: the design of capital structure and the issuance of securities
 - c. Consolidations and mergers
 - 3. The management of human resources: personnel administration
 - a. Personnel departments: their functions and services
 - b. Manpower planning, recruitment, and placement
 - c. Employee training and development
 - d. Methods of maintaining employee incentive and commitment
 - 4. The administration and control of production
 - a. The flow channels of information and materials
 - b. The control function: maintaining conformity between operations and the plan

- c. Production scheduling
- d. Inventory adjustment
- 5. The distribution of goods
 - a. The functions of a marketing department in a large firm
 - b. Retailing
 - c. Wholesaling
 - d. Marketing goods to industry, marketing farm products
 - e. The application of market research techniques to merchandising
- I. Advertising
- J. The distribution of risk
 - 1. The nature of insurance
 - 2. Fire and marine insurance
 - 3. Casualty and surety insurance: liability insurance, theft insurance, aviation insurance, workmen's compensation or industrial injury insurance, credit insurance, title insurance, suretyship
 - 4. Private life and health insurance
 - 5. Government-sponsored and/or government-administered health insurance [see 534.B.4.c.]
 - 6. Underwriting of risks: rate making
 - 7. Legal aspects of insurance
- K. Consumer credit
 - 1. Types of consumer credit: installment loans and noninstallment, or single-payment, loans
 - 2. Historical development of consumer credit in industrialized countries
 - a. Lending institutions and the question of interest rates
 - b. Costs and hazards of consumer credit
 - 3. Efforts to protect the consumer: the dimensions of consumer credit

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the organization of production and distribution

Accounting	Coins and Coinage	Insurance	Social Sciences, The
Banks and	Economic Growth	International Trade	Work and
Banking	and Planning	Marketing and	Employment
Business	Economic Theory	Merchandising	
Organization	Government	Markets	
	Finance	Money	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>agricultural</i>	bank	development bank	investment trust
<i>economics</i> :	bond	discount rate	liquidity preference
agricultural	business finance	dividend	marginal efficiency
economics	capital	exchange, bill of	of investment
extensive	central bank	Federal Deposit	money market
agriculture	commercial bank	Insurance	money order
intensive	consumer credit	Corporation	mutual fund
agriculture	credit	Federal Reserve	national bank
kolkhoz	credit, letter of	System	over-the-counter
tenant farming	credit card	finance company	market
<i>banking and</i>	credit union	installment credit	promissory note
<i>financing</i> :	deposit,	interest	revolving credit
acceptance	certificate of	investment	risk
arbitrage		investment bank	saving

- savings and loan association
savings bank
security
sinking fund
stock
stock exchange
stock option
ticker
time deposit
- business organization:*
account payable
account receivable
amortization
audit
bookkeeping
cartel
chartered company
clearinghouse
conglomerate corporation
credit bureau
depletion allowance
depreciation
industrial espionage
inventory
limited liability
mercantile agency
merger
monopoly
multinational corporation
partnership
pawnbroking
public enterprise
public relations
public utility
trust company
zaibatsu
- economic measurement and forecasting:*
consumer price index
cost of living
Dow Jones average
econometrics
- economic forecasting
economic indicator
income and employment theory
input-output analysis
Keynesian economics
Laspeyres index
multiplier
Paasche index
Phillips curve
price index
wholesale price index
- insurance:*
actuary
annuity
casualty insurance
fire insurance
friendly society
group insurance
guaranty and suretyship
health insurance
insurance
liability insurance
life insurance
marine insurance
motor-vehicle insurance
- markets, marketing, and merchandising:*
advertising
auction
bazaar
black market
chain store
department store
fair
general store
mail-order business
market research
marketing
retailing
supermarket
trade fair
trading stamp
- vending machine
wholesaling
- money:*
bimetallism
bullionism
check
coin
currency
dollar
drachma
ecu
Eurodollar
fractional reserve system
franc
gold-exchange standard
gold reserve
gold standard
Gresham's law
lira
mark
monetarism
money
money supply
parity
peso
pound sterling
quantity theory of money
ruble
rupee
seigniorage
silver standard
tael
two-tier gold system
yen
- production:*
conservation
cost
cost-benefit analysis
marginal-cost pricing
mathematical programming
pollution
price
- price discrimination
price maintenance
production function
production management
rent
resources, allocation of
supply curve
- work and employment:*
boycott
child labour
closed shop
collective bargaining
coolie
enterprise unionism
featherbedding
fringe benefit
general strike
guaranteed wage plan
industrial union
labour
labour, hours of
labour economics
labour law
lockout
maquiladora
mediation
migrant labour
minimum wage
pension
personnel administration
profit sharing
retraining program
right-to-work law
strike
trade union
unemployment
union shop
wage theory
yellow-dog contract

Biographies

- advertising and public relations:*
Benton, William
Bernays, Edward I.
Bernbach, William
Boyer, Carl
Lasker, Albert
- finance:*
Baring family
Belmont family
Fugger family
- Markowitz, Harry M.
Mellon, Andrew W.
Miller, Merton H.
Modigliani, Franco
Morgan, John Pierpont
- Rothschild family
Sage, Russell
- industry:*
Carnegie, Andrew
du Pont family
Field, Marshall
Ford, Henry
Getty, J. Paul
Guggenheim, Meyer and Daniel
Hammer, Armand
- Hughes, Howard
Hunt, H.L.
Iacocca, Lee
Krupp von Bohlen und Halbach, Alfred
Krupp von Bohlen und Halbach, Gustav
McCormick, Cyrus Hall

Pew, J. Howard; and Pew, Joseph N., Jr.	Thyssen family <i>labour:</i> Chavez, Cesar	Meany, George Reuther, Walter Stephens, Uriah Smith	Penney, J.C. Sears, R.W. Ward, Montgomery
Rockefeller, John D.	Debs, Eugene V.	Woodcock, George	See also Section 10/36 of Part Ten
Schwab, Charles M.	Feather, Victor	<i>merchandising:</i> Marcus, Stanley	
Squibb, E.R.	Hill, Joe		
Tata family	Hoffa, James R.		

INDEX: See entries under all of the terms above

Section 534. The Distribution of Income and Wealth

- A. The distribution of wealth and income by categories of the population
 1. The nature and measurement of wealth and income
 2. Methods of classifying the distribution of wealth and income
 - a. Distribution by factor shares: wages, profits, interest, and rent
 - b. Distribution according to the number of persons in various classes of wealth and income
 3. Patterns of wealth and income distribution among various countries and among persons within a country
 - a. Frequency distributions
 - b. Comparisons among wealth and income groups
- B. The routes by which government affects the distribution of wealth and income
 1. The national budget as the program of the government's revenues and expenditures
 2. The nature and purposes of taxation
 - a. Principles of taxation; *e.g.*, adequacy, adaptability, universality, ability to pay
 - b. The effect of taxes on the distribution of income: progressive and regressive taxes
 - c. The burden of taxation: the problem of shifting and incidence
 - d. Characteristics of national tax systems: comparisons of tax burdens
 3. Kinds of taxes
 - a. Taxes on real and personal property
 - b. Sales and excise taxes
 - c. Tariffs and export taxes
 - d. Taxes on personal income and capital gains
 - e. Taxes on corporate income and excess profits
 - f. Death and gift taxes
 - g. Social security and payroll taxes
 4. Transfers and subsidies
 - a. Interest payments on the public debt
[see B.5., below]
 - b. Subsidies and tax concessions
 - c. Government-sponsored and government-administered welfare programs
 5. The financing of budgetary deficits and surpluses
 6. Direct controls over the private sector
 - a. Price, wage, and profit control
 - b. Control of restrictive practices: antitrust legislation, regulations imposed upon public utilities, labour legislation imposed on unions
[see also 532.C.1.d.]
 - c. Economic mobilization for war
 7. Land reform: the redistribution of land tenure

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the distribution of income and wealth

Economic Theory	Social Sciences, The
Government Finance	Social Welfare
International Trade	Taxation
Land Reform and Tenure	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>government revenue</i>	inheritance tax	taxation	protectionism
<i>and spending:</i>	likin	toll	rationing
ad valorem tax	luxury tax	treasury bill	<i>wealth and income:</i>
aid	poll tax	unemployment	absentee
assessment	progressive tax	insurance	ownership
capital-gains tax	property tax	use tax	allodium
capital levy	public debt	value-added tax	disposable income
death tax	regressive tax	war finance	ejido
depletion	relief	welfare state	enclosure
allowance	revenue bond	workers'	equal-field system
estate tax	sales tax	compensation	investment credit
excess-profits tax	single tax	<i>regulation of</i>	living, standard of
gift tax	social insurance	<i>economic activity:</i>	métayage
government budget	social security	antitrust law	profit
guaranteed	social welfare	fair-trade law	wealth
minimum income	program	laissez-faire	and income,
income tax	subsidy	land reform	distribution of
indexation	tariff	nationalization	

Biographies

See Section 10/36 of Part Ten

INDEX: See entries under all of the terms above

Section 535. Macroeconomics**A. National income and employment theory**

1. The concern of income and employment theory with changes in aggregate output, employment, and prices
 - a. The classical law of markets contrasted with the Keynesian theory of effective demand
 - b. The classical and Keynesian theories of unemployment
2. The circular flow of income and expenditure: national product as goods and as earnings
3. Analyses of fluctuations in national income

B. International economic and financial equilibrium and disequilibrium

1. Foreign exchange markets: problems of alternative monetary standards and fixed and fluctuating exchange rates
 - a. Equilibrating movements in the balance of payments and the mechanisms of adjustment: arbitrage, short-term movements, interest rates, and forward exchange
 - b. Disequilibrating movements as a response to currency devaluation: covering, hedging, and speculation
 - c. Balance of payments accounting
 - d. Methods for adjusting to fundamental disequilibrium: fiscal and monetary policy, incomes policy, devaluation and revaluation, and restrictions on capital movements
2. International monetary and financial institutions: the International Monetary Fund, the Group of Ten, and other attempts at international cooperation
[see also 533.D.2.f.]

- a. Problems of maintaining adequate gold and currency reserves: gold crises, special drawing rights
 - b. The aftermath of major wars: economic and financial crises, economic nationalism
- C. Business cycles
1. The statistical study of cycles: the identification and measurement of business cycles, various cyclical theories
 2. Theories of the business cycle and business cycle models
 3. Countercyclical monetary and fiscal policy
- D. Inflation and deflation

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with macroeconomics

Economic Theory
 Government Finance
 International Trade
 Social Sciences, The

MICROPAEDIA: Selected entries of reference information

General subjects

<i>economic cycles:</i>	monetarism	International	international
business cycle	monetary policy	Development	payment
depression	national income	Association	international trade
inflation	accounting	International	invisible trade
panic	nationalization	Finance	most-favoured-
Phillips curve	open-market	Corporation	nation treatment
recession	operation	International	payments,
<i>fiscal and monetary</i>	parity	Monetary Fund	balance of
<i>policy:</i>	regional	<i>trade:</i>	protectionism
bimetallism	development	comparative	quota
bullionism	program	advantage	reciprocity
deficit financing	silver standard	customs union	tariff
economic stabilizer	sterling area	embargo	trade, balance of
fiscal policy	two-tier gold	exchange rate	trade, terms of
fractional reserve	system	free trade	trade agreement
system	<i>international</i>	free-trade zone	visible trade
gold-exchange	<i>monetary and</i>	General	
standard	<i>financial institutions:</i>	Agreement on	
gold standard	International	Tariffs and Trade	
Gresham's law	Bank for	imperial preference	
incomes policy	Reconstruction	international	
interest	and Development	exchange	

Biographies

See Section 10/36 of Part Ten

INDEX: See entries under all of the terms above

Section 536. Economic Growth and Planning

- A. The nature and causes of economic growth
1. Various factors influencing economic growth; *e.g.*, technology, markets, the supply of capital, the labour force, governmental fiscal policies
 2. The theory of economic growth and models of growth
 - a. Various models of economic growth: supply-determined models, demand-determined models, and target-instrument models
 - b. The practical functions of growth theory and mathematical growth models
 3. Social costs and benefits of economic growth
 4. Economic growth in developing countries
 - a. The relationship between economic underdevelopment and low per capita income: the rate of increase of gross domestic product (GDP) as compared to population growth
 - b. Various theories of national economic development and economic retardation
 5. Changes in economic efficiency as measured by changes in output per unit of input: economic productivity
- B. Planning for economic growth and stability
1. The nature of economic planning
 2. Economic planning in Communist countries
 3. Economic planning in developed non-Communist countries
 4. Economic planning in developing countries

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with economic growth and planning

Economic Growth and Planning
 Economic Theory
 Government Finance
 International Trade
 Social Sciences, The

MICROPAEDIA: Selected entries of reference information

General subjects

economic development	economic growth economic planning	Gosplan government budget	international trade productivity
-------------------------	--------------------------------------	------------------------------	-------------------------------------

Biographies

See Section 10/36 of Part Ten

INDEX: See entries under all of the terms above

Division IV. Politics and Government

[For Part Five headnote see page 173.]

The outlines in the four sections of Division IV treat general theories of the state and of government; the structure, branches, and offices of government; the functioning of government; and international relations in peace and war.

Section 541. Political Theory 202

542. Political Institutions: the Structure, Branches, and Offices of Government 204

543. The Functioning of Government: the Dynamics of the Political Process 205

544. International Relations: Peace and War 206

Section 541. Political Theory

- A. The national state as viewed in political theory
 1. Properties of statehood: sovereignty
 2. The state and the individual
 3. The national state in the international community
[see also 552.B.]
 4. Various conceptions of the bases of legitimacy and authority of government
 - a. Continuing consent of the governed: popular sovereignty
 - b. The social contract
 - c. Venerable sanction: hereditary monarchy, constitutional succession
 - d. Divine right: God as the source of political authority
 5. Theories of constitutionalism, modern constitutional governments
[see also 551.B.4.]
 - a. Origins and theories of constitutional government
 - b. Features of constitutional government
 - c. Methods of constitutional growth: evolution and substantive replacement
- B. Patterns of political action as viewed in political theory
 1. Political action within small groups, villages, or communities
 2. Political action by organized parties
 3. Political action by special-interest groups
 4. The political influence of public opinion
- C. Political concepts, ideologies, and problems
 1. The concept of political power
 2. The concept of human rights
 3. Modern ideologies
 - a. The importance of ideology to a political system or movement: the relationship between ideological and civil politics
 - b. Current political ideologies and tendencies
 - i. Anarchism
 - ii. Communism
 - iii. Conservatism
 - iv. Fascism
 - v. Liberalism
 - vi. Marxism
 - vii. Nationalism
 - viii. Socialism

4. Contemporary political issues and problems
 - a. The problem of church and state: its background and contemporary form
 - b. The urban problem: the administration of cities and metropolitan areas
[see also 524.B. and 542.A.1.c.]
 - c. The problem of international cooperation and integration
[see also 544.A.]
 - d. The issue of centralization of power versus decentralization
 - e. The problem of adapting traditional political forms to changing conditions
 - f. Bureaucracy: the issue of responsive government
[see 542.C.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with political theory

Constitution and Constitutional Government	Political Parties and Interest Groups
Human Rights	Social Sciences, The
Ideology	Socio-Economic Doctrines
Marxism, Marx and	and Reform Movements, Modern

MICROPAEDIA: Selected entries of reference information

General subjects

<i>charters and documents:</i>	representation	individualism	<i>political organizations:</i>
Constitution of the United States of America	self-determination	jingoism	commonwealth
Kapital, Das	social contract	Leninism	interest group
Magna Carta	sovereignty	liberalism	political machine
Rights, Bill of	<i>political ideologies:</i>	Maoism	political party
Rights of Man and of the Citizen,	anarchism	Marxism	popular front
Declaration of the Universal	authoritarianism	National Socialism	soviet
Declaration of Human Rights	Christian Socialism	nationalism	<i>status of the individual:</i>
	collectivism	nihilism	alien
	communism	pluralism	bourgeoisie
	conservatism	radical	citizenship
	corporatism	revisionism	freedman
	democracy	social democracy	nationality
	dialectical	socialism	naturalization
<i>concepts of sovereignty:</i>	materialism	Stalinism	proletariat
church and state	Eurocommunism	Syndicalism	refugee
divine right of kings	fascism	totalitarianism	
established church powers,	Fourierism	Trotskyism	
separation of	Guild Socialism	utopia	
	Idéologie		
	ideology		

Biographies

Bakunin, Mikhail Aleksandrovich	Herzen, Aleksandr	Mao Zedong	Tocqueville, Alexis de
Bebel, August	Jefferson, Thomas	Marx, Karl	Trotsky, Leon
Bentley, Arthur F.	Kropotkin, Peter	Plekhanov, Georgy Valentinovich	Webb, Sidney and Beatrice
Bernstein, Eduard	Laski, Harold J.	Proudhon, Pierre-Joseph	See also Section 10/36 of Part Ten
Blanc, Louis	Lasswell, Harold D.	Rousseau, Jean-Jacques	
Brecht, Arnold	Lenin, Vladimir		
Burke, Edmund	Ilich		
Engels, Friedrich	Lippman, Walter		

INDEX: See entries under all of the terms above

Section 542. Political Institutions: the Structure, Branches, and Offices of Government**A. Political systems**

1. Levels and structures of various systems of government

a. Supranational political systems: empires; leagues, confederations, and commonwealths; regional federations; world congresses
[see 544.A.]

b. National political systems: the unitary nation-state system, the federal state system

c. Urban governments

d. Other subnational political systems: tribal community governments, rural community governments, regional community governments
[see also 521.A.]

2. Types and models of political systems

B. The branches of government

1. The concentration of legislative and executive functions: parliamentary rule

2. The legislature

3. The executive

4. The judiciary
[see also 552.F.1.]

C. Public administration: the planning, organization, and coordination of governmental bureaucratic operations; civil service

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with political institutions: the structure, branches and offices of government

Cities

Government, The Forms of:
Their Historical Development

Political Systems

Public Administration

Social Sciences, The

MICROPAEDIA: Selected entries of reference information

General subjects*administrative units:*

borough
canton
city
city-state
commonwealth
commune
county
hsien
municipality
shire
township

courts and judiciary:

See Section 552

governmental forms and systems:

absolutism
aristocracy
bicameral system
democracy

dictatorship

federalism
government
military
government
monarchy
oligarchy
two-party system

legislative bodies:

Commons,
House of
Congress of the
United States
Diet
Knesset
Lords, House of
Parliament
Representatives,
House of
Senate

municipal

government:
alderman
burgomaster
city manager
mayor
pao chia
town meeting

public administration:

administrative law
bureaucracy
cabinet
civil service
commission
ombudsman
public
administration
regulatory agency
spoils system

titles and offices:

chancellor
count
duke
emperor
grand duke
king
landgrave
lord
president
prime minister
prince
tsar
other:
assembly
local option
states' rights
tenure

Biographies

See Section 541

INDEX: See entries under all of the terms above

Section 543. The Functioning of Government: the Dynamics of the Political Process

- A. The ways in which political power is exercised
1. Internal and external security functions of government
 2. The conduct of foreign relations: the function of government in relation to other sovereign states, its own dependencies, and international organizations
[see 544]
 3. Supervisory functions of government: the resolution of conflicts through mediation and the adjudication of suits
[see also 552.F.1. and 3.]
 4. Regulatory functions of government: the establishment and active enforcement of standards
 5. Law enforcement and the corrective functions of government: sanctions, inducements, and penalties
[see also 522.C.6. and D.2.i.]
 6. Enterprising functions of government
[see 355.D., 424.D., 522.D., 533.G.4., 534.B.4.c. and 6.b., 561, 724.A.2.a., and 732.I.]
- B. Government's role in production and consumption
- C. Methods of changing the form of government
1. Peaceful changes: by electoral process (plebiscite), by constitutional mandate
 2. Violent changes: revolution, civil war, conquest by a foreign power

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the functioning of government: the dynamics of the political process

Censorship	Political Parties and Interest Groups
Crime and Punishment	Political Systems
Police	Social Sciences, The

MICROPAEDIA: Selected entries of reference information

General subjects

<i>censorship:</i>	<i>electoral process:</i>	<i>law enforcement:</i>	sheriff
banning	absentee voting	capital punishment	torture
ensor	Australian ballot	constable	<i>legislative procedure:</i>
ensorship	election	criminal	cloture
obscenity	electoral college	investigation	filibuster
pornography	plebiscite	Federal Bureau of	legislative
<i>electoral</i>	plurality system	Investigation	investigative
<i>constituencies:</i>	political	Interpol	powers
gerrymandering	convention	KGB	parliamentary
legislative	political party	police	procedure
apportionment	primary election	posse comitatus	<i>other:</i>
pocket borough	referendum and	punishment	revolution
proportional	initiative	ranger	sabotage
representation	suffrage	Royal Canadian	terrorism
		Mounted Police	

Biographies

See Section 541

INDEX: See entries under all of the terms above

Section 544. International Relations: Peace and War

- A. The politics of international relations
 1. Transnational political parties and movements, *e.g.*, Pan-Africanism, Pan-Arabism, Pan-Slavism, European federalism
 2. International and nonnational organizations and agencies, *e.g.*, the United Nations, Red Cross and Red Crescent
- B. International treaties and agreements
 1. Nonaggression treaties: collective security
 2. Treaties terminating wars
 3. Arms limitation and disarmament treaties
 4. Territorial treaties regarding the sale or transfer of land; treaties granting rights of access and other uses of territory; treaties settling border disputes
 5. Economic and commercial treaties
[see 533.F.3.]
 6. Communications and transportation treaties
 7. Cultural exchange treaties
- C. Foreign policy and diplomacy
 1. Foreign policy: its aims and compatibility with national and humanitarian interests
 2. The use of diplomacy in the negotiation of international disputes; public international conferences, arbitration, and mediation; secret diplomacy
 3. Foreign aid; government-sponsored organizations that affect internal relations in nonpolitical spheres, *e.g.*, economic, cultural, technological organizations
- D. The use of intelligence and counterintelligence activities in the preservation of national security and the conduct of international affairs
- E. War among states
 1. Degrees and kinds of war: limited war; total war; ethnic or tribal wars; religious wars; national, regional, and worldwide wars; civil wars and insurrections; guerrilla warfare
 2. The conduct of war
 - a. Military strategy
 - b. Military tactics
 - c. Military logistics
 - d. Effects of psychological warfare on troops and civilians during wartime
 - e. International law relating to the treatment of persons during wartime
[see also 552.B.4.]
 - f. The management of military expenditures
 3. Armed forces: military organizations designed for conquest or defense
 - a. Types of soldiers: *e.g.*, professional, volunteer, conscripted, and mercenary
 - b. Historical development of organized military forces
 - c. Establishment and maintenance of various branches of the armed forces
 - i. Ground forces
 - ii. Naval and amphibious forces
 - iii. Air forces
 - iv. Various auxiliary branches: *e.g.*, police, intelligence, logistics, communications, medical, and legal corps
 4. The consequences of war

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with international relations: peace and war

Diplomacy	United Nations
Intelligence and Counterintelligence	War, The Theory and Conduct of
Social Sciences, The	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>aggression and warfare:</i>	executive agreement	air force	streletsy
aggression	foreign service	army	<i>military science:</i>
air warfare	Geneva	battalion	deterrence
amphibious warfare	Convention	brevet	just war
annexation	geopolitics	captain	logistics
belligerency	international agreement	cavalry	sea power
blitzkrieg	international organization	centurion	strategy
blockade	organization	chasseur	tactics
civil defense	legate	coast guard	<i>sovereignty:</i>
conquest	mediation	commandant	colonialism
convoy	neutralism	company	dominion
economic warfare	power, balance of	division	exterritoriality
embargo	power, balance of treaty	dragoon	home rule
mobilization	United Nations	frogman	imperialism
sabotage	<i>intelligence gathering:</i>	general	influence,
safe-conduct	BND	general staff	sphere of
terrorism	Central Intelligence Agency	grenadier	protectorate
total war	counterespionage	guerrilla	sovereignty
trench warfare	espionage	hussar	territorial waters
visit and search war	intelligence	infantry	<i>other:</i>
<i>diplomacy and international agreements:</i>	KGB	legion	American Legion
alliance	MI-5	lieutenant	concentration
ambassador	MI-6	marine	camp
armistice	Mossad	marshal	conscientious
arms control	National Security Agency	mercenary	objector
collective security	Stasi	military police	conscription
consul	Ultra	militia	defense economics
diplomacy	<i>military organization and personnel:</i>	navy	fifth column
	admiral	phalanx	impressment
		platoon	martial law
		privateer	military, naval,
		ranger	and air academies
		regiment	

Biographies

<i>diplomats and statesmen:</i>	Dulles, John	Khrushchev,	Stevenson,
Adenauer, Konrad	Foster	Nikita S.	Adlai E.
Ben-Gurion, David	Eisenhower,	Kissinger,	Sun Yat-sen
Bismarck,	Dwight D.	Henry A.	Thant, U
Otto von	Gandhi, Mohandas	Lie, Trygve	Weizmann, Chaim
Bunche, Ralph	Karamchand	Marshall,	Wilson, Woodrow
Chamberlain,	Gaulle, Charles de	George C.	<i>intelligence agents</i>
Neville	Gladstone,	Metternich,	<i>and officers:</i>
Chou En-lai	William Ewart	Klemens,	Baker, Lafayette
Churchill, Winston	Goebbels, Joseph	Fürst von	Curry
Clemenceau,	Gromyko, Andrey	Mussolini, Benito	Bancroft, Edward
Georges	Andreyevich	Nasser, Gamal	Boyd, Belle
Curzon, George	Hammarskjöld,	Abdel	Burgess, Guy; and
Nathaniel	Dag	Nehru, Jawaharlal	Maclean, Donald
Curzon,	Hitler, Adolf	Roosevelt,	Donovan,
Marquess	Ho Chi Minh	Franklin D.	William J.
Disraeli, Benjamin	Kennedy, John F.	Stalin, Joseph	Hiss, Alger
			Mata Hari

Redl, Alfred	<i>military theorists:</i>	Mahan, Alfred	Scharnhorst,
Schulmeister, Karl	Clausewitz,	Thayer	Gerhard Johann
Van Deman,	Carl von	Montalembert,	David von
Ralph H.	Douhet, Giulio	Marc-René,	Sun Tzu
Winterbotham,	Jomini, Henri,	Marquis de	Vauban, Sébastien
Frederick William	baron de	Montecuccoli,	Le Prestre de
Yardley, Herbert	Liddell Hart, Sir	Raimondo	
Osborne	Basil		

INDEX: See entries under all of the terms above

Division V. Law

[For Part Five headnote see page 173.]

The outlines in the three sections of Division V treat philosophies and systems of law, and the practice of law; the branches of public law; and the branches of private law.

- Section 551. Philosophies and Systems of Law; the Practice of Law 208
 552. Branches of Public Law, Substantive and Procedural 210
 553. Branches of Private Law, Substantive and Procedural 212

Section 551. Philosophies and Systems of Law; the Practice of Law

- A. Western and non-Western philosophies of law
 1. Western philosophy of law
 - a. The scope of the Western philosophy of law and its relationship to other branches of philosophy
 - b. Problems of the philosophy of law, various approaches to a theory of law or jurisprudence
 - c. The relationship between law and morality: the influence of the principles of natural law
 - d. Historical survey of legal theories from the ancient world to the 20th century
 2. Non-Western philosophies of law: Islāmic, Chinese, and other non-Western philosophies of law
- B. Ancient and modern legal systems
 1. Primitive law: the legal systems of nonliterate peoples
 2. Ancient systems of law
 - a. Egyptian law
 - b. Cuneiform law
 - c. Chinese law
 - d. Greek law
 - e. Hellenistic law
 - f. Roman law
 - g. Germanic law
 3. Medieval European law
 - a. Origins and development of medieval European law
 - b. Sources and institutions of medieval constitutional law
 - c. Institutions of private law in medieval Europe
 - d. Development of canon law
 4. Modern systems of law
 - a. Anglo-American common law
 - b. Continental civil law
 - c. Soviet and socialist law

- C. The study of the distinctions and parallels among diverse legal systems
- D. The profession and practice of law
1. The profession of law
 2. Legal ethics
 3. Educational requirements for the legal profession

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the philosophies and systems of law; the practice of law

Law, The Profession and Practice of
 Legal Systems, The Evolution of Modern Western

MICROPAEDIA: Selected entries of reference information

General subjects

<i>ancient legal codes,</i>	ecclesiastical court	Chambre des	sergeanty
<i>principles and</i>	excommunication	Enquêts	socage
<i>institutions:</i>	False Decretals	Chambre des	tallage
aedile	Gratian's	Requêts	usury
archon	Decretum	Clarendon,	wardship and
Basilica	Ḥadith	Assize of	marriage
ensor	Halakha	court baron	wergild
civitas	Mishna	court leet	<i>modern legal codes</i>
clientship	penitential book	curia	<i>and systems:</i>
comitia	Sharī'ah	fehmic court	adat
concubinage	Talmud	High Commission,	Chinese law
cuneiform law	Torah	Court of	German Civil
decemviri	<i>legal practitioners:</i>	High Court of	Code
delator	advocate	Admiralty	Indian law
delict	assessor	law merchant	Israeli law
dharmashastra	attorney general	legal glossator	Japanese Civil
dicastery	barrister	manorial court	Code
Egyptian law	lawyer	Parlement	Japanese law
emphyteusis and	notary	piepoudre court	Napoleonic Code
superficies	solicitor	prerogative court	Prussian Civil
Greek law	<i>medieval European</i>	Privy Council	Code
Hammurabi,	<i>law—codes and</i>	Reichskammergericht	Roman-
Code of	<i>systems:</i>	Requests, Court of	Dutch law
hypothec	Anglo-Saxon law	Star Chamber,	Scottish law
interdict	Brehon law	Court of	Soviet law
ius gentium	capitulary	<i>medieval European</i>	Swiss Civil Code
ius Latii	Germanic law	<i>law—principles:</i>	<i>other:</i>
Justinian, Code of	Jerusalem,	blood money	assize
manus	Assizes of	clergy, benefit of	bar association
nomos	Sachsenspiegel	composition	civil law
Pandects	Salic Law	compurgation	common law
patria potestas	Salic Law of	copyhold	custom
proscription	Succession	demesne	disbarment
Roman law	Scandinavian law	entail	duel
talion	Welsh law	feudal land tenure	equity
Twelve Tables,	Westminster,	feudalism	feud
Law of the	Statutes of	fief	law
<i>ecclesiastical law:</i>	<i>medieval European</i>	frankpledge	law code
canon law	<i>law—institutions</i>	freehold	movable and
Codex Juris	<i>and officers:</i>	heriot	immovable
Canonici	audiencia	homage and fealty	natural law
Corpus Juris	Augmentations,	liege	sumptuary law
Canonici	Court of	peine forte et dure	
decretal	Chambre des	right, petition of	
dispensation	Comptes	seisin	

Biographies

Austin, John	Cockburn, Sir	Hand, Learned	Pufendorf, Samuel,
Blackstone, Sir	Alexander James	Harlan, John	Freiherr von
William	Edmund	Marshall	Savigny, Friedrich
Brandeis, Louis	Coke, Sir Edward	Holmes, Oliver	Karl von
Brennan, William	Darrow, Clarence	Wendell, Jr.	Solon
J., Jr.	Draco	Jackson, Robert H.	Stone, Harlan
Brougham and	Erskine, Thomas	Johnson, William	Fiske
Vaux, Henry	Erskine, 1st	Mansfield, William	Story, Joseph
Peter Brougham,	Baron	Murray, 1st	Taney, Roger
1st Baron	Field, Stephen	Earl of	Brooke
Burger, Warren E.	J(ohnson)	Marshall, John	Waite, Morrison
Cardozo, Benjamin	Fortas, Abe	Matthews, Stanley	Remick
Nathan	Frankfurter, Felix	Miller, Samuel	Warren, Earl
	Grotius, Hugo	Freeman	White, Edward
	Hale, Sir Matthew		Douglass

INDEX: See entries under all of the terms above

Section 552. Branches of Public Law, Substantive and Procedural

- A. Laws defining and implementing the authority and power of the state
 1. Basic laws governing the organization and functions of the state: constitutional law
 2. Laws governing public administration: regulation of the organization, powers, duties, and functions of public administrative authorities
- B. Laws governing relations among sovereign states
 1. Sources and concepts of international law
 2. The attempt to create a supranational legislative and executive authority: the United Nations
 3. The attempt to create a supranational judicial authority
 4. The attempt to impose rules of warfare
 5. The attempt to limit and punish war crimes and crimes against peace and humanity
 6. The attempt to preserve the peaceful uses and exploration of outer space
- C. Laws governing acts viewed as crimes
 1. Principles and doctrines of criminal law: comparisons between common law and civil law systems
[see also 543.A.5.]
 2. Laws governing offenses committed by military forces and other persons subject to military discipline
- D. Laws promoting the public welfare
 1. Laws providing for general social security and welfare
 2. Laws promoting public health and safety
 3. Laws regulating the health, safety, and welfare of workers
- E. Laws governing taxation
[see also 534.B.2. and 3.]
- F. Laws of judicial procedure
 1. The organization and administration of the legal system: the courts and the judiciary
 2. Methods and procedures of the law
 - a. Criminal procedure
 - b. Civil procedure
[see 553.E.]
 - c. Administrative procedure
 3. Methods of adjudicating litigious disputes: the jury system, systems of arbitration

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with branches of public law, substantive and procedural

Constitutional Law	Public Administration
Criminal Law	Taxation
International Law	United Nations
Judicial and Arbitrational Systems	War, The Theory and Conduct of
Procedural Law	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>constitutional law:</i>	petit jury	kidnapping	<i>general procedural law:</i>
advisory opinion	prosecutor	lynching	adversary
attainder	public defender	mayhem	procedure
commerce clause	Queen's Bench, Court of	mens rea	appeal
constitution	rappporteur	mutiny	assize
due process	Supreme Court of Japan	obscenity	brief
equal protection	Supreme Court of the United States	pardon	certiorari
ex post facto law	Tax Court	perjury	circumstantial evidence
interstate commerce	United States Claims Court	poaching	competence and jurisdiction
judicial review	United States Court of Appeals	rape	complaint
police power	United States Court of Military Appeals	riot	demurrer
powers, delegation of	United States District Court	sedition	domicile
privacy, rights of	<i>criminal law:</i>	seduction	equity
standing to sue	accomplice	self-defense	evidence
states' rights	arson	smuggling	examination
<i>courts, court officials, and juries:</i>	assault and battery	solicitation	interlocutory decree
amicus curiae	bribery	theft	judgment
Appeal, Court of	child abuse	treason	law report
assigned counsel	confidence game	unlawful assembly	legal fiction
attorney general	conspiracy	usury	legal maxim
bailiff	contempt	vagrancy	limitations, statute of
Chancery, Court of	counterfeiting	<i>criminal procedure:</i>	mistrial
Common Pleas, Court of	crime, délit, and contravention	accused, rights of	nolle prosequi
coroner	criminal law	acquittal	pleading
Conseil d'État	delinquency	arraignment	privileged communication
Cour de Cassation	diminished responsibility	arrest	procedural law
court	disorderly conduct	bail	stare decisis
court-martial	disturbing the peace	clergy, benefit of	summary jurisdiction
Crown Court	embezzlement	commutation	venue
family court	entrapment	confession	<i>international law:</i>
Federal Constitutional Court	extortion	double jeopardy	aggression
grand jury	felony and misdemeanour	exclusionary rule	air law
High Court of Justice	forgery	extenuating circumstances	armistice
judge d'instruction	fraud	extradition	asylum
jury	hijacking	habeas corpus	Berne Convention
justice of the peace	homicide	impeachment	Calvo Doctrine
juvenile court	infamy	indictment	continuous voyage
lord chancellor	insanity	inquest	contraband
lord chief justice		interrogation	genocide
lord high steward		outlawry	Hague Convention
lord steward		preventive detention	high seas
magistrates' court		probation	international law
ministère public		recognizance	laws, conflict of
		search and seizure	mutiny
		self-incrimination	
		sentence	
		warrant	

neutrality	sequestration	war, law of	legislative
Nürnberg trials	space law	war crime	investigative
piracy	territorial waters	<i>other:</i>	powers
prisoner of war	Universal	administrative law	military law
prize court	Copyright		United Nations
safe-conduct	Convention		

Biographies

See Section 551

INDEX: See entries under all of the terms above

Section 553. Branches of Private Law, Substantive and Procedural

A. Law of property

1. Historical development of property rights
2. Methods of acquiring property rights
3. Types of property rights classified by types of ownership
4. Laws concerning tangible property: the distinctions between real and personal property
5. Laws protecting intangible or incorporeal property rights
 - a. Easements and servitudes: profits and mineral rights
 - b. Rights to the exclusive exploitation of literary, dramatic, musical, and other artistic works
 - c. Rights to the exclusive exploitation of inventions and other discoveries of useful processes and materials
 - d. Rights to the exclusive exploitation of symbols and other devices used to identify the origin or ownership of business products
6. Laws concerning the temporal division of property rights
 - a. Common law land ownership: freehold and leasehold estates
 - b. Civil law land ownership: dominium (absolute ownership) and usufruct (life estate)
7. Laws concerning trusts: ownership for the benefit of others
 - a. The elements of a trust: settlor, trust property, trustee, beneficiary, trust instrument
 - b. Types of trusts: express, implied, constructive, statutory, and public and private trusts
 - c. Trusts established for the benefit of families, social and philanthropic organizations, and business corporations
 - d. The status of the trust in civil law systems: a comparison of the trust and the fidei commissum
8. Law of mortgages
9. Laws concerning bankruptcy

B. Family law

1. Laws governing the institution of the family and the relationships among its members
[see also 513.A.2.]
 - a. Laws concerning the marriage contract: civil effects of marriage, the legal status of married women
 - b. Laws concerning children: legitimacy, adoption, and guardianship; parental obligations and rights
 - c. Laws concerning the termination of marriage: divorce and other forms of marital dissolution
2. Laws concerning the devolution of property by means of inheritance

C. Law of torts

1. The doctrine of strict liability as compared with negligence liability: recent changes in tort liability burden
2. Intentional personal injuries: battery and assault, false imprisonment, mental anguish

3. Intentional injuries to property: trespass to land and chattels, nuisance, unlawful appropriation and conversion of property
 4. Injuries resulting from negligent acts
 - a. Injuries resulting from failure to comply with required standards of care: the proximate cause doctrine, effects of contributory negligence and third-party intervention
 - b. The employer's liability and the master–servant relationship
 - c. The manufacturer's liability to the consumer
 5. Injuries to personality and personal relationships: physical, mental, and economic injuries
 - a. Defamation: libel and slander, other invasions of privacy and interference with familial relationships
 - b. Interference with economic relationships: deceptive practices, unfair competition, infringement
- D. Laws governing economic transactions
1. Law of contracts
 2. Law of commercial transactions
 - a. Principal elements of commercial law: commercial transactions as contracts
 - i. Sales of goods and requirements for delivery
 - ii. Transfer of negotiable instruments; *e.g.*, promissory notes, checks, drafts or bills of exchange
 - iii. Issuance of documents of title; *e.g.*, bills of lading, warehouse receipts
 - iv. Issuance of letters of credit
 - v. The use of security interests (liens and pledges) as collateral for loans of money
 - b. Laws governing the relationship between agent and principal in the transaction of commercial and other legal affairs
 3. Law of business associations
 - a. Principal forms of business associations
 - i. Partnerships
 - ii. Corporate companies or corporations
 - iii. Cooperative and mutual organizations
 - iv. State and municipal corporations, quasi-public enterprises and utilities
[see also 533.G.4. and 534.B.6.b.]
 - b. Laws governing the management and control of business entities
 - c. The structure of corporate finance
 - i. Common and preferred shares of stock: rights and interests of owners of equity capital
 - ii. Borrowed capital: rights acquired by holders of bonds and debentures
 - iii. Reinvestment of company earnings
 - d. Trends in laws governing mergers and consolidations: employee participation
[see also 533.H.2.c.]
 - e. Laws governing the liquidation of insolvent business and nonbusiness estates: the law of bankruptcy
 4. Labour law
 5. Laws governing commercial transportation
 - a. Laws regulating the carriage of goods
 - b. Maritime law
 - c. Air law
- E. Civil procedural law
1. Elements of civil procedure
 - a. National or territorial jurisdiction and venue of courts: the competence of a court to handle a case

- b. Jurisdiction or venue in private international law: the source and nature of the conflict of laws, foreign judgments and choice of law
 - c. Definitions and limitations of parties to a suit: class actions and amicus curiae
 - d. Provisional remedies sought prior to trial; *e.g.*, writs of attachment, injunctions, and other restraining orders
 - e. The commencement of civil action: summons, pleadings, appearance, pretrial motions, discovery procedures, and pretrial conference
2. The conduct of civil trials: the law of evidence
 3. The rendering of judgment in civil cases: assessment of damages, *res judicata*, collateral estoppel
 4. Post-trial appeals and other methods of review

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with branches of private law, substantive and procedural

Business Law	Property Law
Family Law	Torts
Inheritance and Succession	Transportation Law
Procedural Law	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>business law:</i>	attorney,	concubinage	preemption
affrayment	power of	consensual union	prescription
agency	damages	divorce	property
air law	declaratory	guardian	real and personal
antitrust law	judgment	illegitimacy	property
average	escrow	marriage law	remainder
bankruptcy	foreclosure	minor	restrictive covenant
business law	garnishment	morganatic	reversion
caveat emptor	injunction	marriage	riparian right
cessio bonorum	joinder and	separation	servitude
composition	impleader	<i>property law:</i>	treasure trove
consideration	liability	abandonment	trust
contract	lien	adverse possession	use
copyright	mandamus, writ of	ancient lights	usufruct
debtor and creditor	replevin	bailment	<i>tort law:</i>
guaranty and	settlement	beneficiary	assault and battery
suretyship	writ	condominium	contributory
hypothec	<i>estate law:</i>	deformement	negligence
insolvency	executor	domain	conversion
labour law	gift	easement	damages
lading, bill of	heir	ejectment	defamation
liquidation	inheritance	eminent domain	delict
maritime law	intestate succession	emphyteusis and	fraud
patent	legacy	superficies	manufacturer's
performance	probate	entail	liability
receivership	will	escheat	misrepresentation
right-to-work law	<i>family law:</i>	landlord and	negligence
salvage	adoption	tenant	nuisance
trademark	alimony	mortgage	tort
<i>civil procedure:</i>	annulment	mortmain	trespass
abatement	common-law	movable and	trover
arbitration	marriage	immovable	
attachment	community	ownership	
	property	possession	

Biographies

See Section 551

INDEX: See entries under all of the terms above

Division VI. Education

[For Part Five headnote see page 173.]

The outlines in the two sections of Division VI treat the subjects of education and the world's educational systems.

Section 561. The Aims and Organization of Education 215

562. Education Around the World 216

Section 561. The Aims and Organization of Education**A. Philosophies of education**

[see also 435.A.]

B. The learning process and the teaching art

1. Processes of learning and thinking: experimental findings and theories

[see 435]

2. Pedagogy: the art and science of teaching

a. Components of the teaching situation

b. General theories concerning the role of the teacher in the learning process

c. The organization of instruction: contemporary practices and techniques

d. Instructional media: speaking-listening facilities, visual and observational aids, computer-based instruction

C. The organization of education

1. Phases or levels of education

a. Preschool education

b. Elementary and secondary education

c. Higher education: colleges, universities, and professional schools

d. Special education: education of exceptional children

e. Education of the adult population

f. Vocational training: apprenticeship and employee training

2. The preparation and performance of teachers

a. The education of teachers

b. The teaching profession

3. The economics of education

4. Social aspects of education

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the aims and organization of education

Philosophies of the Branches of Knowledge

Teaching

MICROPAEDIA: Selected entries of reference information

General subjects

adult education:

adult education

chautauqua

movement

folk high school

lyceum movement

elementary and

secondary education:

comprehensive

school

elementary

education

eleven-plus

graded school

grammar school

Grundschule

Gymnasium

Hauptschule

high school

lycée	madrasah	computer-assisted	retraining program
preparatory school	military, naval, and	instruction	vocational
public school	air academies	correspondence	education
realschule	nation	education	<i>other:</i>
secondary	normal school	Dalton Plan	academic freedom
education	Rhodes scholarship	Initial Teaching	educational
technical education	university	Alphabet	psychology
Vorschule	university extension	monitorial system	physical education
<i>higher education:</i>	<i>preschool education:</i>	programmed	special education
college	children's house	learning	student aid
degree	day nursery	progressive	summer camp
fraternity and	kindergarten	education	
sorority	maternal school	Quincy Plan	
Fulbright	preschool education	teaching	
scholarship	<i>teaching methods and</i>	teaching machine	
higher education	<i>theories:</i>	<i>vocational education:</i>	
junior college	audiovisual	apprenticeship	
land-grant college	education	employee training	

Biographies

See Section 562

INDEX: See entries under all of the terms above

Section 562. Education Around the World**A. Systems of education**

1. The formation of educational policy
2. Administrative functions and procedures
3. Types of educational systems and their characteristics
 - a. Centralized systems: systems in which control is exercised through a national administrative agency
 - b. Decentralized systems: systems in which control is exercised at the regional or local level
 - c. Joint national and local systems
 - d. Systems controlled by political parties
 - e. Sectarian systems: national and regional sectarian systems, sectarian education as an alternative system to public education

B. History of education: philosophies, practices, and institutions

1. Education in ancient cultures
 - a. Ancient Indian education
 - b. Ancient Chinese education
 - c. Ancient Hebrew education
 - d. Ancient Greek education
 - e. Ancient Roman education
2. Education in the Persian, Byzantine, early Russian, and Islāmic civilizations
 - a. Ancient Persian education: influences of Zoroastrian and Sāsānid cultures
 - b. Byzantine education: influences of Greek Christian and humanistic culture; development of primary, secondary, and higher educational institutions
 - c. Kiev and Muscovy: Russian education to the period of the early Romanovs
 - d. Islāmic education
3. Education in the European Middle Ages

- a. Christian education to the 8th century: early schools; development of monastic schools in England, Ireland, Italy, and Spain
- b. The cultural revival under Charlemagne and his successors
- c. The 12th-century renaissance: reform of monastic schools and the rise of secular urban schools, development of universities and grammar schools, courtly education
4. Education in Asian civilizations from c. 700 to the eve of Western influence
 - a. Indian education from c. 700 to 1707
 - b. Chinese education from 618 to 1911
 - c. Japanese education from ancient times to 1867
5. European education during the Renaissance and Reformation
 - a. Development of Renaissance education: Arabic and secular influences on humanism
 - b. The humanistic tradition in Italy
 - c. The humanistic tradition in northern and western Europe
 - d. Education during the Reformation and Counter-Reformation
6. European education in the 17th and 18th centuries
 - a. The social and historical setting
 - b. Educational theories and practices
 - c. European influences in New World educational development
7. Western education in the 19th century
 - a. The social and historical setting: nationalism, industrialism, urbanization, political revolution and reform
 - b. The early reform movements: the new pedagogy and psychology
 - c. Development of national systems of education
 - d. Spread of Western educational practices to Asian countries
8. Education in the 20th century
 - a. Political, social, economic, and intellectual trends
 - b. Traditional and experimental educational movements in the West
 - c. The modernization of education in Asia and Africa
 - d. Education in colonies and newly emerging nations in Africa, Asia, and Latin America

C. International educational activities

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with education around the world

Education, History of
Teaching

MICROPAEDIA: Selected entries of reference information

General subjects

<i>educational systems:</i>	<i>history of education:</i>	juku	<i>other:</i>
coeducation	American	land-grant college	United Nations
correspondence	Missionary	lyceum movement	Educational,
education	Association	mechanics'	Scientific and
educational system	cathedral school	institute	Cultural
liberal arts	charity school	normal school	Organization
minority education	chautauqua	Quincy Plan	
monitorial system	movement		
parochial education	Dalton Plan		
progressive	hornbook		
education			

Biographies

Adler, Mortimer J.
Alcuin
Ascham, Roger
Bagley, William
Chandler
Basedow, Johann
Bernhard
Comenius, John
Amos

Cygnaeus, Uno
Dewey, John
Eaton, John
Froebel, Friedrich
Griswold, Alfred
Whitney
Herbart, Johann
Friedrich
Hopkins, Johns

Hutchins,
Robert M.
Lancaster, Joseph
Mann, Horace
Melanchthon,
Philipp
Montessori, Maria
Pestalozzi, Johann
Heinrich

Richards, Ellen
Swallow
Sadler, Sir Michael
Ernest
Stowe, Calvin E.
Vittorino da Feltr
Vives, Juan Luis

INDEX: See entries under all of the terms above

Introduction to Part Six:

The World of Art

by Mark Van Doren

Let us imagine if we can a world entirely without art: without story, image, edifice, or significant sound. If we can, for perhaps it is impossible. Such a world might well be invisible, inaudible, ineffable, and intangible. Even if we could see it, hear it, feel it, we would not know we did, at least as men know things. Without the earliest of all arts, language, we would scarcely know of what we were deprived: the privilege, namely, of expressing our satisfaction or dissatisfaction with what had taken place before our eyes. Without the arts of speaking, listening, thinking, counting, and measuring—without the intellectual arts—we could not assess or repossess the experience we had undergone. Without the useful arts we could make nothing, build nothing worthy to contain and shelter our bodies, to be a home wherein our thought might rest. And then without the fine arts—the arts that serve only themselves, that are ends, not means, that justify themselves when they give us nothing but pleasure—we would be shallow and poor of mind, with little or no sense of the world's depth and colour, or of ourselves as creatures for whom the present moment is also past and future. We call these arts fine not because they are better than the others but because they are different, as beauty is different from use—beauty that is its own excuse for being.

None of them is more intimately ours than story. The art of literature is the art of story; there are songs and there are essays long and short, there are histories, there are biographies, there are treatises, sermons, and discussions of everything under the sun, but story is our first and last entertainment—when we are children and when we are too old to care any more what truth is unless it comes in the past tense, with persons reflecting in their lives the peculiar radiance that attends the accidents of time and character. Stories may vary in length from the anecdote to the epic, from the fairy tale to the novel, the imaginary biography, the romance. And they may reach us in many forms: in the theatre, for instance, where they may employ flesh-and-blood actors to convey their meaning or where they may be only flickers of light and shade upon a screen that has no depth save what we give it in our imaginations; where, in other words, they call themselves plays or motion pictures or where, if music also sounds and dancers whirl and pose, they call themselves ballets.

Nature does not tell stories; only artists do, and in the process they work transformations that measure the distance between matter and mind. In nature, so far as we can know it, there are no beginnings and no ends in the sense familiar to both writers and readers of fiction and drama, or for that matter history, which likewise imposes form upon a welter of events. No matter how simple a tale is, or how complex, how few the words in it or how many, it is a human construction that no animal or plant, and of course no stone, would find in the least degree interesting;

whereas human beings hold their breaths until an end is reached. Ends are intelligible as the raw materials of life seem not to be; if life itself does not become intelligible through story, it becomes in some mysterious way both beautiful and clear, and for the time being that suffices.

Each of the fine arts flourishes both in large and in little forms. Just as story has a choice between the brevity of folk tales and the elaboration of epics and romances, so statements about life may be as compendious as a proverb—the wisdom of many and the wit of one—or as bulky as the longest book in numberless volumes. So music—the sound of other worlds—reaches our ears either as simple song or as opera and symphony and other complex forms. There are those who say that the song, like the anonymous fable or tale, is more lasting and important than compositions of great complexity can ever be; and they also say that the lyric poem, at least when it is perfect, as in truth it seldom is, has more to tell us, or at least deeper ways of touching us, than the most tremendous tragedy in five acts or the subtlest comic novel in a thousand pages. When a memorable melody attaches itself to a lyric or a ballad, something indeed does come into existence and hang there as if for perpetuity. Music is the most ineffable of all the arts. It has its own language and it listens to itself; we do not so much hear it as overhear it, nor can we speak very sensibly about what we have overheard. Successful music, powerful music, has an effect upon us that many have tried in vain to describe; it takes us out of ourselves, they say, and perhaps they need to say no more than that. Even then they may be speaking only of the music that is native to them; Eastern music sounds like mere noise to untrained Western ears, and Western music has a monotony, say the Chinese, that Europeans of course deny is there. The same thing is true, though in lesser measure, of all the arts. East and West have different eyes as well as ears, and different thoughts.

The arts of drawing and painting, of etching and lithography, of engraving and decorative design, have covered many surfaces—canvas, plaster, parchment, paper—which no longer show where the artist's hand once worked; for the materials of these arts are perishable, as the marble of sculptors has been, as the bronze, as the wood. Much remains, but more does not. Even the cave paintings of prehistoric France and Africa, hailed by modern man when he discovered them as miracles of survival, may not survive the visits that living people rushed to pay them. Ancient Greek music has failed to survive for a further reason: we do not know how it was written or how it sounded; we are told that it had almost magical powers over those who heard it in its time, but that time is gone, along with the time when paintings adorned the walls and columns of Greek temples and houses. Painting has been for centuries the queen of the arts in Europe. Belgium,

The Netherlands, France, Germany, Spain, Italy, and England—each of them in its turn, and sometimes in more than one turn, has enriched the world with shapes and colours that only genius could have foretold, only passion could have brought into being. And that is but half the story; in China long before, in India, in Persia, in Japan, in Russia, the brushes of painters, sometimes tipped with gold, beautified and glorified the palaces of emperors, the tombs of princes, and the dwelling places of great gods. In Egypt for millennia the order of the world was registered in stone and gold, and the written word itself was pictures.

Sculpture, that once was solid and now is full of spaces—or may be—left open by the ingenuity of workers in metal, has changed as architecture has changed. Both arts now cultivate openness: buildings are closed, but the exterior is glass, so that space plays games with itself inside, and the effect is of a lightness that winds might blow away, except of course that the buildings look lean and strong enough to remain just where they are. It has always been true that architects desired the effect of lightness, as all art does, heaviness being a quality that no mind admires; any building weighs tons, but we are not supposed to think of that; rather indeed we are expected to imagine that brick and stone for once have learned to lie lightly on the earth, which they do not seem to press at all. So with Classical sculpture, from Greek days on; the charm of it was its poise, its grace, its management of idea in marble. So too with Classical architecture; the Parthenon is both massive and weightless, like a ship that might sail yet does not. And always in China and Japan there have been those curled and tapered roofs that still look as if at this very instant in time they are taking wing. The open revolution, then, was only a restatement of what had long been understood though some of its secrets were forgotten.

Abstraction in all the arts, for there is no art from which it is absent, is again a restatement of what has always been true, however feebly it was recognized by schools of artists who had lost contact with reality. Great painting, great music, great poetry, great architecture—great landscape architecture too—have never been strangers to abstraction, just as they have never been slaves to an incomplete understanding of what is meant when we say that art is imitation. It *is* imitation, but of what? Of essences, not accidents; of the truth that is hard to see; of beauty that is basic; of shapes that will not change; of colours that will not fade. And if, say, the great painters of the past, comprehending this, still “copied nature,” they did not do so inanely. They did so, on the contrary, with huge effort aimed at the verities that underlie verisimilitude, so that in one sense they were not copying at all; they were extracting essences, they were reducing appearances to the ideas that informed them; they were, in a word, abstracting truth from vessels that contained it. But they did not say they were doing this. They said they were copying nature. And when later on they were taken at their word by painters with inadequate aspiration, the result was woeful insipidity, was mediocrity and flatness. The heroic remedy was warfare against representation as such, was a shortcut to abstraction that could have its weakness too, was a loss, in all but the great revolutionaries, of the contact with Earth

which no art ever can be without. Abstract painting at its best—and the worst does not matter—imitates nature at nature’s best; is “like” nature after all, for nature is brilliant and strong, and abstract painting convinces us of this even though it dispenses with the particulars with which we used to be fascinated and of which we were quite properly fond.

A world entirely without art would be worse than invisible, inaudible, ineffable, and intangible. It would be a world without temporal dimension, it would be a world that human minds could not remember. Human memory is unique in its capacity not only to recall but also to utilize the past, and to apply it; and better still, to re-create it so that it becomes a part of the present moment, which is more like eternity than anything else we shall ever experience. Human memory is nothing less than the origin of human art.

“The Greeks fabled not unwisely,” said Sir Thomas Browne, “in making Memory the mother of the Muses.” The memory of man is indeed a wonderful thing, and his richest possession. Not only is it the source of all our arts, it is their record too, stored in the mind of the beholder, the listener. Plato even asked us to conceive “in the mind of man a block of wax, the gift of Memory, and when we wish to remember anything which we have seen, or heard, or thought in our own minds, we hold the wax to the perceptions and thoughts, and in that material receive the impression of them as from the seal of a ring; and we remember and know what is imprinted as long as the image lasts.” An artist whose poems or pictures or musical ideas have great power is certainly, we feel, the possessor of a memory that is always at his command, bringing to him at any moment whatever detail he needs, and reminding him too of the knowledge he has, and never forgets, of the way the world is put together, so that he does not misrepresent things as they are. The human race itself can be said to be such an artist, for it has its myths which it keeps alive, its stories that are “so true,” someone has said, “that they couldn’t have happened.” There is such a thing as folk memory, the mother perhaps of all our thoughts and feelings, and the guardian of such wisdom as we have.

A story that cannot be remembered, a song that fades out of the mind, a hero whose name escapes us, a sentence we thought we would never forget but somehow do—such works of art must be defective at the core. But there are others that we could not forget if we tried, and it is those we live with in the company of friends who remember them too. Perhaps the final justification of art is the two-fold pleasure it gives: the pleasure of remembering great and beautiful things that we cannot lose, and the pleasure of sharing them with others who possess them in the same fashion.

There is a limited number of such things, of these greatest of human works of art; by definition there can be no superfluous masterpieces. The ones we have are numerous after all, and no single person can claim to have done justice to every one of them, or can claim to know what further ones are still unborn, Mnemosyne, goddess of Memory and Mother of the Muses, will have the deciding vote as to which ones, now or in the future, will survive the ravages of time.

Part Six. Art

The outlines in the twelve sections of Part Six are concerned with mankind's creation, experience, and evaluation of works made primarily for aesthetic enjoyment and contemplation. The arts of making things primarily for practical use are treated in Part Seven, on technology.

Division I. Art in General 221

II. The Particular Arts 225

Division I. Art in General

The outlines in the three sections of Division I treat the theory and classification of the arts; the experience and criticism of works of art; and the nonaesthetic contexts of art.

Section 611. Theory and Classification of the Arts 221

612. Experience and Criticism of Works of Art; the Nonaesthetic Contexts of Art 222

613. Characteristics of the Arts in Particular Cultures 224

Section 611. Theory and Classification of the Arts

A. The philosophy of art

1. Diverse conceptions of the scope of art
2. Diverse theories concerning the nature, functions, and effects of art: mimetic theories, expressive theories, formalist theories, pragmatic theories
3. The making of works of art: the creative process

B. Classification of the arts

1. Major distinctions among the kinds of art
 - a. By reference to the intention of the maker or the recipient of the work of art: useful art, fine art, arts that are both useful and fine
 - b. By reference to the manipulation of physical matter: the production of artistic works that are physical objects
 - c. By reference to performers as interpreters or creators of works of art
 - d. By reference to the use of notational devices; *e.g.*, literature, music, dance
2. Other distinctions among the kinds of art; *e.g.*, space and time arts, primary and auxiliary arts
3. The characterization of works of art by reference to the cultural or social circumstances of their production or the extent and character of their audience: the primitive, folk, and popular arts
4. Style in the arts
 - a. The nature of style
 - b. The varieties of style; *e.g.*, personal, school, ethnic, regional, and period styles
 - c. The dynamics of style: the historical development, diffusion, change, and duration of style in the arts

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major article dealing with the theory and classification of the arts
Philosophies of the Branches of Knowledge

MICROPAEDIA: Selected entries of reference information

art	mimesis
fine art	popular art
folk art	

INDEX: See entries under all of the terms above

Section 612. Experience and Criticism of Works of Art; the Nonaesthetic Context of Art

- A. The aesthetic experience: the apprehension, interpretation, and appreciation of works of art
 1. Influences affecting the apprehension of works of art: individual temperament, social and cultural conditioning, acquired attitudes and values
 2. The interpretation of works of art
 - a. Meaning in art
 - b. Symbol and myth in the arts
[see Division II, below]
 3. The appreciation of works of art
 4. Special problems of appreciation and apprehension
 - a. In the sphere of literature
[see 621]
 - b. In the sphere of the theatrical arts
[see 622, 623, and 625]
 - c. In the sphere of music
[see 624]
 - d. In the sphere of the visual arts
[see 626, 627, 628, and 629]
- B. The criticism of works of art
 1. Diverse criteria of evaluation: aesthetic criteria; criteria related to the union of form and content; criteria related to meaning; criteria related to social, moral, or religious significance; criteria related to technique; criteria related to the intention of the artist
 2. The practice of criticism
 - a. The functions of the critic in relation to the artist, to his work, and to its public reception
 - b. Critical methods: analytical, interpretative, and descriptive types of criticism
 - c. Critical styles: journalistic criticism, scholarly criticism, annotative and referential criticism
 - d. Critical approaches to the arts
 - e. Factors affecting the excellence of criticism
- C. Scholarship in the arts
 1. Resources and methods of scholarship in the field of the arts
 2. The relation of scholarship in the arts to other humanistic disciplines; *e.g.*, to linguistic studies, to history, to archaeology
- D. The interaction of the arts with social, economic, and cultural institutions
 1. Social uses of art
[see 521.D.5.]

2. Social control of art: censorship and related forms of regulation
 3. The arts and religion
[see 811.G.1.]
 4. Technology, science, and the arts
[see 711.B.4.]
 5. The arts in education: aesthetic education
- E. The economics of art
1. Factors affecting the economic value of a work of art
 2. Systems of financing artistic activities
 3. The art market
 4. Remuneration of artists and protection of their rights
 5. Fraudulence in the arts: forgery, piracy, plagiarism
- F. The training and work of the artist
1. The preparation of the artist: methods of training
 2. Art as a vocation: conditions of work in the arts
 3. Professionalism and amateurism in the arts
- G. The preservation and dissemination of works of art
1. The role of institutions: libraries and archives; museums and galleries; producing associations—the preservation of works of art by performance
 2. The role of writing and notation
 3. The role of industry and commerce
 4. The role of mechanical and electronic media
 5. The role of oral tradition
 6. The role of imitative tradition
 7. The role of fairs, festivals, exhibitions, expositions, and related phenomena

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the experience and criticism of works of art; the nonaesthetic contexts of art

Arts, Practice and Profession of the
Libraries
Museums

MICROPAEDIA: Selected entries of reference information

General subjects

Actors Studio, The	forgery	Stanislavsky	WPA Federal Art
antique	library	method	Project
Armory Show	little magazine	Treasury Relief Art	
art collection	maniera	Project	
art conservation	Mbari Mbayo Club	Treasury Section	
art criticism	museum	of Painting and	
art history	PEN, International	Sculpture	
Beaux-Arts,	pinacotheca	Universal	
École des	Royal Academy of	Copyright	
Berne Convention	Dramatic Art	Convention	
censorship	Salon	World Intellectual	
copyright	Salon des	Property	
Degenerate Art	Indépendants	Organization	

Biographies

Baumgarten, Alexander Gottlieb	Fenollosa, Ernest F. Fry, Roger	Ruskin, John Santayana, George Thou, Jacques- Auguste de	Vasari, Giorgio Winckelmann, Johann
Cotton, Sir Robert Bruce, 1st Baronet	Read, Sir Herbert Rossetti, William		

INDEX: See entries under all of the terms above

Section 613. Characteristics of the Arts in Particular Cultures

- A. Arts of the Stone Age peoples
- B. Arts of the Western tradition
 - 1. In antiquity: the arts of ancient Egypt and the ancient Middle East, ancient Greek and Hellenistic arts, ancient Roman and Early Christian arts
 - 2. Arts of the Middle Ages
 - 3. Arts from the Renaissance to the present in Europe and America
- C. Arts of Asian peoples
 - 1. In East Asia: China, Japan, Korea
 - 2. In Central Asia: Turkey, Afghanistan, Turkistan, Mongolia, and Siberia; Tibet and other Himalayan countries; the arts of the nomadic peoples
 - 3. In South Asia: India, Sri Lanka, Kashmir, Pakistan, Bangladesh
 - 4. In Southeast Asia: Burma, Cambodia, Indonesia, Malaysia, Thailand, Vietnam, the Philippines
- D. Arts of the Middle East and of the Islāmic peoples
 - 1. Arts of the Jewish peoples
 - 2. Arts of North Africa and of the Arab world
- E. Arts of the African peoples
 - 1. Arts of Sudanic cultures
 - 2. Arts of Central African cultures
 - 3. Arts of East African cultures
 - 4. Arts of Southern African cultures
 - 5. Arts of West African cultures
- F. Arts of the Oceanian peoples
 - 1. Arts of Melanesia
 - 2. Arts of Micronesia
 - 3. Arts of Polynesia
 - 4. Arts of the Australian Aboriginal peoples
- G. Arts of the American Indian peoples
 - 1. Arts of the Eskimo and North American Indian peoples
 - 2. Arts of Meso-American peoples
 - 3. Arts of South American peoples
- H. Primitive, folk, and popular arts
[see also 611.B.3.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the characteristics of the arts in particular cultures; historical development of the arts

African Arts	Egyptian Arts	Middle Eastern	Prehistoric Peoples
American Peoples, Arts of Native	and Architecture, Ancient	Arts and Architecture, Ancient	and Cultures
Central Asian Arts	Folk Arts	Oceanic Arts	South Asian Arts
East Asian Arts	Islâmic Arts		Southeast Asian Arts

MICROPAEDIA: Selected entries of reference information

<i>arts in particular cultures:</i>	Anglo-Saxon art	Expressionism	Novembergruppe
African arts	Art Deco	formalism	Op art
Central Asian arts	Art Nouveau	Futurism	Ottonian art
Chinese art	Baroque period	Georgian style	Pop art
East Asian arts	Biedermeier style	Gothic art	Queen Anne style
Egyptian art	Bohemian school	Henry IV style	realism
Islâmic arts	Byzantine art	Impressionism	Régence style
Korean art	Carolingian art	Jacobean age	Regency style
Oceanic arts	Classicism and Neoclassicism	Louis XIII style	Renaissance
Paleolithic Period	Constructivism	Louis XIV style	Rococo style
South Asian arts	Coptic art	Louis XV style	Romanesque art
Southeast Asian arts	Cubism	Louis XVI style	Romanticism
<i>historical periods, styles, schools, and movements:</i>	Dada	Mannerism	Stijl, De
Aestheticism	Early Christian art	minimalism	Stuart style
	Early	modern art	Surrealism
	Netherlandish art	Mozarabic art	Symbolist movement
	Empire style	naïve art	Visigothic art
		naturalism	

INDEX: See entries under all of the terms above

Division II. The Particular Arts

[For Part Six headnote see page 221.]

Division I deals generally with the theory and classification of the arts, the experience and criticism of works of art, and the interaction of the arts with social, cultural, and economic institutions.

The outlines in the nine sections of Division II treat the particular arts: literature; theatre; motion pictures; music; dance; architecture, garden and landscape design, and urban design; sculpture; drawing, painting, printmaking, and photography; and the arts of decoration and functional design.

- Section 621. Literature 225
 622. Theatre 234
 623. Motion Pictures 236
 624. Music 238
 625. Dance 244
 626. Architecture, Garden and Landscape Design, and Urban Design 246
 627. Sculpture 249
 628. Drawing, Painting, Printmaking, and Photography 250
 629. Arts of Decoration and Functional Design 254

Section 621. Literature**A. The art of literature**

1. The nature and scope of literature: the distinction between literature and other forms of writing
2. Literary composition
3. The contents of literature: its subject matter

4. Literature and its audience
 5. The integration of literature with other arts
 6. Literary genres: diverse systems of classifying literary works
 7. Writings on literature: theoretical treatises, scholarly research and writing, critical writing
- B. Techniques of literature
1. Rhetoric: the art of discourse
 - a. Elements of rhetoric: figures of speech; *e.g.*, metaphor, simile, personification, hyperbole, allegory, parallelism
 - b. The relation of rhetoric to grammar and syntax, to literary diction and style, and to prosody
 2. Prosody: the manipulation of the elements of language that contribute to acoustic and rhythmic effects in literature
 - a. Elements of prosody
 - i. Rhythmic elements; *e.g.*, accent, beat, cadence, the foot, the stanza, metre
 - ii. Acoustic elements; *e.g.*, rhyme, assonance, alliteration
 - b. Prosodic style: the uses of prosody in verse, prose, drama, and oratory
- C. Kinds of literary composition
1. Poetry: distinctions between verse and prose
 2. Narrative imaginative literature
 - a. Epic; *e.g.*, the “literary” epic, the beast epic, the mock epic, the romantic epic
 - b. Saga: the king’s sagas, legendary sagas, the sagas of Icelanders, and related forms
 - c. Romance: the romance of love, chivalry, and adventure; *e.g.*, Arthurian romance, the pastoral romance, the Gothic romance, the historical romance
 - d. The novel and the tale
 - e. The short story and its antecedents
 - f. Fable, parable, allegory, and related forms
 - g. Ballad, lay, idyll
 3. Dramatic or theatrical literature
 - a. Tragedy
 - b. Comedy
 - c. Tragicomedy
 - d. Farce and related forms
 - e. Melodrama
 - f. Religious drama and ritual
 - g. Radio, motion-picture, and television scripts
 4. Lyric literature
 - a. Music-based lyrics; *e.g.*, ballad, hymn, madrigal
 - b. Language-based lyrics; *e.g.*, sonnet, ode, elegy, pastoral
 5. Satiric literature: satire, parody, lampoon
 6. Nonfictional prose literature
 - a. The essay
 - b. History as literature
 - c. Criticism as literature
 - d. Doctrinal and religious literature
 - e. Philosophical literature
 - f. Political literature
 - g. Polemical literature

- h. Scientific literature
 - i. Reportage: journalism
 - j. Aphorism, epigram, adage, maxim, and related short forms
 - k. The dialogue: philosophical and literary dialogues
 - l. Travel literature
 - m. Epistolary literature: the letter as literature
 - n. The oration, the speech, and related forms
 - o. Biographical and autobiographical literature; *e.g.*, character sketch, critical biography, popular biography, interpretive biography, letter, diary, journal, memoir
7. Children's literature
8. Primitive, folk, and popular literature
[see also 613]
- D. The history of literature
- 1. Literature of Western peoples
 - 2. Literatures of non-Western peoples
[see also 613]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and biographies dealing with literature

General subjects

African Arts	French Literature	Latin Literature	South Asian Arts
American Literature	German Literature	Literature, The Art of	Southeast Asian Arts
American Peoples, Arts of Native	Greek Literature	Literature, The History of	Spanish Literature
Australia and New Zealand, Literatures of	Hebrew Literature	Western	Yiddish Literature
Belgian Literature	Homeric Epics, The	Oceanic Arts	
Canadian Literature	Hungarian Literature	Polish Literature	
Celtic Literature	Islāmic Arts	Portuguese Literature	
Central Asian Arts	Italian Literature	Rhetoric	
Chinese Literature	Japanese Literature	Russian Literature	
Dutch Literature	Korean Literature	Scandinavian Literature	
English Literature	Latin-American Literature		

Biographies

Cervantes	Dostoyevsky	Johnson, Samuel	Shakespeare
Chaucer	Goethe	Milton	Tolstoy
Dante	Greek Dramatists, The Classical	Molière	Virgil
Dickens		Montaigne	Voltaire

MICROPAEDIA: Selected entries of reference information

General subjects

<i>dramatic literature</i> :	comedy	humours,	revenge tragedy
Absurd, Theatre of the	dialogue	comedy of	Senecan tragedy
anagnorisis	domestic tragedy	intrigue,	sentimental
catharsis	dramatic literature	comedy of	comedy
chronicle play	fabula Atellana	manners,	slapstick
climax	fabula palliata	comedy of	sotie
cloak and sword	farce	melodrama	tragedy
drama	hamartia	New Comedy	tragicomedy
comédie	Hocktide play	Old Comedy	unities
larmoyante	hubris	prologue and epilogue	Wakefield plays

- well-made play
York plays
elements of prosody:
alliteration
anapest
assonance
caesura
cynghanedd
dactyl
euphony and
cacophony
foot
hexameter
iamb
metre
pentameter
prosody
refrain
rhyme
rhythm
spondee
sprung rhythm
stanza
trochee
elements of rhetoric:
conceit
hyperbole
metaphor
metonymy
parallelism
personification
rhetoric
simile
epics:
beast epic
bylina
chanson de geste
cycle
epic
epyllion
Heike monogatari
Heldenlieder
heroic poetry
mock-epic
skaldic poetry
fable, parable, allegory, and related forms:
allegory
bestiary
dream allegory
fable
parable
proverb
riddle
folk literature and folklore:
ballad revival
dilemma tale
- fairy tale
folklore
gaucho literature
good-night
legend
praise song
Raven cycle
romancero
tall tale
trickster tale
literary criticism:
affective fallacy
Cambridge critics
Chicago critic
Formalism
Freudian criticism
literary criticism
New Criticism
New Humanism
organic unity
sublime
literary devices:
anachronism
anaphora
consciousness,
stream of
flashback
in medias res
interior monologue
irony
malapropism
palindrome
paradox
pathetic fallacy
plot
literary groups and schools:
Acmeist
arcádia
Arzamas society
Black Mountain
poet
Bloomsbury group
Cavalier poet
cénacle
Confederation
group
crepuscularismo
Decadent
fleshly school of
poetry
Göttinger Hain
graveyard school
Gruppe 47
Hartford wit
Heidelberg
Romantics
Imagist
- Jena Romanticism
Kailyard school
Knickerbocker
school
Lost Generation
makar
Metaphysical poet
Montreal group
neōteros
1927,
Generation of
'98, Generation of
Northeastern
school
Parnassian
philosophe
rhétoriqueur
Sicilian school
University wit
lyric poetry:
alcaic
alexandrine
alliterative verse
alphabet rhyme
blank verse
bouts-rimés
Breton lay
broadside ballad
clerihew
couplet
cywydd
dithyramb
doggerel
dramatic
monologue
eclogue
elegy
epigram
epinicion
epithalamium
fabliau
Fescennine verse
flyting
free verse
fu
ghazal
gnomic poetry
haiku
Horatian ode
idyll
jōruri
Kleptic ballad
lauda
light verse
limerick
lyric
macaronic
muwashshaḥ
nonsense verse
- nursery rhyme
ode
ottava rima
pattern poetry
Pindaric ode
poetry
praise song
qasida
rhyme royal
sestina
sonnet
Spenserian stanza
terza rima
triolet
vers de société
vers libre
villanelle
waka
yüeh-fu
movements and periods:
American
Renaissance
Arabic literary
renaissance
Augustan Age
Beat movement
Ciceronian period
Creacionismo
Decadentism
Elizabethan
literature
Gaelic revival
Gilded Age
Golden Age
Harlem
Renaissance
Hermeticism
Imaginism
Irish literary
renaissance
Midwestern
Regionalism
moderne
gennembrud, det
Modernismo
Negritude
Restoration
literature
scapigliatura
Socialist Realism
Sturm und Drang
Transcendentalism
Ultraism
Unanimism
verismo
Young Germany
Young Poland
movement

- national literatures:*
- African arts
 - Albanian literature
 - American literature
 - Anglo-Norman literature
 - Arabic literature
 - Armenian literature
 - Australian literature
 - Belgian literature
 - Breton literature
 - Bulgarian literature
 - Burmese literature
 - Canadian literature
 - Caribbean literature
 - Celtic literature
 - Central Asian arts
 - Chinese literature
 - Coptic literature
 - Croatian literature
 - Czech literature
 - Danish literature
 - Dutch literature
 - English literature
 - Estonian literature
 - Ethiopian literature
 - Finnish literature
 - French literature
 - Frisian literature
 - Georgian literature
 - German literature
 - Greek literature
 - Hebrew literature
 - Hungarian literature
 - Icelandic literature
 - Indian literature
 - Indonesian literatures
 - Irish literature
 - Italian literature
 - Japanese literature
 - Korean literature
 - Latin literature
 - Latin-American literature
 - Latvian literature
 - Lithuanian literature
 - Macedonian literature
 - Mongolian literature
 - New Zealand literature
 - Norwegian literature
 - Oceanic arts
 - Polish literature
 - Portuguese literature
 - Provençal literature
 - Romanian literature
 - Russian literature
 - Sanskrit literature
 - Scandinavian literature
 - Scottish literature
 - Serbian literature
 - Slovak literature
 - Slovene literature
 - South African literature
 - Southeast Asian arts
 - Spanish literature
 - Swahili literature
 - Swedish literature
 - Swiss literature
 - Syriac literature
 - Thai literature
 - Tibetan literature
 - Turkish literature
 - Ukrainian literature
 - Urdu literature
 - Walloon literature
 - Welsh literature
 - Yiddish literature
- popular literature:*
- best-seller
 - detective story
 - hard-boiled fiction
 - mystery story
 - science fiction
- prose forms:*
- antinode
 - apology
 - Bildungsroman
 - biography
 - confession
 - diary
 - epistolary novel
 - essay
 - frame story
 - Gothic novel
 - historical novel
 - I novel
 - Indianista novel
 - Künstlerroman
 - literary sketch
 - manners, novel of
 - maqāmāh
 - memoir
 - nonfiction novel
 - novel
 - novella
 - picaresque novel
 - psychological novel
 - roman à clef
 - roman-fleuve
 - sentimental novel
 - short story
- romances:*
- Alexander romance
 - Arthurian legend
 - Hellenistic romance
 - rímur romance
- sagas and related heroic prose:*
- Edda
 - Fenian cycle
 - fornaldar saga
 - heroic prose
 - Icelanders' sagas
 - Ossianic ballads
 - saga
 - scél
 - Ulster cycle
- satire:*
- burlesque
 - fool's literature
 - parody
 - pasquinade
 - satire
 - travesty
- themes and types:*
- ancients and moderns
 - archetype
 - Beatrice
 - Bluebeard
 - courtly love
 - Deirdre
 - Dietrich von Bern
 - Don Juan
 - Excalibur
 - Faust
 - Galahad
 - Grail
 - Griselda
 - Guinevere
 - Hagen
 - hero
 - Isengrim
 - Lancelot
 - Lear
 - Lohengrin
 - Mephistopheles
 - Merlin
 - Morgan le Fay
 - noble savage
 - Perceval
 - poète maudit
 - Round Table
 - superfluous man
 - Tristan and Isolde
 - type name
- other:*
- bard
 - black humour
 - Bluestocking
 - cancioneiro
 - cañkam literature
 - chapbook
 - character writer
 - children's literature
 - classical literature
 - conceptismo
 - costumbrismo
 - culteranismo
 - dolce stil nuovo
 - emblem book
 - fellow traveller
 - fili
 - frontier humour
 - goliard
 - Hindi literature
 - jongleur
 - journalism
 - literature
 - local colour
 - Marinism
 - pastoral literature
 - poet laureate
 - preciosity
 - rāwī
 - saudade
 - Spielmann
 - troubadour
 - trouvère
 - Weltschmerz
 - yellow journalism
 - Zhdanovshchina

Biographies*African writers:*

Achebe, Chinua
 Beti, Mongo
 Bosman, Herman
 Charles
 Boudjedra, Rachid
 Clark, John Pepper
 Cordeiro da Matta,
 Joaquim Dias
 Dib, Mohammed
 Ekwensi, Cyprian
 Ferreira, Manuel
 Kateb Yacine
 Kezilahabi,
 Euphrase
 Khatibi,
 Abdelkebir
 Laye, Camara
 Mutswairo,
 Solomon M.
 Ngugi wa Thiong'o
 Okara, Gabriel
 Ousmane
 Sembene
 Oyono, Ferdinand
 Léopold
 Rabéarivelo,
 Jean-Joseph
 Soromenho,
 Fernando
 Monteiro de
 Castro
 Soyinka, Wole
 Tutuola, Amos

American writers:

Adams, Henry
 Alger, Horatio
 Anderson,
 Sherwood
 Baldwin, James
 Bellows, Saul
 Berryman, John
 Bradstreet, Anne
 Bryant, William
 Cullen
 Burroughs,
 William
 Caldwell, Erskine
 Capote, Truman
 Cather, Willa
 Chapman,
 John Jay
 Cooper, James
 Fenimore
 Crane, Hart
 Crane, Stephen
 Dennie, Joseph
 Dickinson, Emily
 Donnelly, Ignatius

Dos Passos, John
 Dreiser, Theodore
 Emerson, Ralph
 Waldo
 Faulkner, William
 Fitzgerald, F. Scott
 Frost, Robert
 Green, Julien
 Harte, Bret
 Hawthorne,
 Nathaniel
 Hearn, Lafcadio
 Hecht, Ben
 Hemingway,
 Ernest
 Henry, O.
 Hughes, Langston
 Inge, William
 Irving, Washington
 James, Henry
 Lanier, Sidney
 Lewis, Sinclair
 Locke, Alain
 London, Jack
 Longfellow, Henry
 Wadsworth
 Lowell, Robert, Jr.
 Mailer, Norman
 Melville, Herman
 Miller, Arthur
 Miller, Henry
 Nabokov, Vladimir
 Nevins, Allan
 O'Neill, Eugene
 Parker, Dorothy
 Poe, Edgar Allan
 Pound, Ezra
 Salinger, J.D.
 Sandburg, Carl
 Saroyan, William
 Shepard, Sam
 Sherwood,
 Robert E.
 Simms, William
 Gilmore
 Sinclair, Upton
 Stein, Gertrude
 Steinbeck, John
 Stevens, Wallace
 Stowe, Harriet
 Beecher
 Thoreau, Henry
 David
 Thurber, James
 Twain, Mark
 Van Doren, Mark
 Vidal, Gore
 Warren, Robert
 Penn

Whitman, Walt
 Whittier, John
 Greenleaf
 Wiesel, Elie
 Williams,
 Tennessee
 Wolfe, Thomas
 Wright, Richard

Australian writers:

Boldrewood, Rolf
 Clarke, Marcus
 FitzGerald, R.D.
 Lawson, Henry
 McAuley, James
 Phillip
 Paterson, A.B.
 Richardson, Henry
 Handel
 Stewart, Douglas
 White, Patrick

*British and Irish
writers:*

Addison, Joseph
 Akenside, Mark
 Arden, John
 Auden, W.H.
 Austen, Jane
 Beaumont, Francis
 Behan, Brendan
 Belloc, Hilaire
 Bennett, Arnold
 Blake, William
 Boswell, James
 Brontë, Charlotte
 Brontë, Emily
 Browne, Sir
 Thomas
 Browning,
 Elizabeth Barrett
 Browning, Robert
 Bunyan, John
 Burns, Robert
 Butler, Samuel
 Byron, George
 Gordon Byron,
 6th Baron
 Carlyle, Thomas
 Carroll, Lewis
 Cary, Joyce
 Chatterton,
 Thomas
 Chaucer, Geoffrey
 Chesterton, G.K.
 Coleridge, Samuel
 Taylor
 Collins, William
 Congreve, William
 Conrad, Joseph

Cowper, William
 Crabbe, George
 Crichton, James
 De Quincey,
 Thomas
 Defoe, Daniel
 Dickens, Charles
 Donne, John
 Douglas, Gawin
 Dowson, Ernest
 Dryden, John
 Dunbar, William
 Durrell, Lawrence
 Edgeworth, Maria
 Eliot, George
 Eliot, T.S.
 Evelyn, John
 Farquhar, George
 Fielding, Henry
 Fletcher, John
 Forster, E.M.
 Foxe, John
 Galsworthy, John
 Gascoigne, George
 Gaskell, Elizabeth
 Cleghorn
 Gay, John
 Glyn, Elinor
 Graves, Robert
 Greene, Graham
 Greene, Robert
 Hardy, Thomas
 Hazlitt, William
 Herrick, Robert
 Heywood, John
 Hopkins, Gerard
 Manley
 Housman, A.E.
 Hudson, W.H.
 Hunt, Leigh
 Isherwood,
 Christopher
 Johnson, Samuel
 Jonson, Ben
 Joyce, James
 Keats, John
 Kipling, Rudyard
 Kyd, Thomas
 Lawrence, D.H.
 Lewis, Wyndham
 Lyndsay,
 Sir David
 Lytton, Edward
 George Earle
 Bulwer-Lytton,
 1st Baron
 Mandeville, Sir
 John

- Marlowe,
Christopher
Meredith, George
Middleton,
Thomas
Milton, John
Moore, George
O'Casey, Sean
Orwell, George
Otway, Thomas
Pinter, Harold
Pope, Alexander
Ramsay, Allan
Richardson,
Samuel
Rossetti, Dante
Gabriel
Ruskin, John
Scott, Sir Walter,
1st Baronet
Shakespeare,
William
Shaw, George
Bernard
Shelley, Percy
Bysshe
Sheridan, Richard
Brinsley
Sidney, Sir Philip
Skelton, John
Smollett, Tobias
Southey, Robert
Spenser, Edmund
Steele, Sir Richard
Sterne, Laurence
Stevenson, Robert
Louis
Swift, Jonathan
Swinburne,
Algernon Charles
Syngé, John
Millington
Tennyson, Alfred
Tennyson,
1st Baron
Thackeray,
William
Makepeace
Thomas, Dylan
Trollope, Anthony
Udall, Nicholas
Walpole, Horace,
4th earl of
Orford
Waugh, Evelyn
Wells, H.G.
Wilde, Oscar
Wither, George
Woolf, Virginia
- Wordsworth,
William
Yeats, William
Butler
Canadian writers:
Callaghan, Morley
Crémazie, Octave
Davies, Robertson
de la Roche, Mazo
Grove, Frederick
Philip
Hémon, Louis
Johnson, Pauline
Lampman,
Archibald
Layton, Irving
Leacock, Stephen
MacLennan, Hugh
Moodie, Susanna
Strickland
Pratt, E.J.
Richardson, John
Richler, Mordecai
Roberts, Sir
Charles George
Douglas
Scott, Duncan
Campbell
Scott, F.R.
Service, Robert W.
Smith, A.J.M.
*Early Greek and
Roman writers:*
Aeschylus
Aristophanes
Bacchylides
Catullus, Gaius
Valerius
Cicero, Marcus
Tullius
Ennius, Quintus
Euripides
Hesiod
Homer
Horace
Juvenal
Lucan
Lucian
Lucretius
Martial
Menander
Ovid
Petronius Arbitr.,
Gaius
Pindar
Plautus
Pliny the Elder
Pliny the Younger
Pollio, Gaius
Asinius
- Propertius, Sextus
Sappho
Seneca, Lucius
Annaeus
Sophocles
Statius
Suetonius
Tacitus
Terence
Theocritus
Tibullus, Albius
Varro, Marcus
Terentius
Virgil
Xenophon
East Asian writers:
Akutagawa
Ryūnosuke
Bashō
Buson
Cheng Chen-to
Chikamatsu
Monzaemon
Chou Tso-jen
Ding Ling
Fujiwara Sadaie
Futabatei Shimei
Ihara Saikaku
Kakinomoto
Hitomaro
Kawabata
Yasunari
Kuo Mo-jo
Lao She
Li Po
Lu Hsün
Mao Dun
Mishima Yukio
Mori Ōgai
Murasaki Shikibu
Natsume Sōseki
Ōe Kenzaburō
Ou-yang Hsiu
Shiga Naoya
Tu Fu
Wang An-shih
Zeami
French writers:
Adamov, Arthur
Anouilh, Jean
Apollinaire,
Guillaume
Artaud, Antonin
Balzac, Honoré de
Baudelaire,
Charles
Beauvoir,
Simone de
Beckett, Samuel
Camus, Albert
- Chateaubriand,
François-Auguste-
René,
Viscount de
Chenier, André de
Chrétien de Troyes
Claudel, Paul
Cocteau, Jean
Colette
Constant,
Benjamin
Corneille, Pierre
Diderot, Denis
Dumas, Alexandre
Duras, Marguerite
Flaubert, Gustave
France, Anatole
Gautier, Théophile
Genet, Jean
Gide, André
Giraudoux, Jean
Hugo, Victor
Huysmans,
Joris-Karl
Ionesco, Eugène
Jarry, Alfred
La Fontaine,
Jean de
Laforgue, Jules
Lamartine,
Alphonse de
Machaut,
Guillaume de
Mallarmé,
Stéphane
Marivaux, Pierre
Marot, Clément
Maupassant,
Guy de
Mauriac, François
Mérimée, Prosper
Mistral, Frederic
Molière
Nerval, Gérard de
Proust, Marcel
Rabelais, François
Racine, Jean
Rimbaud, Arthur
Sade, Marquis de
Sand, George
Sartre, Jean-Paul
Scarron, Paul
Staël,
Germaine de
Stendhal
Valéry, Paul
Verlaine, Paul
Vigny,
Alfred-Victor,
comte de
Villon, François

- Voltaire
Zola, Émile
German writers:
Alexis, Willibald
Arndt, Ernst
Moritz
Arnim,
Bettina von
Böll, Heinrich
Brecht, Bertolt
Broch, Hermann
Büchner, Georg
Chamisso,
Adelbert von
Dürrenmatt,
Friedrich
Fontane, Theodor
Freiligrath,
Ferdinand
Freytag, Gustav
Frisch, Max
George, Stefan
Goethe, Johann
Wolfgang von
Görres, Joseph von
Gottfried von
Strassburg
Grass, Günter
Grillparzer, Franz
Grimm, Jacob
Ludwig Carl and
Wilhelm Carl
Grimmelshausen,
Hans Jacob
Christoph von
Haller,
Albrecht von
Hartmann
von Aue
Hauptmann,
Gerhart
Hebbel, Friedrich
Heine, Heinrich
Herder, Johann
Gottfried von
Hesse, Hermann
Hoffmann, E.T.A.
Hoffmannsthal,
Hugo von
Hölderlin,
Friedrich
Immermann, Karl
Leberecht
Jean Paul
Johnson, Uwe
Kafka, Franz
Kaiser, Georg
Kaschnitz, Marie
Luise
Keller, Gottfried
- Kleist,
Heinrich von
Mann, Thomas
Meyer, Conrad
Ferdinand
Morgenstern,
Christian
Mörke, Eduard
Friedrich
Novalis
Opitz, Martin
Rilke, Rainer
Maria
Schiller,
Friedrich von
Schnitzler, Arthur
Sternheim, Carl
Stifter, Adalbert
Storm, Theodor
Woldsen
Sudermann,
Hermann
Tieck, Ludwig
Trakl, George
Walafrid Strabo
Walther von der
Vogelweide
Wedekind, Frank
Werfel, Franz
Wieland,
Christoph Martin
Wolfram von
Eschenbach
Zuckmayer, Carl
Zweig, Stefan
- Hebrew writers:*
Agnon, S.Y.
Berdichevsky,
Micah Joseph
Bialik, Ḥayyim
Naḥman
Ḥisdai ibn Shaprut
ibn Ezra, Moses
Ibn Gabirol
Judah ha-Levi
Zunz, Leopold
- Hungarian writers:*
Ady, Endre
Arany, János
Eötvös, József
Báró
Kazinczy, Ferenc
Petöfi, Sándor
- Indian writers:*
Chatterjee, Bankim
Chandra
Harishchandra
Iqbāl, Sir
Muḥammad
Kālidāsa
- Tagore,
Rabindranath
Tulsidās
Italian writers:
Alfieri, Vittorio,
Conte
Amicis,
Edmondo De
Angiolieri, Cecco
Aretino, Pietro
Ariosto, Ludovico
Bacchelli, Riccardo
Bandello, Matteo
Basile,
Giambattista
Belli, Giuseppe
Gioacchino
Betti, Ugo
Boccaccio,
Giovanni
Boiardo, Matteo
Maria
Buzzati, Dino
Calvino, Italo
Campanella,
Tommaso
Carducci, Giosuè
Casa, Giovanni
Della
Castiglione,
Baldassare
Cavalcanti, Guido
Chiabrera, Grazia
D'Annunzio,
Gabriele
Dante
Eco, Umberto
Folengo, Teofilo
Foscolo, Ugo
Gadda, Carlo
Emilio
Gibaldi,
Giambattista
Goldoni, Carlo
Gozzi, Carlo,
Conte
Leopardi,
Giacomo
Levi, Carlo
Machiavelli,
Niccolò
Maffei, Francesco
Scipione
Malaparte, Curzio
Manzoni,
Alessandro
Marinetti, Filippo
Tommaso
Marino,
Giambattista
- Metastasio, Pietro
Montale, Eugenio
Moravia, Alberto
Parini, Giuseppe
Pascoli, Giovanni
Pavese, Cesare
Petrarch
Pirandello, Luigi
Politian
Pratolini, Vasco
Pulci, Luigi
Quasimodo,
Salvatore
Sannazzaro,
Jacopo
Silone, Ignazio
Svevo, Italo
Tasso, Torquato
Tassoni,
Alessandro
Ungaretti,
Giuseppe
Verga, Giovanni
Vittorini, Elio
- Latin-American writers:*
Agustini, Delmira
Alegria, Ciro
Alencar, José de
Amado, Jorge
Asturias, Miguel
Angel
Azuela, Mariano
Bandeira, Manuel
Bello, Andrés
Benedetti, Mario
Bioy Casares,
Adolfo
Blest Gana,
Alberto
Borges, Jorge Luis
Cardenal, Ernesto
Carpentier, Alejo
Cruz, Sor Juana
Inés de la
Cunha, Euclides de
Darío, Rubén
Durão, José de
Santa Rita
Echeverría,
Esteban
Ercilla y Zúñiga,
Alonso de
Fernández de
Lizardi, José
Joaquín
Freyre, Gilberto de
Mello
Fuentes, Carlos
Gallegos, Rómulo

- Gama, Basílio da
García Márquez,
Gabriel
Gonçalves Dias,
Antônio
Graça Aranha,
José Pereira da
Guillén, Nicolás
Guimarães Rosa,
João
Güiraldes, Ricardo
Hernández, José
Herrera y Reissig,
Julio
Huidobro, Vicente
García
Ibarbourou,
Juana de
Icaza, Jorge
Isaacs, Jorge
Lins do Rego
Cavalcanti, José
López y Fuentes,
Gregorio
Lugones, Leopoldo
Lynch, Benito
Machado de Assis,
Joaquim Maria
Mallea, Eduardo
Mármol, José
Martí, José Julián
Mistral, Gabriela
Neruda, Pablo
Nervo, Amado
Olmedo, José
Joaquín
Onetti, Juan
Carlos
Palma, Ricardo
Paz, Octavio
Quiroga, Horacio
Ramos, Graciliano
Reyes, Alfonso
Roa Bastos,
Augusto
Sábato, Ernesto
Sarmiento,
Domingo
Faustino
Silva, José
Asunción
Storni, Alfonsina
Torres Bodet,
Jaime
Vallejo, César
Vargas Llosa,
Mario
Vega, Garcilaso
de la
- Veríssimo, Érico
Zorrilla de San
Martín, Juan
*Middle Eastern
writers:*
Cevdet Paşa,
Ahmed
Edib Adıvar,
Halide
Ferdowsi
Gökalp, Ziya
Hâfez
Ḥakīm, Tawfīq al-
Ibn Baṭṭūṭah
Ibn Ḥazm
Jāhīz, al-
Jamalzadeh,
Mohammad Ali
Kemal, Namık
Ma'arrī, al-
Mutanabbī, al-
Omar Khayyam
Sa'dī
Taha Hussein
New Zealand writers:
Baxter, James K.
Mansfield,
Katherine
Sargeson, Frank
Sinclair, Sir Keith
Portuguese writers:
Camões, Luís de
Castelo Branco,
Camilo
Deus, João de
Eça de Queirós,
José Maria de
Gonzaga, Tomás
Antônio
Herculano de
Carvalho e
Araújo, Alexandre
Quental, Antero
Tarquínio de
Sá de Miranda,
Francisco de
Vicente, Gil
Vieira, Antônio
Scandinavian writers:
Almqvist, Carl
Jonas Love
Andersen, Hans
Christian
Asbjørnsen, Peter
Christen; and
Moe, Jørgen
Engebretsen
Bergman, Hjalmar
Fredrik Elgérus
- Bjørnson,
Bjørnstjerne
Martinius
Dinesen, Isak
Ewald, Johannes
Fröding, Gustaf
Hamsun, Knut
Holberg, Ludvig,
Friherre Holberg
Ibsen, Henrik
Jensen,
Johannes V.
Lagerkvist, Pär
Lagerlöf, Selma
Laxness, Halldór
Pontoppidan,
Henrik
Rydberg, Viktor
Snorri Sturluson
Strindberg, August
Undset, Sigrid
Wergeland, Henrik
Arnold
Slavic writers:
Akmatova,
Anna
Aksakov, Sergey
Timofeyevich
Andrić, Ivo
Babel, Isaak
Emmanuilovich
Bely, Andrey
Bezruč, Petr
Blok, Aleksandr
Aleksandrovich
Březina, Otakar
Bulgakov, Mikhail
Afanasyevich
Čapek, Karel
Chekhov, Anton
Dostoyevsky,
Fyodor
Ehrenburg, Ilya
Grigoryevich
Fredro, Aleksander
Gogol, Nikolay
Gorky, Maksim
Havel, Václav
Ilf, Ilya; and
Petrov, Yevgeny
Ivanov, Vsevolod
Vyacheslavovich
Jirásek, Alois
Katayev, Valentin
Khomyakov,
Aleksy
Stepanovich
Krléža, Miroslav
Kundera, Milan
- Lermontov,
Mikhail
Lomonosov,
Mikhail
Vasilyevich
Mandelstam,
Osip Emilyevich
Mayakovsky,
Vladimir
Vladimirovich
Modrzewski,
Andrzej
Pasternak, Boris
Pilnyak, Boris
Potocki, Waclaw
Pushkin,
Aleksandr
Sergeyevich
Rozañov, Vasily
Vasilyevich
Saltykov, Mikhail
Yevgrafovich,
Graf
Seifert, Jaroslav
Sienkiewicz,
Henryk
Sinyavsky, Andrey
Donatovich
Slowacki, Juliusz
Solzhenitsyn,
Aleksandr
Szymborska,
Wisława
Tikhonov, Nikolay
Semyonovich
Tolstoy, Leo
Tsvetayeva,
Marina Ivanovna
Turgenev, Ivan
Sergeyevich
Voznesensky,
Andrey
Andreyevich
Yesenin, Sergey
Aleksandrovich
Yevtushenko,
Yevgeny
Zamyatin,
Yevgeny
Ivanovich
Spanish writers:
Alarcón y Ariza,
Pedro Antonio de
Aleixandre,
Vicente
Azorín
Baroja, Pío
Bécquer, Gustavo
Adolfo

Benavente y Martínez, Jacinto	Francisco Gómez de	Frye, Northrop Fuller, Margaret	Schlegel, August Wilhelm von
Blasco Ibáñez, Vicente	Rojas, Fernando de	Gottsched, Johann Christoph	Schlegel, Friedrich von
Buero Vallejo, Antonio	Rueda, Lope Ruiz, Juan	Henley, William Ernest	Stephen, Sir Leslie Wilson, Edmund
Calderón de la Barca, Pedro	Sender, Ramón José	Howells, William Dean	<i>Yiddish writers:</i> Ansky, S.
Cervantes Saavedra, Miguel de	Tamayo y Baus, Manuel	Lamb, Charles Leavis, F.R.	Asch, Sholem Goldfaden, Abraham
Echegaray y Eizaguirre, José	Tirso de Molina Torres Naharro, Bartolomé de	Lessing, Gotthold Ephraim	Mendele Moykher Sforim
Encina, Juan del	Unamuno, Miguel de	Lowell, James Russell	Peretz, Isaac Leib Singer, Isaac
Espronceda y Delgado, José de	Valera y Alcalá Galiano, Juan	Mencken, H.L. Menéndez Pidal, Ramón	Bashevis <i>other:</i>
García Lorca, Federico	Valle-Inclán, Ramón María del	Menéndez y Pelayo, Marcelino	Conscience, Hendrik
Góngora y Argote, Luis de	Vega, Garcilaso de la	Merezhkovsky, Dmitry	Ghelderode, Michel de
Herrera, Fernando de	Vega, Lope de Zorrilla y Moral, José	Sergeyevich Mochnecki, Maurycy	Kazantzákis, Nikos Korais,
Jiménez, Juan Ramón	<i>theorists and critics:</i> Arnold, Matthew	Ortega y Gasset, José	Adamántios Prámoedya
León, Luis de	Barbey d'Aurevilly, Jules-Amédée	Papini, Giovanni Pater, Walter	Ananta Toer Verhaeren, Émile
Palacio Valdés, Armando	Boileau, Nicolas Brandes, Georg	Roy, Camille Rymer, Thomas	Vondel, Joost van den
Pardo Bazán, Emilia	Breton, André Burke, Kenneth	Sainte-Beuve, Charles-Augustin	
Pérez Galdós, Benito	Empson, Sir William	Saintsbury, George	
Quevedo y Villegas,			

INDEX: See entries under all of the terms above

Section 622. Theatre

A. The art of theatre

1. The nature and origins of theatre as an art
2. Functions of theatre and theatrical production; *e.g.*, theatre as social, moral, or religious expression; theatre as entertainment
3. Problems of theatre and theatrical production
4. Interrelation of theatrical performance and audience
5. The arts of design in the theatre: staging and the design of stages, sets, lights, costumes, and makeup
[see C.2., below]
6. Directing
7. Acting
8. The roles of other arts in the theatre: literature, music, dance, painting, and architecture
[see C., below]

B. Kinds and methods of theatrical production

1. Diverse kinds of theatrical production
 - a. Kinds defined by the nature of the production itself
 - i. The traditional dramatic forms or genres; *e.g.*, tragedy, comedy
[for these forms as literature, see 621.C.3.]

- ii. Dramatic improvisation: *commedia dell'arte* and related forms
 - iii. Mime and pantomime
 - iv. Puppet, marionette, and shadow plays and related forms
 - v. Nondramatic theatrical production
[see B.I.f., below]
- b. Kinds defined by their special purpose or audience; *e.g.*, religious theatre, civic theatre, educational theatre, court theatre
 - c. Kinds defined by their system of production; *e.g.*, single-performance productions, repertory systems, stock companies, touring companies
 - d. Kinds defined by the controlling artist; *e.g.*, actor-dominated productions, dramatist-controlled productions, productions controlled by a nonperforming director
 - e. Kinds defined by their style: general aesthetic style; styles of particular countries, historical periods, and playwrights
 - f. Kinds defined by the lack of a unified dramatic structure
 - i. Circuses and carnivals
 - ii. Pageants, parades, and related forms
 - iii. Popular entertainments: music hall, variety, and burlesque productions; nightclub shows; cabaret; musical comedy and revue
 - g. Kinds defined by the cultural character of their audience: primitive, folk, and popular theatre
 - h. Kinds defined by their production media: radio and television
2. Methods of theatrical production
- C. Elements of theatrical production
- 1. The production area: theatre buildings, stages, auditoriums
 - a. Theatre as place: kinds and uses of theatre buildings, stages, and auditoriums
 - b. The historical development of theatres in Western and non-Western cultures
 - 2. Staging and stage design: the arrangement of words, dance, music, costumes, makeup, lighting, sound, and properties for theatrical effect
- D. The history of theatre
- 1. Western theatre
 - 2. Non-Western theatre

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the theatre

African Arts	Folk Arts	Theatre, The Art of the	Theatrical Production
American Peoples, Arts of Native	Oceanic Arts	Theatre, The History of	
Central Asian Arts	Puppetry	Western	
Circus	South Asian Arts		
East Asian Arts	Southeast Asian Arts		

MICROPAEDIA: Selected entries of reference information

General subjects

<i>dramatic conventions and techniques:</i>	actor-manager system	régisseur	<i>movements and tendencies:</i>
agon	chorus	repertory theatre	Absurd, Theatre of the
lazzo	courtyard theatre	skene	biomechanics
soliloquy	theatre	Stanislavsky method	Cruelty, Theatre of little theatre
<i>elements of theatrical production:</i>	directing	stock company	Living Newspaper
acting	hanamichi	summer theatre	theatricalism
	open stage	theatre	
	proscenium	theatre-in-the-round	

- popular dramatic entertainment:*
 burlesque show
 cabaret
 circus
 conjuring
 Fasching
 ice show
 masque
 mime and
 pantomime
 minstrel show
 music hall and
 variety
 pageant
 revue
 shell game
 son et lumière
 vaudeville
 Wild West show
- staging and stage design:*
 cyclorama
 deus ex machina
 eccyclema
 limelight
 Linnebach lantern
 mansion
 multiple setting
- Biographies**
- actors and actresses:*
 Ashcroft, Dame
 Peggy
 Barrymore, Lionel
 Bernhardt, Sarah
 Booth, Edwin
 Cooper, Dame
 Gladys
 Duse, Eleonora
 Gwyn, Nell
 Irving, Sir Henry
 Kean, Edmund
 Kemble, John
 Philip
 Kendal, Dame
 Margaret; and
 William Hunter
 Kortner, Fritz
 Lenya, Lotte
- pageant wagon
 perspective scenery
 sound effects
 spotlight
 stage design
 stage machinery
 trap
- stock characters:*
 Brighella
 Capitano
 Columbine
 Dottore
 Guignol
 Harlequin
 Kasperle
 Miles Gloriosus
 Pantaloon
 Pedrolino
 Punch
 Scaramouche
 soubrette
 zanni
- types of theatrical production:*
 afterpiece
 auto sacramental
 black theatre
 bunraku
- ching-hsi
 Comédie-Française
 Comédie-Italienne
 commedia dell'arte
 commedia erudita
 drame bourgeois
 droll
 epic theatre
 farce
 Fastnachtspiel
 interlude
 Jesuit drama
 kabuki
 Karagög
 liturgical drama
 ludi scaenici
 melodrama
 miracle play
 morality play
 mumming play
 mystery play
 nō theatre
 ombres chinoises
 Passion play
 sacra
 rappresentazione
 Satyr play
 wayang
 Yiddish drama
- other:*
 benefit
 performance
 children's
 company
 choragus
 civic theatre
 claque
 clown
 East Asian arts
 Enfants san Souci
 Englische
 Komödianten
 improvisation
 Islāmic arts
 juggler
 Misrule, Lord of
 Oceanic arts
 peep show
 South Asian arts
 Southeast Asian
 arts
 toy theatre
 ventriloquism
- Lunt, Alfred; and
 Fontanne, Lynn
 Mathews, Charles
 Murdoch, James
 Edward
 Nakamura
 Utaemon
 Neuber, Caroline
 Olivier, Laurence
 Paxinou, Katina
 Siddons, Sarah
 Taylor, Laurette
 Terry, Ellen
 Worth, Irene
- directors:*
 Barrault,
 Jean-Louis
 Burian, Emil
- Craig, Edward
 Gordon
 Guthrie,
 Sir Tyrone
 Littlewood,
 Joan
 Popov, Alexey
 Dmitriyevich
 Reinhardt, Max
 Stanislavsky,
 Konstantin
 Zavadsky, Yury
 Alexandrovich
- producers:*
 Belasco, David
 Meyerhold,
 Vsevolod
 Yemilyevich
- Richardson, Tony
 Shubert brothers
other:
 Barnum, P.T.
 Henslowe, Philip
 Henson, Jim
 Lupino family
 Macready, William
 Charles
 Obraztsov, Sergey
 Ringling Brothers

INDEX: See entries under all of the terms above

Section 623. Motion Pictures

- A. The art of motion pictures
1. The nature of motion-picture art: the classification of motion pictures
 2. The component arts of motion pictures
 - a. The role of the writer of the script or screenplay
 [see 621.C.3.g.]

- b. Motion-picture acting: characteristics that distinguish it from acting in the theatre
 - c. The role of the director
 - d. The role of the film editor
 - e. The use of technology in the creative process: the camera, sound, animation, and other special effects
3. Motion-picture production: scenic design, costumes and makeup, lighting, shooting, editing, film processing
- B. The interrelation of other arts in motion pictures: literature, music, dance, painting and drawing, architecture
- C. The nonaesthetic contexts of motion pictures
- 1. The motion-picture industry
 - 2. Functions of motion pictures: their use as media of education and propaganda
 - 3. The study and appreciation of motion pictures
- D. The history of motion pictures

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major article dealing with motion pictures

Motion Pictures

MICROPAEDIA: Selected entries of reference information

General subjects

animation	documentary film	New Wave	Twentieth
auteur theory	dubbing	newsreel	Century-Fox
cinéma vérité	horror film	Paramount	Film Corporation
CinemaScope	Metro-Goldwyn-Mayer,	Pictures	underground film
cinematography	Inc.	Corporation	United Artists
Columbia Pictures	montage	reel	Corporation
Entertainment,	motion picture	script	Universal Pictures
Inc.	musical film	Technicolor	Company
		3-D	Warner Brothers

Biographies

<i>actors and actresses:</i>	Mifune Toshiro	Fellini, Federico	Stroheim,
Astaire, Fred	Monroe, Marilyn	Ford, John	Erich von
Bergman, Ingrid	Muni, Paul	Godard, Jean-Luc	Truffaut, François
Bogart, Humphrey	Newman, Paul	Griffith, D.W.	Vertov, Dziga
Brando, Marlon	Olivier, Laurence	Hawks, Howard	Welles, Orson
Chaplin, Charlie	Pickford, Mary	Hitchcock, Sir	Wilder, Billy
Crawford, Joan	Stewart, James	Alfred	<i>producers:</i>
Davis, Bette	Sydow, Max von	Huston, John	Disney, Walt
de Havilland,	Tracy, Spencer	Kurosawa Akira	Goldwyn, Samuel
Olivia	Wayne, John	Lean, Sir David	Korda, Sir
De Niro, Robert	<i>directors:</i>	Lubitsch, Ernst	Alexander
Gable, Clark	Antonioni,	Malle, Louis	Mayer, Louis B.
Garbo, Greta	Michelangelo	Ousmane	Selznick, David O.
Gish, Lillian	Bergman, Ingmar	Sembene	<i>other:</i>
Grant, Cary	Buñuel, Luis	Pabst, G.W.	Lumière, Auguste
Guinness, Sir Alec	Capra, Frank	Pagnol, Marcel	and Louis
Hepburn,	Cavalcanti, Alberto	Paul	Mankiewicz,
Katharine	Clair, René	Ray, Satyajit	Herman
Hoffman, Dustin	DeMille, Cecil B.	Renoir, Jean	Muybridge,
Lloyd, Harold	Dreyer, Carl	Rossellini, Roberto	Eadweard
March, Fredric	Theodor	Sennett, Mack	Westmore family
Mastroianni,	Eisenstein, Sergey	Sternberg,	
Marcello	Mikhaylovich	Josef von	

Section 624. Music

- A. The art of music
 - 1. Diverse conceptions of music as an art
 - 2. Problems of musical meaning
 - 3. Musical performance and interpretation
 - 4. The relation of music to other human activities
[see also E.3., below]
 - 5. Writings about music
- B. The sources of musical sound
 - 1. The physical aspects of musical sound: tone, movement, pitch, timbre
[see C., below and 128.E.6.]
 - 2. The human voice: techniques, styles, and historical developments of the art of singing in Western and non-Western cultures
 - 3. Musical instruments: the history, technology, and technique of classes and specific types of instruments
 - a. Idiophonic and membranophonic instruments: instruments that produce sound by means of percussion
 - b. Aerophonic instruments: instruments that produce sound by the vibration of a column of air
 - c. Chordophonic instruments: instruments that produce sound by the vibration of struck, plucked, or bowed strings
 - d. Electrophonic instruments: instruments that produce sound by electrical, electromechanical, or electronic means; *e.g.*, electronic organs, tape recorders, synthesizers, computers
- C. The elements of music: their patterning and modes of organization in composition
 - 1. Pitch
 - a. Interval: the difference in pitch between two tones
 - b. Scale: a pattern of pitch relationships expressed as a series of intervals dividing an octave
 - c. Tuning and temperament: the organization and modification of systems of pitch relationships
 - d. Motive and theme
 - e. Mode, melody type, tune family
 - 2. Duration (time)
 - a. Metre
 - b. Rhythm
 - c. Tempo
 - 3. Timbre
 - 4. Harmony
 - 5. Counterpoint
 - 6. Texture: monophonic, homophonic, heterophonic, polyphonic
 - 7. Orchestration and instrumentation
 - 8. Form in music: the design and structures whereby musical ideas are presented
- D. Musical notation
- E. Musical forms and genres: the types of musical composition

1. Forms and genres characterized by the medium of performance
 - a. Instrumental music
[sec 2., below]
 - b. Vocal music
 - i. Vocal music for solo performance; *e.g.*, liturgical chant, secular song, lied, aria
 - ii. Choral music; *e.g.*, mass, motet, cantata, oratorio
 - iii. Vocal music for several voices, the parts for either solo or choral performance; *e.g.*, madrigal, glee
 - c. Electrophonic music: *e.g.*, tape music, computer music
 2. Forms and genres characterized by the technique of composition
 - a. Musical compositions with fully notated structures
 - i. Sonata
 - ii. Symphony
 - iii. Concerto
 - iv. Variation forms; *e.g.*, chaconne, passacaglia, variation set
 - v. Fugue
 - b. Jazz: music combining notated material with extemporaneous performance
 - i. General considerations about jazz: its differentiation from and relation to folk music, popular music, and “art” music; its emphasis on the performer as creator; the importance of improvisation; its reflection of social and cultural forces
 - ii. Development of jazz styles
 3. Forms and genres characterized by function or by social setting
 - a. Liturgical music
 - b. Chamber music
 - c. Music for the theatre
 - i. Opera
 - ii. Music for theatrical dance; *e.g.*, ballet, modern dance
[see also 625]
 - iii. Music theatre; *e.g.*, musical, operetta, zarzuela, nō theatre
[see also 622]
 - iv. Incidental and background music; *e.g.*, for the theatre, for motion pictures and television
 4. Genres determined by the cultural milieu: primitive, folk, and popular music
- F. Recording and reproduction of music
1. Types of music reproduction; *e.g.*, mechanical, magnetic, optical
[see 735.F.]
 2. Techniques of music recording: the role of the producer
 3. Effects of music recording: on composition, on teaching, on criticism, on performance, on musicology
 4. Development of music recording
- G. The history of music
1. Western music
 2. The music of non-Western peoples

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and biographies dealing with music

African Arts	East Asian Arts	Musical Forms and Genres	Southeast Asian Arts
American Peoples, Arts of Native	Folk Arts	Musical Instruments	
Bach	Mozart	Oceanic Arts	
Beethoven	Music, The Art of	South Asian Arts	
Central Asian Arts	Music, The History of Western		

MICROPAEDIA: Selected entries of reference information

General subjects

<i>aerophones—brass instruments:</i>	saxophone	lute	arrangement
alphorn	shakuhachi	mandolin	cadenza
bugle	shawm	mandora	canon
cornet	sheng	p'i-p'a	cantus firmus
euphonium	whistle	rabāb	coda
French horn	<i>chordophones—harp family:</i>	rebec	counterpoint
horn	Aeolian harp	samisen	fauxbourdon
ophicleide	angular harp	san-hsien	fugue
saxhorn	arched harp	sāraṅgī	ground bass
serpent	frame harp	sitar	hocket
trombone	harp	tar	instrumentation
trumpet	Irish harp	theorbo	leitmotiv
tuba	konghou	'umd	melody
<i>aerophones—keyboard instruments:</i>	musical bow	viol	musical variation
accordion	pedal harp	viola	ornamentation
barrel organ	<i>chordophones—keyboard instruments:</i>	violin	ostinato
concertina	clavichord	yüeh-ch'in	paraphrase
harmonium	clavicytherium	<i>chordophones—lyre family:</i>	parody
organ	dulce melos	erwth	period
positive organ	harpsichord	kinnor	ritornello
regal	harp	kithara	<i>elements of pitch:</i>
<i>aerophones—woodwind instruments:</i>	piano	lyre	church mode
aulos	player piano	pluriarc	combination tone
bagpipe	spinet	<i>chordophones—zither family:</i>	comma
basset horn	square piano	Autoharp	consonance and dissonance
bassoon	upright piano	ch'in	diatonic
clarinet	virginal	cimbalom	echos
curtal	<i>chordophones—lute and fiddle families:</i>	dulcimer	equal temperament
English horn	balalaika	koto	gamut
fife	banjo	monochord	hexachord
flageolet	cello	psaltery	meantone temperament
flute	chitarrone	trumpet marine	microtonal music
harmonica	cittern	vina	mode
heckelphone	double bass	wagon	musica ficta
hichiriki	erh-hu	yang-ch'in	octave species
hornpipe	fiddle	zither	overtone
musette	gittern	<i>electrophones:</i>	pentatonic scale
oboe	guitar	electronic carillon	pitch
ocarina	gusla	electronic organ	scale
panpipe	hu-ch'in	music synthesizer	solmization
pipe and tabor	hurdy-gurdy	ondes martenot	tessitura
recorder	kamanjä	theremin	tetrachord
	koboz	trautonium	timbre
	lira	<i>elements of composition:</i>	tone
		accompaniment	tonos

- tune family
tuning and
temperament
white noise
whole-tone scale
- ensembles—*
instrumental:
band
orchestra
quartet
quintet
trio
- ensembles—vocal:*
choir
quartet
responsorial
singing
trio
- forms—general:*
aleatory music
aria
Bar form
barcarole
berceuse
binary form
caccia
cantilena
capriccio
carol
character piece
clausula
conductus
cyclic form
finale
fuging tune
lai
minuet
nocturne
quodlibet
recitative
serenade
ternary form
- harmonic elements:*
appoggiatura
atonality
cadence
chord
chromaticism
drone
enharmonic
harmony
interval
inversion
key
modulation
monody
organum
pedal point
polytonality
thorough bass
tonality
tritone
- idiophones:*
bell
bell chime
carillon
castanets
celesta
clapper
claves
crotal
cymbal
glass harmonica
glockenspiel
gong
handbell
Jew's harp
jingling Johnny
lamellaphone
marimba
music box
rattle
scraper
sistrum
slit drum
steel drum
stone chimes
triangle
tubular bells
vibraphone
wind-bell
xylophone
- instrumental forms:*
canzona
chaconne
chamber music
chorale prelude
concerto
concerto grosso
courante
divertimento
estampie
étude
fanfare
fantasia
gigue
impromptu
invention
Konzertstück
march
musique concrète
overture
passacaglia
prelude
quartet
quintet
ricercare
rondo
scherzo
sinfonia
sonata
sonatina
suite
- symphonic poem
symphony
toccata
trio
trio sonata
vocal-instrumental
concerto
- instruments—*
classifications:
aerophone
brass instrument
chordophone
electronic
instrument
electrophone
idiophone
keyboard
instrument
membranophone
percussion
instrument
reed instrument
stringed
instrument
transposing
musical
instrument
wind instrument
woodwind
- instruments—*
components:
crook
pipe
tracker action
valve
- jazz styles:*
bebop
Chicago style
cool jazz
Dixieland
free jazz
jazz
jazz-rock
Kansas City style
New Orleans
style
scat
swing
- medieval musicians:*
meistersinger
minnesinger
minstrel
troubadour
trouvère
wait
- membranophones:*
bass drum
drum
dùndùn pressure
drum
friction drum
- kettledrum
snare drum
tablā
tambourine
timpani
tsuzumi
- music history, theory,*
and training:
affections, doctrine
of the
Ars Antiqua
Ars Nova
colour music
conservatory
ethnomusicology
musical societies
and institutions
musicology
program music
Roman de Fauvel
schola cantorum
- musical schools and*
styles:
Burgundian school
concertato style
empfindsamer Stil
Franco-Netherlandish
school
Gebrauchsmusik
gymel
Mannheim school
Notre-Dame
school
Postromantic
music
serialism
Tin Pan Alley
- musical textures:*
heterophony
homophony
monophony
polyphony
- non-Western music:*
ālāpa
Carnatic music
Chinese music
dastgah
gagaku
gamelan
Hindustani
music
Indian music
Japanese music
Korean music
maqām
nagauta
raga
tāla
taqsim
Vedic chant

<i>notation:</i>	isorhythm	Ethiopian chant	lied
accidental	metre	Gallican chant	madrigal
clef	polyrhythm	Gregorian chant	madrigal comedy
mensural notation	rhythm	hymn	mélodie
musical notation	rhythmic mode	kontakion	musique mesurée
neume	rubato	liturgical music	nigun
note	syncopation	mass	rondeau
score	<i>theatre music:</i>	Mi-Sinai tune	serenata
shape-note hymnal	ballad opera	motet	song
staff	cabaletta	Mozarabic chant	villancico
tablature	Camerata	Old Roman chant	villanella
time signature	cavatina	oratorio	villota
<i>performance</i>	drinking song	Passion music	virelai
<i>technique:</i>	incidental music	plainsong	work song
bel canto	intermezzo	psalm tone	yodel
conductor	libretto	psalmody	<i>vocal registers:</i>
improvisation	music drama	requiem mass	alto
musical expression	musical	responsory	baritone
singing	Nigerian theatre	Sarum chant	bass
<i>popular forms:</i>	opera	sequence	castrato
bluegrass	opera buffa	Syrian chant	countertenor
blues	opéra-comique	Te Deum	falsetto
boogie-woogie	opera seria	laudamus	soprano
bossa nova	operetta	troparion	tenor
calypso	Singspiel	trope	<i>other:</i>
country music	verismo	<i>vocal forms—secular:</i>	bull-roarer
gospel music	zarzuela	air de cour	cantor
kivela	<i>vocal forms—sacred:</i>	ayre	change ringing
ragtime	Ambrosian chant	ballade	computer music
reggae	Anglican chant	balletto	Greek music
rhythm and blues	anthem	cantiga	metronome
rock	antiphon	cantillation	music
shanty	Armenian chant	canzonet	musical
spiritual	Byzantine chant	carnival song	composition
<i>rhythmic elements:</i>	canonical hours	catch	national anthem
accent	cantata	chanson	
aksak	canticle	frottola	
beat	chorale	glee	
īqā'āt	Coptic chant	goliard	

Biographies

<i>composers—Ars Nova period:</i>	Purcell, Henry	Clementi, Muzio	Ives, Charles
Adam de la Halle	Rameau,	Gluck, Christoph	Janáček, Leoš
Landini, Francesco	Jean-Philippe	Willibald	Krenek, Ernst
Machaut,	Scarlatti,	Haydn, Joseph	Messiaen, Olivier
Guillaume de	Domenico	Mozart, Wolfgang	Milhaud, Darius
Sachs, Hans	Schein, Johann	Amadeus	Penderecki,
<i>composers—Baroque:</i>	Hermann	Pleyel, Ignace	Krzysztof
Bach, Johann	Schütz, Heinrich	Joseph	Poulenc, Francis
Sebastian	Telemann, Georg	<i>composers—modern:</i>	Prokofiev, Sergey
Buxtehude,	Philipp	Barber, Samuel	Ravel, Maurice
Dietrich	Vivaldi, Antonio	Bartók, Béla	Roussel, Albert
Corelli, Arcangelo	<i>composers—Classical period:</i>	Berg, Alban	Satie, Erik
Couperin, François	Arne, Thomas	Bernstein, Leonard	Schoenberg,
Couperin, Louis	Bach, Carl Philipp	Boulez, Pierre	Arnold
Ditters von	Emanuel	Cage, John	Scriabin,
Dittersdorf, Carl	Beethoven,	Carter, Elliott	Aleksandr
Frescobaldi,	Ludwig van	Copland, Aaron	Nikolayevich
Girolamo	Boccherini, Luigi	Cowell, Henry	Shostakovich,
Handel, George	Boyce, William	Debussy, Claude	Dmitry
Frideric	Cherubini, Luigi	Hindemith, Paul	Stockhausen,
		Honegger, Arthur	Karlheinz

- Strauss, Richard
 Stravinsky, Igor
 Villa-Lobos, Heitor
 Webern, Anton von
 Weill, Kurt
 Xenakis, Iannis
composers—opera:
 Bellini, Vincenzo
 Bizet, Georges
 Britten, Benjamin
 Cimarosa,
 Domenico
 Donizetti, Gaetano
 Gounod, Charles
 Henze, Hans
 Werner
 Lully,
 Jean-Baptiste
 Massenet, Jules
 Menotti,
 Gian Carlo
 Meyerbeer,
 Giacomo
 Offenbach, Jacques
 Paisiello, Giovanni
 Puccini, Giacomo
 Rossini,
 Gioacchino
 Scarlatti,
 Alessandro
 Sullivan, Sir Arthur
 Verdi, Giuseppe
 Wagner, Richard
composers—popular:
 Arlen, Harold
 Billings, William
 Comden, Betty;
 and Green, Adolf
 Duke, Vernon
 Foster, Stephen
 Gershwin, George
 Handy, W.C.
 Lerner, Alan Jay
 Lloyd Webber,
 Sir Andrew
 Loewe, Frederick
 Mercer, Johnny
 Porter, Cole
 Rodgers, Richard
 Sondheim, Stephen
 Warren, Harry
composers—
Renaissance:
 Blow, John
 Byrd, William
 Cabezón,
 Antonio de
 Dowland, John
 Dufay, Guillaume
 Gabrieli, Andrea
 Gabrieli, Giovanni
 Gibbons, Orlando
 Isaac, Heinrich
 Josquin des Prez
 Lasso, Orlando di
 Monteverdi,
 Claudio
 Morley, Thomas
 Ockeghem, Jean d'
 Palestrina,
 Giovanni
 Pierluigi da
 Tallis, Thomas
 Weelkes, Thomas
 Wilbye, John
 Zarlino, Gioseffo
composers—
Romantic period:
 Balakirev, Mily
 Berlioz, Hector
 Borodin,
 Aleksandr
 Brahms, Johannes
 Bruckner, Anton
 Chabrier,
 Emmanuel
 Chopin, Frédéric
 Delius, Frederick
 Dukas, Paul
 Dvořák, Antonín
 Elgar, Sir Edward
 Fauré, Gabriel
 Franck, César
 Glière, Reinhold
 Glinka, Mikhail
 Ivanovich
 Grieg, Edvard
 Holst, Gustav
 Indy, Vincent d'
 Liszt, Franz
 MacDowell,
 Edward
 Mahler, Gustav
 Mendelssohn, Felix
 Mussorgsky,
 Modest
 Paderewski, Ignacy
 Paganini, Niccolò
 Rachmaninoff,
 Sergey
 Respighi, Ottorino
 Rimsky-Korsakov,
 Nikolay
 Andreyevich
 Rubinstein, Anton
 Grigoryevich
 Saint-Saëns,
 Camille
 Schubert, Franz
 Schumann, Robert
 Sibelius, Jean
 Smetana, Bedřich
 Strauss, Johann,
 the Elder
 Strauss, Johann,
 the Younger
 Tchaikovsky, Peter
 Ilich
 Vaughan Williams,
 Ralph
 Weber, Carl
 Maria von
 Wolf, Hugo
conductors:
 Ansermet, Ernest
 Beecham, Sir
 Thomas,
 2nd Baronet
 Beinum,
 Eduard van
 Bernstein, Leonard
 Damrosch, Walter
 Johannes
 Furtwängler,
 Wilhelm
 Goossens, Sir
 Eugene
 Karajan,
 Herbert von
 Klemperer, Otto
 Koussevitzky,
 Serge
 Mengelberg,
 Willem
 Monteux, Pierre
 Munch, Charles
 Nikisch, Arthur
 Ormandy, Eugene
 Reiner, Fritz
 Solti, Sir Georg
 Stokowski,
 Leopold
 Szell, George
 Thomas, Theodore
 Toscanini, Arturo
 Walter, Bruno
 Weingartner, Felix
instrument makers:
 Amati family
 Boehm, Theobald
 Cavaillé-Coll,
 Aristide
 Cristofori,
 Bartolomeo
 Guarneri family
 Hammond,
 Laurens
 Stein, Johann
 Andreas
 Steinway, Henry
 Engelhard
 Stradivari, Antonio
 Willis, Henry
 Wurlitzer family
musicians—blues,
country, gospel, pop,
rock:
 Acuff, Roy
 Baez, Joan
 Beatles, the
 Carter family
 Charles, Ray
 Crosby, Bing
 Franklin, Aretha
 Guthrie, Woody
 Hendrix, Jimi
 Jackson, Mahalia
 Jolson, Al
 Lauder, Sir Harry
 Monroe, Bill
 Presley, Elvis
 Rainey, Ma
 Rolling Stones
 Seeger, Pete
 Sinatra, Frank
 Smith, Bessie
musicians—ragtime,
jazz, swing, bebop:
 Armstrong, Louis
 Basie, Count
 Blakey, Art
 Coltrane, John
 Davis, Miles
 Dorsey, Jimmy;
 and Dorsey,
 Tommy
 Ellington, Duke
 Gillespie, Dizzy
 Goodman, Benny
 Hines, Earl
 Holiday, Billie
 Horne, Lena
 Joplin, Scott
 Kenton, Stan
 Miller, Glenn
 Parker, Charlie
 Shaw, Artie
 Silver, Horace
 Whiteman, Paul
musicologists:
 Adler, Guido
 Burney, Charles
 Chrysander, Karl
 Franz Friedrich
 Guido of Arezzo
 Hornbostel, Erich
 Moritz von
 Sachs, Curt
 Sharp, Cecil
pianists:
 Bülow, Hans,
 Freiherr von
 Busoni, Ferruccio
 Cortot,
 Alfred-Denis
 Gieseking, Walter
 Godowsky,
 Leopold
 Hess, Dame Myra
 Horowitz,
 Vladimir
 Paderewski, Ignacy

Rubinstein, Anton Grigoryevich Schnabel, Artur <i>singers—baritones and basses:</i> Chaliapin, Feodor Fischer, Ludwig Fischer-Dieskau, Dietrich Lablache, Luigi Maurel, Victor Pinza, Ezio Robeson, Paul Warren, Leonard <i>singers—contraltos:</i> Alboni, Marietta Anderson, Marian Butt, Dame Clara Ferrier, Kathleen Homer, Louise Schumann-Heink, Ernestine <i>singers— mezzo-sopranos:</i> Baker, Dame Janet	Berganza, Teresa Gerhardt, Elena Horne, Marilyn Malibran, Maria Viardot, Pauline <i>singers—sopranos:</i> Callas, Maria Destinn, Emmy Farrar, Geraldine Flagstad, Kirsten Galli-Curci, Amelita Garden, Mary Grisi, Giulia Lehmann, Lotte Lind, Jenny Melba, Dame Nellie Nilsson, Birgit Pons, Lily Ponselle, Rosa Price, Leontyne Schumann, Elisabeth	Sills, Beverly Sutherland, Dame Joan <i>singers—tenors:</i> Björling, Jussi Caruso, Enrico Domingo, Plácido Duprez, Gilbert García, Manuel García, Manuel del Popolo Gigli, Beniamino McCormack, John Mario, Giovanni Matteo Nourrit, Adolphe Pavarotti, Luciano Pears, Sir Peter Raaff, Anton Reszke, Jean de Rubini, Giovanni Battista	Slezak, Leo Tucker, Richard <i>violinists:</i> Auer, Leopold Elman, Mischa Heifetz, Jascha Joachim, Joseph Menuhin, Sir Yehudi Oistrakh, David Paganini, Niccolò Perlman, Itzhak Sarasate, Pablo de Ysaÿe, Eugène
--	--	---	--

INDEX: See entries under all of the terms above

Section 625. Dance

- A. The art of dance
 1. The nature of dance as art: its origins and functions
 2. Choreography and dance notation
 3. Diverse classifications of kinds of dance
 4. Theoretical, critical, and descriptive writing about dance
 5. The integration of dance with other arts: dance in the theatre, in motion pictures
[see 622.C.2. and 623.B.]
- B. Ballet
 1. The nature of ballet as an art
 2. The integration of ballet with other arts; *e.g.*, with opera, drama, motion pictures, television
 3. Major kinds of ballet: traditional, classical, modern, abstract, expressive
 4. The history of ballet
- C. Modern dance
 1. Principles underlying modern dance: expression and communication of feeling
 2. The relation of modern dance to other arts; *e.g.*, to musical theatre, drama, motion pictures, television
 3. Development of modern dance: kinds, theories, techniques, and methods of modern dance
- D. Primitive, folk, and popular dance
- E. The history of dance
 1. The dance of Western peoples
 2. The dance of non-Western peoples

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with dance

African Arts	East Asian Arts
American Peoples, Arts of Native	Folk Arts
Central Asian Arts	Oceanic Arts
Dance, The Art of	South Asian Arts
Dance, The History of Western	Southeast Asian Arts

MICROPAEDIA: Selected entries of reference information

General subjects

<i>ballet</i> :	hora	<i>Indian classical</i>	jazz dance
assemblé	hornpipe	<i>dance</i> :	jitterbug
ballet	huayño	bharata natya	mambo
Ballet comique de la reine	hula	garabā	minuet
ballet movement	jarabe	kathak	passacaglia
ballet position	jig	kathākali	passepied
battement	jota	kuchipudi	pavane
brisé	juba	manipuri	quadrille
classical ballet	kolo	orissī	rumba
entrechat	ländler	<i>popular dance</i> :	samba
fouetté en tournant	maypole dance	allemande	tango
International Ballet Competitions	mazurka	basse danse	twist
pirouette	Morris dance	bergamasca	volta, la
<i>folk dance</i> :	polka	branle	waltz
bourrée	polska	cakewalk	<i>other</i> :
capoeira	reel	cha-cha	bugaku
carole	rigaudon	chaconne	choreography
clog dance	sarabande	Charleston	dance
country dance	seguidilla	contredanse	dance notation
czardas	seguidilla	courante	eurythmics
fandango	square dance	estampie	Labanotation
farandole	sword dance	fox-trot	modern dance
flamenco	syrtos	galliard	tap dance
	Virginia reel	gavotte	
	voladores, juego de los	gigue	

Biographies

Balanchine, George	Diaghilev, Sergey Pavlovich	Helpmann, Sir Robert	Nureyev, Rudolf
Baryshnikov, Mikhail	Dolin, Sir Anton	Humphrey, Doris	Pavlova, Anna
Bournonville, August	Duncan, Isadora	Jooss, Kurt	Petit, Roland
Cunningham, Merce	Fokine, Michel	Laban, Rudolf	Rambert, Dame Marie
de Mille, Agnes	Fonteyn, Dame Margot	Lifar, Serge	Saint Denis, Ruth
	Graham, Martha	Massine, Léonide	Tamiris, Helen
		Nijinsky, Vaslav	Taylor, Paul
		Nikolais, Alwin	Weidman, Charles

INDEX: See entries under all of the terms above

Section 626. Architecture, Garden and Landscape Design, and Urban Design

- A. The art of architecture
1. Elements of design and principles of composition
 2. Aesthetic aspects of building materials and constructional systems used in architecture [for technological aspects, see 733]
 - a. Building materials; *e.g.*, stone, brick, wood, iron and steel, concrete
 - b. Constructional systems; *e.g.*, load-bearing wall and nonload-bearing wall, post and lintel, arch, vault, dome, truss, framed structures
 3. Diverse structural elements and details of buildings; *e.g.*, floors, walls, ceilings, roofs, windows, doors, stairways
 4. Architectural ornamentation: mimetic ornament, applied ornament, organic ornament
 5. Diverse kinds of architecture and building types determined by their functions
 - a. Domestic, or residential, architecture; *e.g.*, houses, apartments, castles, hotels
 - b. Religious and commemorative architecture; *e.g.*, temples, churches, synagogues, mosques, tombs, shrines, memorials, monuments
 - c. Governmental architecture; *e.g.*, town halls, capitols, courthouses, post offices
 - d. Recreational architecture; *e.g.*, theatres, auditoriums, athletic facilities, museums, libraries
 - e. Educational and public welfare architecture; *e.g.*, schools and universities, hospitals, prisons, aqueducts
 - f. Commercial and industrial architecture; *e.g.*, office buildings, banks, stores, factories, refineries
 - g. Agricultural architecture; *e.g.*, barns, stables, silos
 - h. Military architecture; *e.g.*, forts, castles, armouries [see also 736]
 6. Primitive and folk architecture [see also 613]
 7. The history of architecture
 - a. Western architecture
 - b. The architecture of non-Western peoples [see also 613]
- B. Garden and landscape design
- C. Urban design: the artistic aspects of city planning [for the sociological, political, economic, and psychological aspects of urban design, see 524.B.; for the technological aspects, see 737.C.2.]
-

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with architecture, garden and landscape design, and urban design

African Arts	Folk Arts
American Peoples, Arts of Native	Garden and Landscape Design
Architecture, The Art of	Middle Eastern Arts and
Architecture, The History of Western	Architecture, Ancient
Central Asian Arts	Oceanic Arts
East Asian Arts	South Asian Arts
Egyptian Arts and Architecture, Ancient	Southeast Asian Arts

MICROPAEDIA: Selected entries of reference information

General subjects

<i>architecture</i> —	<i>architecture</i> —	fortification	acroterion
<i>building materials</i>	<i>military</i> :	kremlin	anthemion
<i>and techniques</i> :	alcázar	<i>architecture</i> —	brattishing
See Section 733 of	castle	<i>ornamentation</i> :	bucranium
Part Seven		acanthus	

candelabrum	minaret	buttress	spire
coffer	mosque	canopy	squinch
diaper	narthex	cantilever	staircase
finial	nave	capital	term
fluting and reeding	obelisk	carrel	thermal window
fret	pagoda	caryatid	tracery
frieze	presbytery	casement window	truss
hoodmold	pulpit	ceiling	tympanum
ornament	rood screen	chigai-dana	vault
pinnacle	sacristy	chimneypiece	wall
pulvinated frieze	sedilia	clerestory	window
reticulated work	śikhara	colonnade	<i>architecture—</i>
rinseau	slype	column	<i>styles, schools, and</i>
running-dog	stave church	console	<i>movements:</i>
pattern	stūpa	corbel	African arts
scrollwork	temple	corbel table	Akbar period
stalactite work	torii	cornerstone	architecture
strapwork	transept	cupola	Art Deco
stringcourse	triforium	cusped	Art Nouveau
stuccowork	ziggurat	dome	Baroque period
swag	<i>architecture—</i>	door	Bauhaus
terra-cotta	<i>residential:</i>	dormer	Burgundian
<i>architecture—</i>	apartment house	entablature	Romanesque style
<i>recreational:</i>	bungalow	exedra	Byzantine art
amphitheatre	chalet	foyer	Carolingian arts
auditorium	château	framed building	Carpenter Gothic
furo	cliff dwelling	gable	Central Asian arts
Islāmic bath	desert palace	gallery	Chicago School
odeum	domus	gargoyle	Churrigueresque
stadium	hogan	geodesic dome	chusimp'o style
thermae	igloo	hip roof	Cistercian style
Turkish bath	inn	hypocaust	Classicism and
<i>architecture—</i>	insula	intercolumniation	Neoclassicism
<i>religious:</i>	lodge	lantern	Composite order
abbey	log cabin	loft	Constructivism
aisle	longhouse	loggia	Corinthian order
ambo	manor house	louver	Doric order
ambulatory	palace	lunette	Early Christian art
apse	pueblo	megaron	Egyptian art
baldachin	ranch house	moucharaby	Empire style
baptistery	saltbox	newel	Federal style
basilica	tent	oriel	Functionalism
campanile	tepee	Palladian window	Futurism
chancel	villa	patio	Gothic art
chantry	yurt	pedestal	Gothic Revival
chapel	<i>architecture—</i>	pediment	Greek Revival
chapter house	<i>structural elements</i>	pendant	Henry IV style
chevet	<i>and building details:</i>	pendentive	International Style
choir	alcove	penthouse	Ionic order
choragic	anta	piano nobile	Isabelline
monument	arcade	pilaster	Islāmic arts
church	arch	podium	kara-yō
cloister	atlas	porch	Karnatic temple
confessional	atrium	porte cochere	architecture
crypt	balcony	portico	Manueline
gopura	balustrade	quoin	Mozarabic art
hagioscope	bay window	retaining wall	Mughal
hall church	beam	roof	architecture
iconostasis	belvedere	rose window	New Brutalism
jinja	bema	rotunda	Norman style
Lady chapel	bond	salomónica	North Indian
lantern of the dead	bracket	setback	temple
lych-gate	brise-soleil	spandrel	architecture

Oceanic arts	Tenjiku	orientation	park
order	Tudor style	quadrangle	parterre
Palladianism	türbe	skyscraper	pavilion
picturesque	<i>architecture—</i>	stela	pergola
Plateresque	<i>other:</i>	tholos	topiary
Prairie style	architecture	tower	<i>urban design:</i>
rocaille	belfry	triumphal arch	acropolis
Rococo style	caravansary	<i>landscape design:</i>	bastide
Romanesque art	cenotaph	allée	boulevard
Second Empire	cha-shitsu	arbor	civic centre
style	columbarium	broderie	forum
Shāh Jahān period	cortile	cascade	garden city
architecture	court	conservatory	new town
shinden-zukuri	crannog	English garden	promenade
Shingle style	entasis	espalier	urban planning
shoin-zukuri	folly	fountain	
South Asian arts	Gujarāt woodwork	gazebo	
South Indian	high-rise building	green theatre	
temple	hotel dieu	greenhouse	
architecture	hypostyle hall	grotto	
Southeast	kiosk	labyrinth	
Asian arts	kiva	landscape	
Stijl, De	mausoleum	architecture	
superposed order	megalith	nymphaeum	
tap'o style	module	orangery	

Biographies

architects:

Aalto, Alvar	Garnier, Charles	Olbrich, Joseph	Venturi, Robert
Adam, Robert	Gaudí, Antoni	Palladio, Andrea	Vignola,
Adler, Dankmar	Gropius, Walter	Pei, I.M.	Giacomo da
Alberti, Leon	Guarini, Guarino	Phidias	Viollet-le-Duc,
Battista	Hoffmann, Josef	Pietro da Cortona	Eugène-
Behrens, Peter	Hunt, Richard	Pugin, Augustus	Emmanuel
Bernini, Gian	Morris	Welby	Wagner, Otto
Lorenzo	Jenney, William	Northmore	Walter, Thomas
Blondel,	Le Baron	Richardson, Henry	Ustick
Jacques-François	Johnson, Philip C.	Hobson	White, Stanford
Borromini,	Jones, Inigo	Root, John	Wren, Sir
Francesco	Kahn, Albert	Wellborn	Christopher
Boullée,	Kahn, Louis I.	Rudolph, Paul	Wright, Frank
Étienne-Louis	Kent, William	Saarinen, Eero	Lloyd
Bramante, Donato	Klint, Kaare	Sangallo family	<i>urban planners:</i>
Breuer, Marcel	Klatrobe, Benjamin	Sansovino, Jacopo	Brown, Lancelot
Brunelleschi,	Ledoux,	Schinkel, Karl	Burnham,
Filippo	Claude-Nicolas	Friedrich	Daniel H.
Bulfinch, Charles	Loos, Adolf	Serlio, Sebastiano	Fry, E. Maxwell;
Butterfield,	Lutyens, Sir Edwin	Sinan	and Drew, Jane
William	Mansart, François	Soufflot,	Le Nôtre, André
Cerceau, du,	Mansart, Jules	Jacques-Germain	L'Enfant,
family	Hardouin-	Stone, Edward	Pierre-Charles
Chambers, Sir	Meigs,	Durell	Loudon, John
William	Montgomery C.	Street, George	Claudius
Churriguera family	Mendelsohn, Erich	Edmund	Nash, John
Corbusier, Le	Michelozzo	Strickland,	Olmsted,
Delorme, Philibert	Mies van der	William	Frederick Law
Fischer von Erlach,	Rohe, Ludwig	Sullivan, Louis	Repton, Humphry
Johann Bernhard	Nervi, Pier Luigi	Tange Kenzō	Soleri, Paolo
Fuller, R.	Neutra, Richard	Upjohn, Richard	
Buckminster	Joseph	Vanbrugh, Sir	
	Niemeyer, Oscar	John	

Section 627. Sculpture

- A. The art of sculpture
1. Elements of design and principles of composition
 2. The iconography of sculpture
 3. Materials of sculpture; *e.g.*, stone, wood, metal, clay, ivory, plaster, concrete, glass fibre, wax, paper
 4. Tools, methods, and techniques of sculpture; *e.g.*, carving, modeling, casting and molding, surface finishing
- B. The diverse kinds of sculpture
1. Kinds of sculpture distinguished by their spatial context; *e.g.*, sculpture in the round, relief sculpture, kinetic sculpture, environmental sculpture
 2. Kinds of sculpture distinguished by subject matter
 - a. Representational sculpture; *e.g.*, human figures, devotional images and objects, portraits, still lifes, animal figures
 - b. Nonrepresentational sculpture
 - c. Decorative sculpture
 3. Kinds of sculpture distinguished by their special uses or functions
 - a. Ceremonial and ritualistic objects
 - b. Coins and medals
 - c. Commemorative sculpture; *e.g.*, monuments, tombs, tombstones, stelae
[see also 626.A.5.b.]
 - d. Masks
 4. Primitive and folk sculpture
- C. The history of sculpture
1. Western sculpture
 2. The sculpture of non-Western peoples

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with sculpture

African Arts	Middle Eastern Arts and Architecture, Ancient
American Peoples, Arts of Native	Oceanic Arts
Central Asian Arts	Sculpture, The Art of
East Asian Arts	Sculpture, The History of Western
Egyptian Arts and Architecture, Ancient	South Asian Arts
Folk Arts	Southeast Asian Arts
Islāmic Arts	
Masks	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>styles:</i>	Eastern Indian	Massim style	Sukhothai style
Amarāvati	bronze	Mathurā art	Tami style
sculpture	Fujiwara style	Northern Wei	Tempyō style
Baroque period	Futurism	sculpture	Tori style
beak style	Gandhāra art	Renaissance	U Thong style
Bhārhut sculpture	Jōgan style	Rococo style	Western Indian
Classicism and	korwar style	Romanesque art	bronze
Neoclassicism	Kushān art	Sānchi sculpture	<i>types:</i>
Cubism	malanggan style	South Indian	bieri
	Mannerism	bronze	

bird stone	kachina	stabile	lost-wax process
colossus	kinetic sculpture	Tanagra figurine	modeling
cylinder seal	kore	telum figure	Oceanic arts
Daedalic sculpture	kouros	terra-cotta	sculpture
death mask	mbulu-ngulu	<i>other:</i>	South Asian arts
environmental	minimalism	African arts	Southeast
sculpture	moai figure	armature	Asian arts
figurehead	mobile	Central Asian arts	
gigaku mask	relief	contrapposto	
gisant	segoni-kun	Gothic art	

Biographies

Ammannati,	Donatello	Houdon,	Pisano, Nicola
Bartolommeo	Epstein, Sir Jacob	Jean-Antoine	Praxiteles
Bernini, Gian	Flaxman, John	Lehmbruck,	Puget, Pierre
Lorenzo	Gabo, Naum	Wilhelm	Rodin, Auguste
Berruguete, Alonso	Ghiberti, Lorenzo	Lipchitz, Jacques	Saint-Gaudens,
Brancusi,	Giacometti,	Lysippus	Augustus
Constantin	Alberto	Maillol, Aristide	Sluter, Claus
Brunelleschi,	Giambologna	Michelangelo	Smith, David
Filippo	Gill, Eric	Milles, Carl	Thorvaldsen,
Calder, Alexander	Girardon, François	Moore, Henry	Bertel
Canova, Antonio	Hepworth, Dame	Myron	Tinguely, Jean
Cellini, Benvenuto	Barbara	Oldenburg, Claes	Verrocchio,
Della Robbia,	Hildebrand,	Phidias	Andrea del
Luca	Adolf von	Pisano, Giovanni	

INDEX: See entries under all of the terms above

Section 628. Drawing, Painting, Printmaking, and Photography

A. Drawing

1. Elements of design and principles of composition
2. Drawing media; *e.g.*, chalk, charcoal, crayon, ink, pastel, pencil, scratchboard, silverpoint, wash
3. Diverse kinds of drawing
 - a. Kinds of drawing determined by subject matter; *e.g.*, portraits, landscapes, figure compositions, still lifes
 - b. Kinds of drawing determined by special uses
[for aspects of drawing related to writing, see 629.C.4.]
 - i. Animation
 - ii. Caricature, cartoon, comic strip
 - iii. Cartography and mapping
 - iv. Drafting
4. The history of drawing

B. The art of painting

1. Elements of design and principles of composition
2. The iconography of painting
3. Painting media; *e.g.*, acrylic, casein, encaustic, fresco, gouache, ink, oil, tempera, watercolour
4. Related media and techniques
 - a. Calligraphy
[see 629.C.4.a.]
 - b. Drawing
[see A., above]
 - c. Mosaic

- d. Photography
[see D., below]
 - e. Printmaking
[see C., below]
 - f. Stained glass
 - g. Tapestry
 - 5. The kinds of painting
 - a. Kinds of painting determined by the type or form of the physical object on which the picture is painted
 - i. Fixed objects; *e.g.*, cave painting, mural painting
 - ii. Movable objects: easel painting, fan painting, manuscript illumination, miniature painting, screen painting, scroll painting
 - b. Kinds of painting determined by subject matter
 - i. Representational painting; *e.g.*, devotional painting, genre painting, landscape painting, narrative painting, portrait painting, still-life painting
 - ii. Nonrepresentational painting
 - c. Kinds of painting determined by the maker or by the audience: primitive and folk painting
 - 6. The history of painting
 - a. Western painting
 - b. The painting of non-Western peoples
- C. Printmaking
- 1. Printmaking as an art: its characteristics and problems; *e.g.*, the problem of originality versus reproduction
 - 2. Printmaking media
 - a. Relief or cameo media; *e.g.*, woodcuts and linoleum cuts, wood engraving
 - b. Intaglio media; *e.g.*, aquatint, drypoint, etching, lift-ground prints, line engraving, mezzotint, soft-ground prints, stipple engraving
 - c. Surface media: lithography, monoprint, serigraphy
 - 3. Printmaking tools and techniques
[see 735.E.4.]
 - 4. The history of printmaking
- D. Photography as an art
- 1. The nature and problems of photography as an art
 - 2. Photographic equipment and techniques: lenses; cameras; exposure, processing, and printing
[see 735.G.]
 - 3. The kinds of photography
 - a. Major kinds of photography determined by subject matter; *e.g.*, portraits, landscapes
 - b. Kinds of functional photography; *e.g.*, photojournalism and photo reportage, astronomical photography, aerial photography, radiography
 - 4. The history of photography

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and biographies dealing with drawing, painting, printmaking, and photography

General subjects

Caricature, Cartoon,
and Comic Strip
Drafting
Drawing
Folk Arts
Mapping and Surveying

Painting, The Art of
Painting, The
History of Western
Photography
Printmaking

BiographiesLeonardo da Vinci
MichelangeloPicasso
RembrandtTitian
Velázquez

MICROPAEDIA: Selected entries of reference information

General subjects*drawing:*aerial perspective
anamorphosis
animation
blot drawing
brush drawing
caricature
cartography
cartoon
chalk drawing
charcoal drawing
chiaroscuro
comic strip
crayon
drapery
drawing
écorché
foreshortening
isometric drawing
line-and-wash
drawing
metal point
pastel
pen drawing
pencil drawing
perspective
sanguine
scratchboard
sgraffito
silhouette
sketch
squaring
wash drawing*mosaics and stained
glass:*comesso
Cosmati work
emblem
gemmail
mosaic
opus sectile
opus tassellatum
opus vermiculatum
pebble mosaic
pietra dura
stained glass
tessara
tessellated
pavement*painting:*aerial perspective
anamorphosis
bark painting
casein painting
draperyencaustic painting
gesso
gouache
grisaille
oil painting
painting
panel painting
perspective
sand painting
sizing
tempera painting
watercolour*photography:*albumen paper
carte-de-visite
Fotoform
gelatin process
Group f.64
Linked Ring
Photo-Seession
Group
photomontage
tintype
vortograph*prehistoric painting:*Altamira
Font-de-Gaume
Franco-Cantabrian
school
Gargas
Lascaux Grotto
macaroni
Tassili-n-Ajjer
Trois Frères, Les
X-ray style*printing:*aquatint
bookplate
cliché-verre
decal
drypoint
embossing
engraving
etching
ink
intaglio
linocut
lithography
mezzotint
monotype
printmaking
relief printing
rubbing
stencillingwood engraving
woodcut*styles of painting—**Chinese:*Ch'an painting
Che school
Eight Eccentrics of
Yang-chou
Eight Masters of
Nanking
Four Masters of
Anhwei
Four Masters
of the Yüan
Dynasty
kung-pi
Ma-hsia school
p'o-mo
scroll painting
Six Masters of
the early Ch'ing
period
ts'un
wen-jen-hua
Wu school*styles of painting—**Indian:*Basohli painting
Bündi painting
Deccani painting
Eastern Indian
painting
Kālighāt painting
Kishangarh
painting
Mālwa painting
Mewār painting
Mughal painting
Pahari painting
Rājasthāni
painting
South Asian arts
Western Indian
painting*styles of painting—**Islāmic:*Baghdad school
Eṣfahān school
Herāt school
Islāmic arts
Jalāyirid school
Mosul school
Shirāz school
Tabriz school*styles of painting—**Japanese:*chinsō
Kanō school
Nan-ga
nise-e
scroll painting
Shijō school
suiboku-ga
Tosa school
Ukiyo-e
Yamato-e*styles of painting—**Western:*Abstract
Expressionism
Abstraction-Création
Action painting
Ada group
Antwerp
Mannerists
art brut
Automatism
Avignon school
Bambocciati
Barbizon school
Biedermeier style
Blaue Reiter, Der
Bolognese school
Brücke, Die
Camden Town
group
Cobra
Cubism
Dada
Danube school
Düsseldorf school
Eight, The
English school
Fauvism
fête champêtre
Flemish art
Fontainebleau,
school of
fore-edge painting
Futurism
genre painting
Geometric style
Ghent-Bruges
school
Hiberno-Saxon
style
Hudson River
school
Impressionism

Intimism	Novgorod school	Surrealism	Amarna style
Italianate painters	Op art	Symbolist	Central Asian arts
Jack of Diamonds	Orphism	movement	Egyptian art
Japanism	Peredvizhniki	Synchromism	Sogdian art
London group	plein air painting	Synthetism	Southeast
Luminism	Pont-Aven school	Tachism	Asian arts
Macchiaioli	Pop art	tondo	wandjina style
Metaphysical	Postimpressionism	trompe l'oeil	<i>other:</i>
painting	Pre-Raphaelite	Utrecht school	collage
minimalism	Brotherhood	vanitas	diorama
Moscow school	Precisionism	veduta	folk art
Nabis	Pskov school	Venetian school	limner
Nazarene	Purism	Vingt, Les	mural
Neo-Expressionism	Rayonism	Vladimir-Suzdal	panorama
Neo-Impressionism	Romanticism	school	popular art
Neue	singerie	Winchester school	Poussinist
Künstlervereinigung	Social Realism	Worpswede school	Rubenist
Neue Sachlichkeit	still-life painting	<i>styles of painting—</i>	tapestry
New York school	Stroganov school	<i>other:</i>	
Norwich school	Suprematism	African arts	

Biographies

<i>illustrators:</i>	Gogh, Vincent van	<i>painters—French:</i>	Toulouse-Lautrec,
Beardsley, Aubrey	Hals, Frans	Bonnard, Pierre	Henri de
Beerbohm,	Mondrian, Piet	Bourdon, Sébastien	Vuillard, Édouard
Sir Max	Rembrandt	Braque, Georges	Watteau, Antoine
Crane, Walter	Harmenszoon	Cézanne, Paul	<i>painters—German:</i>
Daumier, Honoré	van Rijn	Chardin,	Cranach, Lucas,
Gibson, Charles	Ruisdael,	Jean-Baptiste-Siméon	the Elder
Dana	Jacob van	Claude Lorrain	Dürer, Albrecht
Leech, John	Scorel, Jan van	Corot, Camille	Ernst, Max
Nast, Thomas	Steen, Jan	Courbet, Gustave	Grünewald,
Pyle, Howard	Terborch, Gerard	David,	Matthias
Rockwell, Norman	Vermeer, Jan	Jacques-Louis	Holbein, Hans, the
Thurber, James	<i>painters—East Asian:</i>	Degas, Edgar	Elder
<i>painters—British:</i>	Hasegawa, Tōhaku	Delacroix, Eugène	Holbein, Hans, the
Burne-Jones, Sir	Hiroshige	Duchamp, Marcel	Younger
Edward Coley	Hokusai	Fouquet, Jean	Kirchner, Ernst
Constable, John	Hsia Kuei	Fragonard,	Ludwig
Gainsborough,	Ma Yüan	Jean-Honoré	Lochner, Stefan
Thomas	Ogata Kōrin	Gauguin, Paul	Marc, Franz
Hogarth, William	Sesshū	Géricault,	Nolde, Emil
Lawrence, Sir	Shiba Kōkan	Théodore	Pacher, Michael
Thomas	Tomioka Tessai	Gros,	<i>painters—Italian:</i>
Lewis, Wyndham	Tung Ch'i-ch'ang	Antoine-Jean,	Andrea del Sarto
Millais, Sir John	<i>painters—Flemish:</i>	Baron	Angelico, Fra
Everett, 1st	Bruegel, Pieter, the	Ingres,	Antonello da
Baronet	Elder	Jean-Auguste-	Messina
Palmer, Samuel	Campin, Robert	Dominique	Bassano, Jacopo
Reynolds, Sir	David, Gerard	Le Brun, Charles	Bellini, Gentile
Joshua	Eyck, Jan van	Léger, Fernand	Bellini, Giovanni
Rossetti, Dante	Goes, Hugo	Manet, Édouard	Bellini, Jacopo
Gabriel	van der	Matisse, Henri	Boccioni, Umberto
Stubbs, George	Mabuse, Jan	Monet, Claude	Botticelli, Sandro
Turner, J.M.W.	Massys, Quentin	Pissarro, Camille	Bramantino
Wilson, Richard	Memling, Hans	Poussin, Nicolas	Canaletto
<i>painters—Dutch:</i>	Rubens, Peter Paul	Renoir,	Caravaggio
Bosch,	Van Dyck, Sir	Pierre-Auguste	Carracci, Annibale
Hiëronymus	Anthony	Rouault, Georges	Castagno,
Bouts, Dirck	Weyden, Rogier	Rousseau, Henri	Andrea del
Cuyp, Aelbert	van der	Seurat, Georges	Cavallini, Pietro
Jacobsz			Cimabue

Correggio	Tintoretto	Motherwell,	Cartier-Bresson,
Crespi, Giovanni	Titian	Robert	Henri
Battista	Uccello, Paolo	O'Keeffe, Georgia	Emerson, Peter
Crivelli, Carlo	Veronese, Paolo	Peale, Charles	Henry
Duccio di	Vitale da Bologna	Willson	Evans, Walker
Buoninsegna	<i>painters—Spanish:</i>	Pollock, Jackson	Frank, Robert
Gaddi, Taddeo	Dalí, Salvador	Rothko, Mark	Hine, Lewis
Gentileschi, Orazio	Goya, Francisco de	Sargent, John	Wickes
Ghirlandajo,	Greco, El	Singer	Nadar
Domenico	Miró, Joan	Shahn, Ben	Ray, Man
Giorgione	Murillo, Bartolomé	Warhol, Andy	Robinson, Henry
Giotto de Bondone	Esteban	Whistler, James	Peach
Giovanni di Paolo	Picasso, Pablo	McNeill	Sander, August
Giulio Romano	Ribera, José de	Wood, Grant	Siskind, Aaron
Leonardo da Vinci	Velázquez de	Wyeth, Andrew	Smith, W. Eugene
Lippi, Fra Filippo	Cuéllar, Diego	<i>painters—other:</i>	Steichen, Edward
Lorenzetti, Pietro	Zurbarán,	Behzad	Sieglitz, Alfred
Lotto, Lorenzo	Francisco de	Chagall, Marc	Strand, Paul
Mantegna, Andrea	<i>painters—United</i>	Clouet, Jean	Weston, Edward
Martini, Simone	<i>States:</i>	Kandinsky,	White, Minor
Masaccio	Allston,	Wassily	<i>printmakers and</i>
Masolino	Washington	Klee, Paul	<i>engravers:</i>
Michelangelo	Beckmann, Max	Kokoschka, Oskar	Bewick, Thomas
Modigliani,	Benton, Thomas	Loutherbourg,	Blake, William
Amedeo	Hart	Philip James de	Bresdin, Rodolphe
Orcagna, Andrea	Bingham, George	Munch, Edvard	Callot, Jacques
Parmigianino	Caleb	Orozco, José	Currier, Nathaniel;
Perugino	Cassatt, Mary	Clemente	and Ives, James
Piazzetta,	Cole, Thomas	Rivera, Diego	Duvet, Jean
Giovanni Battista	Curry, John	<i>photographers:</i>	Klinger, Max
Piero della	Steuart	Abbott, Berenice	Kollwitz, Käthe
Francesca	Davis, Stuart	Adams, Ansel	Lucas van Leyden
Piero di Cosimo	de Kooning,	Arbus, Diane	Méryon, Charles
Pisanello, Il	Willem	Atget, Eugène	Raimondi,
Primaticcio,	Eakins, Thomas	Bourke-White,	Marcantonio
Francesco	Frankenthaler,	Margaret	Schongauer,
Raphael	Helen	Brady, Mathew B.	Martin
Roberti,	Gorky, Arshile	Brandt, Bill	Villon, Jaques
Ercole de'	Homer, Winslow	Brassai	
Signorelli, Luca	Hopper, Edward	Cameron, Julia	
Tiepolo, Giovanni	Hurd, Peter	Margaret	
Battista	Inness, George	Capa, Robert	

INDEX: See entries under all of the terms above

Section 629. Arts of Decoration and Functional Design

- A. The nature and scope of the arts of decoration and functional design
- B. The kinds of decorative arts and types of decorative objects classified by the materials and methods used to produce or decorate them, or both
 1. Clay; *e.g.*, earthenware, stoneware, porcelain
 2. Fabrics
 3. Gems
 4. Glass
 5. Metals
 6. Paper; *e.g.*, papier-mâché, wallpaper
 7. Stone

8. Wood
 9. Other kinds of inorganic materials
with special attention to
 - a. Plaster, cement, and concrete
 - b. Plastics and other synthetic materials
 10. Other kinds of organic materials
with special attention to
 - a. Flowers, foliage, and related botanical materials; *e.g.*, bouquets, garlands, wreaths
[for garden and landscape design, see 626.B.]
 - b. Plant fibres, reeds, branches, and related materials; *e.g.*, baskets, mats
 - c. Skins, furs, and related materials
 - d. Shell, horn, bone, ivory, and related materials
 - e. Wax
 11. Special decorative finishing materials, processes, and techniques
 - a. Enamelwork; *e.g.*, cloisonné, champlevé, painted enamels
 - b. Lacquerwork; *e.g.*, carved lacquer, inlaid lacquer, laque burgauté
 - c. Inlay work; *e.g.*, veneering, intarsia, marquetry
- C. The arts of functional design: kinds and types of artistic object classified by their function
1. Dress design and body decoration
 - a. Dress and dress accessories
[for the technological aspects of garment making, see 732.B.3.]
 - b. Jewelry
 - c. Body decoration: cosmetics; hairdressing and hair adornment; physical modification; perfumes, scents, and fragrances
 2. Industrial design
 - a. Industrial design as an art
 - b. Diverse kinds of industrial design classified by function; *e.g.*, design of commercial equipment, design of communications equipment, design of household appliances, design of transportation equipment
 3. Interior design
 - a. Interior design as an art
 - b. The integration of interior design and decoration with architecture: the design and decoration of interior architectural elements
 - i. Ceilings
 - ii. Floors
 - iii. Floor coverings; *e.g.*, rugs, carpets, mats
 - iv. Walls; *e.g.*, molding, paneling, wallpaper
 - v. Windows and doors
 - vi. Other interior architectural elements; *e.g.*, heating units, stairs and staircases
 - c. Objects used for interior decoration: furniture and accessory furnishings
[for technological aspects, see 732.B.4.]
 4. The design of materials and objects for communication and identification
 - a. Handwriting systems and styles: calligraphy, lettering, illuminating
[for forms of writing, see 514.E.]
 - b. Printing arts: typography and printing design, illustration, bookbinding
[for printmaking, see 628.C.]
 - c. Advertising art and design
 - d. The design of signs and symbols used primarily for identification; *e.g.*, heraldic design
 - e. The design of exhibitions and displays; *e.g.*, museum and gallery display

5. The design and decoration of diverse kinds of specialized functional objects
 - a. The design of coins and currency and of medals
 - b. The design and decoration of play materials
 - c. Automata: the design of decorative mechanical objects
 - d. The design and decoration of arms
[for the technological aspects of arms, see 736]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the arts of decoration and functional design

African Arts	East Asian Arts	Printing,	Southeast Asian
Central Asian Arts	Folk Arts	Typography, and	Arts
Decorative Arts	Heraldry	Photoengraving	Writing
and Furnishings	Marketing and	South Asian Arts	
Dress and	Merchandising		
Adornment	Oceanic Arts		

MICROPAEDIA: Selected entries of reference information

General subjects

<i>body decoration:</i>	Art Deco	<i>dress and adornment:</i>	stomacher
barber	Art Nouveau	aigrette	suit
body modifications	Arts and Crafts	buckle	surcoat
and mutilations	Movement	bustle	sweater
hairdressing	auricular style	button	swimsuit
mustache	Biedermeier style	Chilkat weaving	tippet
tattoo	Central Asian arts	chiton	toga
toupee	chinoiserie	cockade	trousers
wig	curvilinear style	codpiece	tunic
<i>calligraphy:</i>	Directoire style	commode	turban
black letter	Empire style	corset	yashmak
bokuseki	Gates of Paradise	crinoline	<i>enameling and</i>
calligraphy	ghaṭa-pallava	dhoti	<i>enamelware:</i>
cancellaresca	Islāmic arts	doublet	Battersea
corsiva	istoriato style	dress	enamelware
Carolingian	Koguryō style	fan	Canton enamel
minuscule	Louis XIII style	farthingale	champlevé
chia-ku-wen	Louis XIV style	glove	cloisonné
chrysography	Louis XV style	hat	en résille
hsiao-chuan	Louis XVI style	hoop skirt	enamel miniature
Insular script	Mosan school	hosiery	enamelwork
italic script	Mosul school	inrō	Limoges painted
ku-wen	Oceanic arts	kashmir shawl	enamel
Kūfic script	patralatā	kimono	<i>floral and foliage</i>
li-shu	Proto-Geometric	loincloth	<i>decorations:</i>
majuscule	style	moccasin	floral decoration
Merovingian script	Queen Anne style	pajamas	garland
minuscule	Régence style	p'ao	ikebana
naskhī script	Regency style	paṭolā	Ikenobō
palimpsest	rocaille	peplos	Ko
rubrication	Scythian art	petticoat	lei
ta-chuan	South Asian arts	Phrygian cap	moribana
ta'liq script	Southeast	poke bonnet	nageire
testegiatta	Asian arts	redingote	nosegay
ts'ao-shu	Turkish style	ruff	Ohara
uncial	William and Mary	sandal	rikka
<i>decorative art styles</i>	style	sari	shōka
<i>and motifs:</i>	vyāla	shawl	wreath
African arts		shoe	zen'ei ikebana
arabesque		sokutai	

- furniture and accessories:*
- Act of Parliament clock
 armoire
 banjo clock
 bath chair
 bed
 bedspread
 bench
 bentwood furniture
 bonheur du jour
 bookcase
 bureau
 cabinet
 cabriole leg
 cane furniture
 Carlton House table
 cassone
 cellarette
 chair
 chest
 chest of drawers
 cheval glass
 Chippendale
 coffer
 commode
 console
 corner furniture
 couch
 court cupboard
 cupboard
 davenport
 desk
 dresser
 dressing table
 drop-leaf table
 drum table
 Early American furniture
 escutcheon
 furniture
 gateleg table
 highboy
 klismos
 ladder-back chair
 love seat
 marquetry
 ming ch'i
 ogee clock
 ottoman
 Parsons table
 Pembroke table
 pew
 pillar and scroll shelf clock
 prie-dieu
 scissors chair
 secretary
- settee
 settle
 Shaker furniture
 sideboard
 stool
 table
 taboret
 throne
 tilt-top table
 tripod
 trundle bed
 upholstery
 vargueno
 veneer
 wainscot chair
 wardrobe
 whatnot
 wickerwork
 Windsor chair
- glassware:*
- Altare glass
 amberina glass
 Amelung glass
 Baccarat glass
 Blaschka glass
 Bohemian glass
 cameo glass
 crown glass
 crystallo ceramic
 cut glass
 engraved glass
 etched glass
 façon de Venise
 flint glass
 Hedwig glass
 Humpen glass
 lustred glass
 Mary Gregory glass
 millefiori glass
 mosaic glass
 Mughal glass
 opaline glass
 perfume bottle
 Portland Vase
 pressed glass
 Römer
 ruby glass
 Sandwich glass
 satin glass
 Venetian glass
 verre églomisé
 Waterford glass
 witch ball
 Zwischengoldgläser
- heraldry, arms, and insignia:*
- armorial ensign
 arms, coat of
 ecclesiastical
 heraldry
- fasces
 flag
 fleur-de-lis
 herald
 heraldic memorial
 heraldry
 labarum
 monogram
 orb
 sceptre
 tartan
- interior design accessories:*
- chandelier
 Coromandel screen
 curtain
 doorstep
 mirror
 molding
 niche
 paneling
 sconce
 toko-no-ma
 wainscot
 wallpaper
- jewelry and gemstones:*
- agate
 almandine
 amethyst
 andradite
 arnlet
 aventurine
 baroque pearl
 bead
 beryl
 birthstone
 brooch
 cameo
 carat
 carnelian
 cat's-eye
 chatelaine
 Chinese jade
 choker
 chrysoberyl
 citrine
 coronet
 crown
 crown jewels
 cultured pearl
 diamond
 diamond cutting
 earring
 emerald
 fibula
 filigree
 Florentine
 diamond
- garnet
 gemstone
 granulation
 hei tiki
 jadeite
 jewelry
 lapis lazuli
 lip ring, lip plug, and lip plate
 magatama
 nephrite
 netsuke
 nose ring
 onyx
 opal
 parure
 pearl
 pendant
 peristerite
 phenakite
 ring
 ruby
 ruby spinel
 sapphire
 sard and sardonyx
 topaz
 torque
 ts'ung
 turquoise
 variscite
 watch fob
 zircon
- lacquerwork and related techniques:*
- chinkin-bori
 decoupage
 fundamiji
 gilding
 hiramaki-e
 hirameji
 japanning
 Kamakura-bori
 kanshitsu
 lacquerwork
 laque burgauté
 maki-e
 nashiji
 raden
 rō-iro
 togidashi maki-e
- metalwork and metalware:*
- Bidri ware
 britannia metal
 bronze work
 caudle cup
 chasing
 chia
 chien
 chüeh

chung	albarello	Rouen ware	ling lung ware
copper work	amphora	Saint-Amand-les-Eaux ware	lithophane
cruse lamp	Apsey faience	Savona faience	Liverpool porcelain
damascening	Astbury ware	Southwark and Lambeth	Longton Hall porcelain
dinanderie	Bartmannkrug	delftware	Lowestoft porcelain
dōtaku	basaltes ware	Staffordshire figure	Medici porcelain
fang-i	Bizen ware	stoneware	Meissen porcelain
fu	black-figure pottery	Strålsund faience	Mikawachi porcelain
gold leaf	bucchero ware	Strasbourg ware	Minton ware
golden rose	Cafaggiolo	terra-cotta	Niderviller ware
goldwork	majolica	terra sigillata ware	Nymphenburg porcelain
hallmark	cauliflower ware	tin-glazed earthenware	Oribe ware
Häufbecher	celadon	ting	Petit porcelain
ho	Chien ware	Ting ware	Plymouth porcelain
hollowware	comb pottery	tortoiseshell ware	porcelain
horse brass	creamware	Tz'u-chou ware	Rockingham ware
hu	Deruta ware	Urbino maiolica	Rouen ware
incense burner	Doulton ware	Venice majolica	Royal Copenhagen porcelain
ironwork	earthenware	Vincennes ware	Saint-Amand-les-Eaux ware
Jungfrauenbecher	Enghalskrug	Wedgwood ware	Saint-Cloud porcelain
karat	Faenza majolica	Westerwald stoneware	Seto ware
kovsh	faience	Zürich ware	Sèvres porcelain
kuang	faience fine	<i>pottery—porcelain:</i>	Shino ware
kuei	Greek pottery	Affenkapelle ware	Spode porcelain
leadwork	Hafner ware	Belleek ware	Strasbourg ware
li	Haji ware	Berlin ware	Swatow wares
Luristan Bronze	Hausmalerei	bone china	Te-hua porcelain
metal	Hispano-Moresque ware	Bow porcelain	Tournai porcelain
metalwork	ironstone china	Bristol ware	Vienna porcelain
nef	jasperware	Buen Retiro ware	Vincennes ware
niello	Kreussen	caddy	Worcester porcelain
ormolu	stoneware	Capodimonte porcelain	ying-ch'ing ware
p'an	Liverpool delft	carrack porcelain	Zürich ware
pierced work	lustreware	Caughley ware	<i>pottery—other:</i>
pomander	Lyon faience	Chantilly porcelain	alabastron
Pontypool ware	majolica	Chelsea porcelain	potter's mark
pyx	Marseille faience	Coalport porcelain	pottery
saltcellar	mezza majolica	Derby ware	slipware
sauceboat	Minton ware	deutsche Blumen	transfer printing
Sheffield plate	Moustiers faience	Doccia porcelain	<i>printing arts:</i>
silverwork	Nevers faience	Doulton ware	black letter
snuffer	Niderviller ware	eggshell porcelain	block book
steeple cup	Norwich ware	flambé glaze	bookbinding
sterling	Orvieto ware	Hausmalerei	italic
tankard	Pan-shan ware	Imari ware	Romain du Roi
tea and coffee service	Paterna ware	Jesuit ware	roman
tinware	pottery	Kakiemon ware	sans serif
toweware	Pueblo pottery	Karatsu ware	typography
touchstone	punch'ōng pottery	Ki Seto ware	
trivet	raku ware	Kutani ware	
yu	red-figure pottery	Kyō-yaki	
<i>pottery—earthenware and stoneware:</i>	Rockingham ware	Limoges ware	
Abstbessingen	Rörstrand faience		
faience			
agateware			

textile arts—lace:

Alençon lace
 blonde lace
 bobbin lace
 Brussels lace
 Buckinghamshire
 lace
 Genoese lace
 lace
 lace pattern book
 needle lace
 Spanish lace
 Valenciennes
 lace
 Venetian needle
 lace

*textile arts—**needlework:*

bargello work
 beadwork
 Berlin woolwork
 broderie anglaise
 chikan work
 crewel work
 embroidery
 needlepoint
 opus anglicanum
 petit point
 quillwork
 raised work
 sampler
 whitework

*textile arts—rugs and**carpets:*

Admiral carpet
 Afghan carpet
 Alcaraz carpet
 Ardabil Carpet
 Arraiolos rug
 Aubusson carpet
 Axminster carpet
 Baku rug
 Balochi rug

Bergama carpet
 Bijār carpet
 bird rug
 Bokhara rug
 Chichi rug
 Chodor carpet
 Cuenca carpet
 Dagestan rug
 Damascus rug
 Dragon rug
 Ersari carpet
 Ferahan carpet
 Garden carpet
 Ghiordes carpet
 Hamadan rug
 Hatchlu rug
 Herāt carpet
 Hereke carpet
 Heriz carpet
 Indo-Eşfahān
 carpet
 Joshagan rug
 Karabagh rug
 Kāshān carpet
 Kazakh rug
 Kermān carpet
 Khorāsān carpet
 Khotan rug
 kilim
 Kirshehr rug
 Konya carpet
 Kuba carpet
 Kula carpet
 Kurdish rug
 Lâdik carpet
 Lotto carpet
 medallion carpet
 Mekri carpet
 Melas carpet
 Mughal carpet
 Mujur rug
 Ottoman carpet

palas
 prayer rug
 Qashqā'ī rug
 rug and carpet
 rya rug
 Salor rug
 Sarūk carpet
 Savonnerie
 carpet
 Senna rug
 Seraband rug
 Shīrāz rug
 Shirvan rug
 Smyrna carpet
 Soumak
 Spring of Khosrow
 Carpet
 Tabriz carpet
 Tekke carpet
 Transylvanian
 rug
 Ushak carpet
 Vase carpet
 Verné rug
 Yomut carpet
 Yürük rug

textile arts—other:

bāndhanī work
 crochet
 jāmdānī
 kimkhwāb
 knitting
 Navajo weaving
 paisley
 qalamkāri textile
 quilting
 tapestry
 tatting
 textile
 toile de Jouy
 verdure tapestry
 weaving

other:

altarpiece
 ampulla
 aryballos
 automaton
 azulejo
 basketry
 Bauhaus
 billboard
 cha-shitsu
 Christmas tree
 decorative art
 Deutscher
 Werkbund
 effigy mound
 featherwork
 frame design
 interior design
 ivory carving
 kirikane
 krater
 mazer
 paper folding
 papier-mâché
 parfleche
 patch box
 pichhwāi
 pilgrim bottle
 piqué work
 poster
 retable
 sandwich board
 sign
 snuffbox
 t'ao-t'ieh
 tatami
 tea ceremony
 tester
 tortoiseshell
 totem pole
 trencher
 umbrella
 yurt

Biographies

Aalto, Alvar
 Asam, Cosmas
 Damian; and
 Asam, Egid
 Quirin
 Astbury, John
 Boule,
 André-Charles
 Breuer, Marcel
 Chippendale,
 Thomas
 Cressent, Charles
 Deskey, Donald

Didot family
 Eames, Charles;
 and Eames, Ray
 Exekias
 Fortuny, Mariano
 Gallé, Émile
 Germain, Thomas
 Gill, Eric
 Goddard family
 Hepplewhite,
 George
 Klint, Kaare

Majorelle, Louis
 Mardersteig,
 Giovanni
 Mi Fei
 Morison, Stanley
 Morris, William
 Northwood, John
 Palissy, Bernard
 Phylfe, Duncan
 Pisanello, Il
 Poggio Bracciolini,
 Gian Francesco

Roentgen, David
 Saarinen, Eero
 Sheraton, Thomas
 Sôtatsu
 Tassie, James
 Thonet, Michael
 Tiffany, Louis
 Comfort
 Townsend family
 Wedgwood, Josiah
 Wood family

Introduction to Part Seven: Knowing How and Knowing Why

by Lord Ritchie-Calder

Benjamin Franklin defined man as “the tool-making animal.” If he had added the phrase “with foresight,” he would have adequately described *Homo faber*, man the technologist.

Inventiveness was the indispensable condition for the survival of the human species. Without fur or feather, carapace or scale, ancestral man stood naked to the elements; and without fang or claw or tusk to fight his predators, without speed to elude them, without camouflage to deceive them or the ability to take to the trees like his cousin, the ape, he was physically at a hopeless disadvantage. What he developed to deal with his deficiencies was the capacity to invent. He possessed not only sensory perceptions (though these were less acute than those of many of his fellow creatures), he also possessed imagination and finger-skills. He did not just improvise to meet an emergency as an ape might in using a broken branch as a weapon; he also saw the need for keeping a club handy—he planned ahead. Other creatures had their inherited instincts, their built-in experience. Some, like the beaver or the weaverbird, with their biological tools, could contrive quite elaborate structures; others, like the bees or the ants, could evolve efficient organizations; others, like the squirrel, were provident in the sense of laying in stores. With nimbleness of brain and hand, a combination of gray matter and motor-cells, man could scheme to outreach, with club, or spear or sling, his natural enemies; he could manage nature and escape from the restraints of his environment. He clothed himself in pelts and moved to inhospitable climes, he mastered fire and dared to bring it into his dwelling for heating and cooking, he learned to cultivate and plant the soil, he domesticated animals, and he devised specialized tools like the hoe and the ax to improve the efficiency of his labour.

From earliest time and beginning with the simplest contrivances, every discovery and invention has depended on the fact that the human being is not only a perceptual but also a conceptual creature capable of observing, memorizing, and juxtaposing images. He can make a mental design, a techno-poetic fantasy, even when the means of actually producing it are not available. Seven hundred years ago Roger Bacon could imagine a power-driven ship, a horseless carriage, an airplane, the miniaturized servo-motor, “but one finger in length and one in width,” and the bathysphere. The vision cannot materialize, however, unless man has the method. This is the process by which he makes an observation (perceptual); forms a hypothesis (conceptual); experiments to test this “hunch”; formulates a theory to justify his insights; and by further proofs produces “laws” according to which anyone can go on repeating the results. With spoken language, he can transfer experience, father to son, master to apprentice, generation to generation. With written language, he can produce the textbooks that are the ready-reckoners for other innovators who thereby do not

have to rediscover Newton’s laws or the laws of thermodynamics every few years. This systematic treatment of the arts and crafts is the simplest expression of the meaning of “technology,” from the Greek roots *techne*, arts, and *logia*, words. The ancient Greeks had no such combined term because their philosophers divorced manual skills from intellectual pursuits. Plato berated Eudoxus and Archytas when by experiments and recourse to instruments they solved problems that the theorists considered insoluble. He accused them of “making use of matter which requires manual labour and is the object of servile trades.”

This intellectual condescension still persists, although individual technologists have won recognition from scientific societies and learned academies. The prejudice is suggested by the acceptance of the term “science *and* technology.” Yet both science and technology use the scientific method. Was Leonardo da Vinci, apart from being an artist, a scientist or a technologist? In terms of discovering and testing new knowledge he was a man of science, but his designs for practical innovations outnumbered those of Thomas Alva Edison. Edison, 400 years later, patented over 1,000 inventions. They included major ones, for which he is remembered, but also hundreds of bits of useful hardware, important in their way. He made only one scientific discovery, the Edison effect, which he patented but did not pursue. The rest were derived from scientific knowledge and developments. He saw the profitable relevancies that lesser men missed; he fitted the mental nut to the mental bolt and created things.

Customarily, science, or the scientific hierarchy, is divided into four categories:

Pure, or academic, research is the pursuit of knowledge for its own sake. It is mainly the work of an individual, or the group he leads. The pure scientist has to justify himself only before a jury of his peers. He is judged not by the usefulness but by the integrity of his work. He is the Maker Possible.

Oriented fundamental research is still basic science; that is to say, the scientist is still questioning nature, seeking to extend knowledge and understanding, but he is not a free agent indulging his curiosity. He is restrained within a frame of reference. For instance, in studying chemical reactions at high pressures he is not assuming that he is going to discover polyethylene, or if he is studying gases at high temperatures he is not necessarily thinking of jet engines or rockets; but he is compiling data that will be important in a general field and likely to have some foreseen applications. In the big corporations, this is called “speculative research.” Such a scientist is likely to have adequate research facilities, endowments, or contracts. He is the Maker Probable.

Applied research is programmed research. The target is specified, and results are expected. The predicted yield is

the measure of the support. The scientist is held accountable in the annual report. He is the Maker to Happen.

Development is really technology, but coupling it with research (R and D) keeps it in the scientific hierarchy and away from the "rude mechanicals." It is the transfer of laboratory results, through the pilot plant, to the production line. R and D is far and away the most expensive scientific bracket because large-scale trial and error ("back to the drawing board") involves multimillions of dollars. The R and D scientist is the Maker to Work.

Through the craft guilds and their "mysteries" and their conversion to factory methods, technology had an evolutionary history in many cultures and many lands. Alfred North Whitehead claimed that "the greatest invention of the nineteenth century was the invention of the method of invention." Nowhere was this better demonstrated than at Edison's "invention factory" at Menlo Park, New Jersey, where, starting in 1876, Edison organized the first industrial research laboratory. In folklore, he is regarded as a "loner," who invented by intuition. In fact, he systematized the process of invention, coordinating and applying relevant knowledge through a hard-worked team that included mathematicians, physicists, chemists, and skilled mechanics. Invention was no longer the private indulgence of the gifted amateur or the rare professional; a techno-methodology had been created to guarantee commercial success. In Edison's case the result was often a "package deal"—not just the incandescent lamp, but the generating plant and the transmission system. In the case of Henry Ford, it was not just the Model T, but the assembly line, which he enlarged to a factory that was one-fifth of a mile long, with a conveyor-belt system that synchronized each stage of construction with the delivery of each part to the operator. He embodied scientific management, with its time-and-motion studies and production engineering.

The feedback system between the know-why (academic science) and the know-how (technology) is recalibrating the time-function of change. A new scientific discovery (explanation of a phenomenon) is seized by the technologists and put to work. In turn the technologists provide the instruments that, with greater refinements and speed, enable the scientists to make further discoveries. An outstanding example is cybernetics. The pencil-and-paper mathematicians had long known the principles of the computer, but they had to wait for the post-World War II electronic engineers to produce the "hardware." Now with instant responses, or nearly so, and vast computer capacities and prodigious "memories," with means not only for numerical calculation but for logical simulation, with feedback (like a burned finger signaling to the brain and the brain withdrawing the finger from the hot plate), scientists are not only able to do calculations so complex that they would not previously have attempted them, but they are also learning, from the engineers, about the nature of systems, including the systems of nature itself. Cybernetics deals with the information-processing aspects, as distinguished from the energy-transforming aspects, of all systems regardless of their physical nature. This has facilitated the development of automatic control, telecommunications, and computing; it is applicable also to systems engineering, economics, and neurophysiology.

Though we acknowledge the truth of Whitehead's apho-

ism, his essentially engineering approach to technology is too restrictive. Every advance in the practical arts from hunting to food-gathering to cultivation, to animal husbandry, to irrigation, to mining, and on through construction, transportation, food-processing, heating, power generation, lighting, communications, military engineering, and clinical medicine has produced social and cultural changes. The Neolithic Revolution was as climacteric as the Industrial Revolution. Moreover, the preoccupation with Western technology ignores the cultural origins of many major innovations and forgets that, historically, the European Dark Ages (not so dark as is often supposed) coincided with Golden Ages of material advances in China, India, and pre-Columbian America. Only in recent years have historians (Singer, Crombie, Lynn White, Hall, Needham, Forbes, and others) given serious attention to these facts. The anthropologists, looking at cultural influences, have been similarly remiss. Economists have been preoccupied with the "production function" and sociologists with the social effects of innovation (from television to freeways) and with work-force redundancy. The present distortions, produced by rapid technological change, obscure the fact that civilization itself derived from excess production and redundancy. When agriculture surpassed subsistence, fewer tillers were required to support the cities, with their artisans (specializing in other forms of production), their priest-hoods, their scholars, their soldiery and warrior-kings, their tithe-gatherers, their merchants, and their money-changers. Technological displacement today, whether it is called unemployment, underemployment, leisure, or nonwork, similarly calls for social readjustments to find nonmanufacturing expressions of human capacities.

No explanation of the intrinsic or historic attributes of technology can convey the love-hate overtones that the term has acquired. In the ogre sense of the word, it has become a threat to lives and livelihoods and to the total environment. In the efficiency sense, it is hailed as the methodological solution of all our problems from government administration to the production of miracle grains to abolish hunger. Some, like Jacques Ellul and B.F. Skinner, claim that we are already the hostages of our man-made environment: the first maintaining that technology has taken over all of man's activities and not just his productive activities; the second, that autonomous man, with free will and freedom and dignity, is now an anachronism and has to be intentionally controlled by the "technology of behaviour."

Obviously this usage is stretching the meaning of "technology" beyond the foregoing derivations and descriptions—the etymology; the cultural origins; the scientific precedents; the nuts-and-bolts and something popularly promoted to capital letters as "The Machine." This usage expands even Harold Lasswell's accommodating version: "The ensemble of practices by which one uses available resources to achieve values." It is more consistent with the French *la technique*, which refers to any complex of standardized means for attaining predetermined ends. Thus it would apply to organization, government institutions, systems of politics or religions, or anything which reduces spontaneous or impulsive behaviour to a rationale. As was said of *la technique* of wartime operational research, "it ran the war by numerical thinking instead of gusts of emotion."

In adventurously exploring the three divisions and fifteen sections of the encyclopaedia's treatment of technology of which this introduction is, hopefully, the appetizer, the reader will find other interpretations and probably produce his own. In common usage, however, the preoccupation is with "The Machine" and the effects of its products on our lives.

Resentment against the replacement of men by machines goes back beyond Ned Ludd and the machine-wreckers of the Industrial Revolution, but present-day attitudes are of a different order of magnitude. They derive from the speed and scale of change. Hahn and Strassmann's laboratory discovery of uranium fission in 1938 was transformed into a nuclear bomb in 1945. If there is no nuclear war, history will consider the Manhattan Project, which produced the bomb, as important as the bomb it produced. It is the archetype of the crash program in which men, materials, and methods are mobilized to attain an objective in a given time. Man on the Moon by 1970 was another example, with the time-target beaten by six months. The time-lapse between a fundamental scientific discovery and its practical application has been reduced from centuries to decades to years to months. Since World War II, we have had the Atomic Age, the Cybernetic Age, the Space Age, and now the Bioengineering Age, in which not only by organ transplants but also by the deliberate manipulation of genes it may be possible to engineer the nature of man himself. Thus in the growing up of the postwar generation

there have been four major epochs nearly as significant as the Stone Age, the Iron Age, the Renaissance, and the Industrial Revolution. At the same time there has come the shocked awareness of the effects on the environment of the wastes of technology. Again this is a matter of scale and lack of prescience. (The ore miners and metal workers of Cyprus and Asia Minor were polluting the Mediterranean with heavy metals 5,000 years ago, but the effects were insignificant compared with volcanic debris.) When people complain, however, of "interference with the environment" they should be mindful that such interference has been the *sine qua non* of the survival of *Homo sapiens*. Moreover, when we try to get rid of our guilt-sense about the effects of misused technology and reject the gadgeting we ashamedly enjoy, we should not go too far and "throw out the baby with the bathwater." We cannot go back to the apes nor even to Arcadia.

The great problem is how to force ebullient technology and its transnational expansion to produce human well-being, not just in the quantity of artifacts but in improving the quality of life, including redressing of the mischief in the environment. This requires an enlightened and informed society that knows what it wants and is not cult-ridden or crash-programmed into accepting what it does not want or need. This cannot be achieved through programmed learning nor the technology of behaviour nor systems engineering. We are back with the know-why as the initiator and the monitor of the know-how.

Part Seven. Technology

Several points should be noted about the relations of this part to other parts. Technology involves applications of the knowledge of nature dealt with in Parts One, Two, and Three and in turn has an influence on the development of that knowledge. It has a major role in relation to human communication and an influence on the cultural, social, economic, political, legal, and educational life of humankind, dealt with in Part Five; and a conditioning effect on the development of the fine arts, dealt with in Part Six. To a degree, technological developments affect developments in the religious life of humans, dealt with in Part Eight. Technology is a major dimension in the history of humankind, the subject of Part Nine.

The branches of technology and of engineering have themselves become the subject of historical and analytical studies. Those studies are presented in Section 10/37 of Part Ten.

Division I. The Nature and Development of Technology 265

II. Elements of Technology 268

III. Major Fields of Technology 280

Division I. The Nature and Development of Technology

The outlines in the two sections of Division I treat the scope and history of technology, and the organization of human work.

Section 711. Technology: Its Scope and History 265

712. The Organization of Human Work 266

Section 711. Technology: Its Scope and History

- A. General conceptions or definitions of technology
- B. Relations between technology and other spheres of contemporary life
 1. Technology and wealth
 2. Technology and war
[see 736]
 3. Technology and education
 4. Technology and art
[see also 612.D.4.]
 5. Technology and social institutions
[see also 512.B.3.]
 6. Technology and the underdeveloped regions: the export of Western technology
[see also 512.B.3.]
 7. Effects of technology on the environment
[see also 355.B.1.]
- C. History of technology: sociocultural consequences of technological changes
[see also 512.B.]
 1. Technology in the ancient world
 - a. The beginnings of technology (to c. 3000 BC): emergence of the earliest communities, use of stone tools and weapons, beginnings of mining and agriculture
 - b. The urban revolution (c. 3000–500 BC): early civilization in the valleys of the Nile and Tigris-Euphrates river systems, waterworks for irrigation, urban manufacturing
 - c. Technological achievements of Greece and Rome (500 BC–AD 500): mastery of iron, invention of mechanical contrivances, architectural and constructional works

2. Technology from the Middle Ages to 1750
 - a. Medieval advances (AD 500–1500): harnessing of wind power and waterpower; construction of canals and bridges; construction of full-rigged ships; invention of printing
 - b. The emergence of Western technology (1500–1750): invention of early scientific instruments and tools, birth of steam power, development of agricultural and constructional techniques
3. The Industrial Revolution (1750–1900)
 - a. Advances in power technology: development of steam power, internal-combustion engine, and electric power; exploitation of mineral and fossil fuels
 - b. Development of industries: iron and steel, textiles, chemicals, transportation, communications
4. Technology in the 20th century
 - a. Early developments: exploitation of hydroelectric power; synthesizing of fibres, plastics, rubber, dyes, and drugs; rationalization of production
 - b. Space Age technology: nuclear power, automation and the electronic digital computer, rocketry and space exploration, advances in agricultural technology, advances in transportation and communication
 - c. Effects of technology on the environment

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and a biography dealing with technology: its scope and history

Edison
Technology, The History of

MICROPAEDIA: Selected entries of reference information

General subjects

industrial engineering	industrialization manufacturing	safety safety engineering	service industry technology
Industrial Revolution	research and development	security and protection system	

Biographies

See Section 10/37 of Part Ten

INDEX: See entries under all of the terms above

Section 712. The Organization of Human Work

- A. The organization of work
 1. The organization of work in the prehistoric world
[see also 512.B.1.]
 - a. Origin of division of labour based on age and sex differences, initial absence of class divisions
 - b. Communal organization: specialization required by the development of pottery, textiles, agriculture, and metallurgy
 2. The organization of work in the ancient world
 - a. Theories of civilization's development: explanations of the origin of hierarchical organization
 - b. Effect of social classes on the organization of labour
 - c. Organization of agricultural labour
 - d. Organization of industrial labour by craft
 - e. Organization of labour for large-scale construction
 3. The organization of work in the medieval world: the manor system, the craft guilds, organization of free labour for large-scale construction

4. Changes in production techniques from the 16th to the 18th century: foundations of modern industrial production
 5. Mass production: the organization of labour by product rather than by process
 6. The use of machines as replacements for labour
- B. The application of scientific methods to managerial functions
1. Operations research: the application of scientific method to the management of organized systems
 2. Systems engineering: the utilization of scientific and technological knowledge in planning and designing complex systems
 3. Systems-design techniques, tools, and procedures
 - a. Techniques: use of flow charts and other symbolic models, precise formulation of suitable objectives
 - b. Tools: optimization theory, communication theory, queuing theory, game theory
[see also 10/23.E. and F.]
 - c. Procedures: exploratory planning, development planning
- C. The relation between man and machine in industrial production
1. The effects on mankind of the rationalization of work: psychological and social aspects of mass production and automation
 2. The human-factors approach: the design of machines, tools, and work environments with consideration for the capabilities and limitations of humans

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the organization of human work

Automation
 Industrial Engineering and Production Management
 Modernization and Industrialization
 Work and Employment

MICROPAEDIA: Selected entries of reference information

General subjects

assembly line	game theory	mathematical	systems engineering
automation	Hawthorne	programming	time-and-motion
critical path	research	operations research	study
analysis	human-factors	queuing theory	trade organization
domestic service	engineering	robot	work
domestic system	mass production	standardization	

Biographies

See Section 10/37 of Part Ten

INDEX: See entries under all of the terms above

Division II. Elements of Technology

[For Part Seven headnote see page 265.]

Division I is concerned with the nature and effects of technology as a whole. The outlines in the five sections of Division II deal with technical processes not specific to any of the major fields of technology. The technologies of the major fields are dealt with in Division III.

Section 721. Technology of Energy Conversion and Utilization 268

722. Technology of Tools and Machines 270

723. Technology of Measurement, Observation, and Control 271

724. Extraction and Conversion of Industrial Raw Materials 274

725. Technology of Industrial Production Processes 277

Section 721. Technology of Energy Conversion and Utilization**A. Major types of energy useful to humankind**

1. Primary energy sources: thermonuclear reaction, nuclear fission, radioactivity
2. Recurring energy sources: solar energy, natural thermal energy, wind and water energy, biomass
3. Nonrenewable energy sources: coal, natural gas, oil

B. Devices and techniques for the utilization of energy

1. Devices for utilizing muscle energy: pulley, lever, block and tackle, treadmill
[see also 722.B.1.]
2. Devices for utilizing wind and water energy: sails and sailboats, windmills, waterwheels, wind and water turbines
3. Devices for utilizing gravitational energy: pendulums, counterweight mechanisms
4. Devices for utilizing strain and compression energy
 - a. Steam engines and steam power plants
 - b. Steam turbines
[see B.2., above]
 - c. Compressed-air and compressed-gas tools and machines
 - d. Hydraulic devices
5. Devices for utilizing magnetic and electrical energy
 - a. Magnets, electromagnets
 - b. Electric motors: induction motors, synchronous motors, commutator motors utilizing alternating current and direct current
6. Devices for utilizing rotational energy: centrifuges, gyroscopes
7. Devices for utilizing heat energy: heat exchangers, refrigeration equipment
8. Devices for utilizing chemical energy
 - a. Internal-combustion engines: gasoline and gas turbine engines; diesel engines; jet, turbojet, fan-jet, and turboprop engines; rocket engines
 - b. Chemical explosives: black powder, nitroglycerin, dynamites, nitrocellulosic explosives, military explosives, other modern high explosives
9. Devices and materials for utilizing nuclear energy: nuclear fission reactors, radioactive isotopes, nuclear fusion reactors
[see also 112.B., C., F., and G.]
10. Devices for utilizing solar energy

C. Devices for energy conversion

1. Thermoelectric devices
2. Thermionic devices
3. Magnetohydrodynamic power generators
4. Batteries and fuel cells

5. Lamps and other lighting devices
 6. X-ray tubes
[see also 111.D.1.]
 7. Devices for electric power generation: turbine-driven generators, engine-driven generators, nuclear-powered generators, hydraulic-turbine-driven generators, thermoelectric generators, dynamos, photovoltaic devices
- D. Devices for energy concentration and control
1. Electron tubes
 2. Solid-state devices; *e.g.*, transistors, semiconductor diodes, integrated circuits
 3. Optoelectronic devices; *e.g.*, liquid-crystal displays, optical fibres, semiconductor lasers
- E. Devices for unlimited production of free energy: attempts to design perpetual motion machines

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the technology of energy conversion and utilization

Electronics
Energy Conversion

Industries, Chemical Process
Industries, Extraction and Processing

MICROPAEDIA: Selected entries of reference information

General subjects

<i>chemical explosives:</i>	<i>electronic devices:</i>	evaporator	<i>moving-fluid devices:</i>
blasting	amplifier	heat exchanger	centrifugal pump
blasting cap	antenna	heat pipe	hydraulic
dynamite	band-pass filter	refrigeration	transmission
explosive	diode	<i>internal-combustion</i>	pump
firework	electric circuit	<i>engines:</i>	turbine
gunpowder	electric switch	carburetor	waterwheel
nitrocellulose	electron tube	choke	windmill
RDX	electronics	diesel engine	<i>nuclear reactors:</i>
<i>compression energy</i>	ferrite	fuel injection	breeder reactor
<i>and its devices:</i>	grid	gasoline engine	fusion reactor
bellows	ignitron	ignition system	nuclear reactor
cogeneration	integrated circuit	internal-combustion	<i>rockets:</i>
compressor	klystron	engine	Atlas rocket
piston and cylinder	laser	jet engine	Delta
pneumatic device	magnetron	ramjet	launch vehicle
propellant	microprocessor	rotary engine	rocket
steam engine	microwave oven	spark plug	Saturn
<i>electrical devices:</i>	photoelectric cell	supercharger	Thor rocket
battery	photomultiplier	turbojet	V-2 missile
cell	tube	turboprop	<i>other:</i>
electric generator	printed circuit	<i>major types of energy:</i>	blowpipe
electric motor	semiconductor	electric power	magneto-hydro-
electrolytic cell	device	energy	dynamic power
electromagnet	transistor	fire	generator
fuel cell	<i>heat exchange and</i>	fossil fuel	perpetual motion
fuse	<i>related devices:</i>	geothermal energy	thermionic power
linear motor	boiler	hydraulic power	converter
magneto	cogeneration	hydroelectric power	thermoelectric
motor generator	condenser	solar energy	device
voltage regulator	cooling system	tidal power	transducer
		waterpower	

Biographies

Braun, Wernher von	Goddard, Robert	Sperry, Elmer	Watt, James
Carnot, Sadi	Hutchings	Ambrose	Westinghouse,
De Forest, Lee	Nobel, Alfred	Stevens, John	George
Diesel, Rudolf	Bernhard	Tesla, Nikola	
Evans, Oliver			

See also Section 10/37 of Part Ten

INDEX: See entries under all of the terms above

Section 722. Technology of Tools and Machines**A. Hand tools**

1. Early history of hand tools: Paleolithic and Neolithic stone tools, development of metal tools
2. Basic types of hand tools
 - a. Percussive tools: hammers, axes
 - b. Cutting, drilling, and abrading tools: knives, saws, files
 - c. Screw-based tools: screwdrivers, wrenches
 - d. Measuring and defining tools: levels, dividers, rules
 - e. Tool auxiliaries: workbench, vise
3. Power-driven hand tools: electric drills and circular saws, pneumatic hammers and riveters

B. Machines and machine components

1. Simple machines: lever, wedge, wheel and axle, pulley, and screw
2. Machine mechanisms: devices that transmit motion by means of flexible connectors, rigid connecting links, or direct contact
3. Machine components
 - a. Gears
 - b. Cams
 - c. Linkages
 - d. Flywheels
 - e. Belt and chain drives
 - f. Couplings
 - g. Clutches
 - h. Brakes
 - i. Bearings
 - j. Shafts and shaft accessories
 - k. Screws
 - l. Springs
4. Friction accommodation and reduction
 - a. Bearings
[see B.3.i., above]
 - b. Lubricants and their functions, types, and properties

C. Machine tools: stationary power-driven machines for shaping and forming parts made of metal or other materials

1. History and characteristics of machine tools
2. Operation of metal-cutting tools
3. Basic machine tools: turning machines, shapers and planers, drilling machines, milling machines, grinding machines, power saws, and presses

4. Modifications of basic machines; *e.g.*, turret lathes, production millers
 5. Special-purpose machines; *e.g.*, gear-cutting machines, broaching machines
- D. Computer-aided machining
1. Computer numerical control
 2. Computer-aided design and computer-aided manufacturing (CAD/CAM)
 3. Robots
 4. Computer-integrated manufacturing
- E. Nonconventional methods of machining
1. Electrical methods: electron-beam machining, electrical-discharge machining, electrochemical machining, ion beam machining, laser machining, plasma arc machining
 2. Other methods: ultrasonic machining, chemical machining, photochemical machining, water-jet machining

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major article dealing with the technology of tools and machines

Tools

MICROPAEDIA: Selected entries of reference information

General subjects

<i>basic machine tools:</i>	router	flexible shaft	transmission
auger	saw	flywheel	washer
boring machine	screwdriver	gear	<i>simple machines:</i>
drill press	vise	governor	capstan
grinding machine	wrench	linkage	crank
lathe	<i>machine components:</i>	machine	inclined plane
milling machine	air brake	mandrel	lever
planer	air spring	mechanism	pulley
punch press	automatic	nut	wheel
reamer	transmission	pin fastener	wheel and axle
router	ball bearing	rack and pinion	<i>other:</i>
shaper	bearing	ratchet	block and tackle
<i>hand tools:</i>	belt drive	Rolamite	divider
adz	bolt	roller bearing	jack
ax	brake	screw	level
brace and bit	cam	shaft coupling	lubrication
chisel	clutch	shaft seal	pantograph
drill	differential gear	slider-crank	square
file	eccentric-and-rod	mechanism	tool
hammer	mechanism	spring	tool and die
pliers	escapement	toggle mechanism	making

Biographies

See Section 10/37 of Part Ten

INDEX: See entries under all of the terms above

Section 723. Technology of Measurement, Observation, and Control

- A. Theory of measurement
[see 10/31.B.3.b.]
- B. Units and standards of measurement
1. Systems of weights and measures: standards for the measurement of mass and length
 2. Standards and techniques for measurement of time

- C. Principles and processes by which instruments of measurement operate
- D. Common types of measuring instruments
 - 1. Instruments for measuring basic dimensions
 - a. Devices for measuring length: rules, calipers, micrometers
 - b. Devices for measuring mass and weight: scales, balances
 - c. Devices for measuring time: mechanical, electric, and atomic clocks
 - d. Devices for measuring temperature: gas, liquid, and electrical resistance thermometers
 - e. Devices for measuring electric current and other electrical properties: galvanometers, ammeters, voltmeters
 - f. Devices for measuring light intensity: photometers, light meters, exposure meters
 - 2. Instruments for measuring physical properties and relationships derived from basic dimensions
 - a. Instruments for measuring pressure: barometers, manometers
 - b. Instruments for measuring rate of flow: flowmeters, water meters, gas meters
 - c. Instruments for measuring position by angulation and direction finding
 - i. Compasses: magnetic compasses, gyrocompasses
 - ii. Surveying instruments: levels, transits, sextants
 - d. Instruments for measuring gravity: gravimeters
 - e. Instruments for making optical measurements: polarimeters, refractometers
 - f. Instruments for measuring ionizing radiation: Geiger counters, scintillation counters
 - g. Instruments for measuring volumetric and mechanical properties of materials, including density, viscosity, and mechanical strength
- E. Instruments used for observing and recording
 - 1. Instruments for observing phenomena
 - a. Microscopes: optical, electron, acoustic, and scanning tunneling microscopes
 - b. Telescopes: optical, radio, and other types (*e.g.*, infrared, ultraviolet, X-ray, and gamma-ray systems)
 - c. Spectroscopes and spectrographs
 - d. Interferometers
 - 2. Instruments for recording phenomena: cameras
[see also 735 G.]
- F. Special instruments and apparatus used in scientific research
 - 1. General laboratory equipment: filters, mixers, centrifuges
 - 2. Research reactors
 - 3. Particle accelerators; *e.g.*, Cockcroft-Walton generators, Van de Graaff generators; linear resonance accelerators, betatrons, cyclotrons, synchrotrons, colliding-beam storage rings
 - 4. Mass spectrometers
 - 5. Chromatographs
 - 6. Seismographs
[see also 213.B.6.]
 - 7. Particle detectors: bubble chambers, scintillation counters
- G. Major systems of measurement and observation
 - 1. Surveying
[see also D.2.c.ii., above, and 733.A.2.]
 - 2. Mapping and cartography
 - 3. Hydrographic charting
 - 4. Oceanographic measurement
[see also 222.B., E., F., G., and H. and 738.B.]
 - 5. Meteorological measurement
[see also 221 and 223]

6. Astronomical observations
 7. Navigational techniques and devices
 8. Radiological techniques and devices
- H. Instrumentation and control systems
1. Instrumentation systems: systems that operate or actuate control devices or record measurements automatically
 2. Control systems
 3. Telemetry systems: remote monitoring and control

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with technology of measurement, observation, and control

Analysis and Measurement,	Microscopes
Physical and Chemical	Navigation
Calendar	Particle Accelerators
Climate and Weather	Radar
Mapping and Surveying	Telescopes
Measurement Systems	Time

MICROPAEDIA: Selected entries of reference information

General subjects

<i>astronomical devices:</i>	caliper	<i>instruments and techniques for measuring</i>	projection
astrolabe	depth finder		surveying
astronomical observatory	gauge	<i>properties of liquids:</i>	theodolite
Cassegrain reflector	range finder	hydrometer	topographic map
coronagraph	strain gauge	Jolly balance	triangulation
Keplerian telescope	vernier caliper	pH meter	trilateration
radio interferometer	<i>instruments for measuring electrical and magnetic quantities:</i>	polarimetry	weather map
radio telescope	ammeter	viscometer	<i>meteorology:</i>
Schmidt telescope	bridge	<i>instruments and techniques for measuring radiation:</i>	anemometer
telescope	cathode-ray oscilloscope	actinometer	barometer
X-ray telescope	electrometer	bolometer	ceilometer
<i>calendars:</i>	galvanometer	cloud chamber	hygrometer
Aztec calendar	magnetometer	coincidence counting	isentropic chart
Chinese calendar	ohmmeter	densitometer	isobar
Dionysian period	oscillograph	dosimeter	isotherm
Egyptian calendar	signal generator	frequency meter	radiosonde
French republican calendar	voltmeter	ionization chamber	temperature-humidity index
Greek calendar	watt-hour meter	photometer	weather bureau
Gregorian calendar	<i>instruments for measuring force:</i>	radiometer	wind rose
international date line	balance	solid-state detector	World Weather Watch
Jewish calendar	gravimeter	spark chamber	<i>navigational techniques and devices:</i>
Julian calendar	Roberval balance	wavemeter	celestial navigation
leap year	spring balance	<i>mapping and surveying:</i>	compass
lunar calendar	torsion balance	aerial photography	consol
Mayan calendar	<i>instruments for measuring motion and fluid flow:</i>	cartography	dead reckoning
Muslim calendar	accelerometer	contour mapping	direction finder
perpetual calendar	accelerometer	hydrography	great circle route
Roman republican calendar	airspeed indicator	isobar	inertial guidance system
solar calendar	anemometer	isotherm	loran
Tibetan calendar	gas meter	itinerarium	loxodrome
<i>instruments for measuring distance:</i>	speedometer	map	navigation
altimeter	tachometer	metes and bounds	navigation chart
	venturi tube	photogrammetry	portolan chart

radio direction finder	<i>temperature measurement:</i>	bushel	pound
radio range	calorimeter	calibre	quart
sextant	pyrometer	caloric	rem
shoran	thermocouple	cord	second
solar compass	thermometry	cubit	sievert
<i>particle accelerators:</i>	<i>timekeeping:</i>	day	stone
betatron	astrolabe	foot	talent
colliding-beam storage ring	atomic clock	furlong	ton
cyclotron	chronometer	gal	volt
linear accelerator	clepsydra	gauss	watt
particle accelerator	clock	gill	week
synchrotron	Coordinated Universal Time	gram	<i>other:</i>
<i>pressure measurement:</i>	daylight saving time	gray	acoustic
barometer	dynamical time	hertz	interferometer
pressure gauge	Ephemeris Time	horsepower	binocular
<i>radiological dating techniques:</i>	longcase clock	hour	control system
carbon-14 dating	ship's bell	inch	dynamometer
fission-track dating	sidereal time	International System of Units	flight recorder
helium dating	solar time	kelvin	fluidics
ionium-thorium dating	standard time	kilogram	incubator
lead-210 dating	sundial	league	instrumentation
potassium-argon dating	Universal Time watch	light-year	log
protactinium-231-thorium-230 dating	<i>units and standards of measurement:</i>	litre	measurement
radiation-damage dating	ampere	metre	microscope
rubidium-strontium dating	apothecaries' weight	metric system	optical
uranium-thorium-lead dating	astronomical unit	mile	interferometer
	avoirdupois weight	mina	periscope
	barrel	mole	photomicrography
	British Imperial System	newton	Richter scale
		ohm	seismograph
		ounce	servomechanism
		parsec	sound-level meter
		paschal	stroboscope
		phon	telemetry
		pint	
Biographies			
Gilbert, Sir Humphrey	Hakluyt, Richard Henry the Navigator	Lawrence, Ernest Orlando	Lovell, Sir Bernard Mercator, Gerardus

See also Section 10/37 of Part Ten

INDEX: See entries under all of the terms above

Section 724. Extraction and Conversion of Industrial Raw Materials

- A. The world's physical and biological resources
 1. The identification and distribution of natural resources
 2. The management of resources
 - a. Conservation of natural resources
 - b. Salvage operations
- B. Technology of the extraction industries
 1. Mining and quarrying
 - a. Processes: underground mining, surface mining, solution mining
 - b. Products: coal, salt, stone, metal ores, sulfur, phosphates
[see also C.2. and 3., below, and 214.A.4.c. and B.5.a.]
 2. Petroleum and natural gas production
[see also C.1., below, 214.B.5.b. and d., and 732.D.2.]

C. Primary conversion of raw materials

1. Petroleum refining
[see also B.2., above, 214.B.5.b., and 732.D.2.]
2. Coal utilization: production of coke, coal tar, light oil, gas, and chemicals
[see also B.1.b., above, and 214.B.5.a.]
3. Production and processing of metal ores and metals
[see also B.1.b., above, and 214.A.4.c.]
 - a. Aluminum
 - b. Calcium
 - c. Chromium
 - d. Cobalt
 - e. Copper
 - f. Gold
 - g. Iron
 - h. Lead
 - i. Magnesium
 - j. Mercury
 - k. Nickel
 - l. Platinum
 - m. Silver
 - n. Sodium and potassium
 - o. Steel and steel alloys
 - p. Tin
 - q. Titanium
 - r. Tungsten
 - s. Uranium
 - t. Zinc
 - u. Rare-earth metals
 - v. Metal alloys
4. Production of synthetic gemstones and industrial crystals
5. Processing of stone, sand, clay, and gravel
 - a. Manufacture of conventional and special types of glass and glass products
 - b. Manufacture of cement, gypsum plasters, and plastic cements
 - c. Manufacture of industrial ceramics
 - d. Manufacture of bricks and tiles
6. Processing of water to obtain salt, magnesium, oxygen, hydrogen, and other elements
7. Processing of air to obtain oxygen, nitrogen, noble gases, and other gases
8. Processing of plant and animal products
 - a. To obtain paper and pulp
[see also 732.D.3.]
 - b. To obtain roundwood, sawn wood, veneer, plywood and laminated constructions, particleboard, and fibreboard
[see also 732.C.8.]
 - c. To obtain tobacco and other nonfood products
 - d. To obtain leather and hides
[see also 732.C.3.]
 - e. To obtain furs
[see also 732.C.4.]
 - f. To obtain natural fibres
[see also 732.C.1. and 732.D.9.]

- g. To obtain pharmaceuticals
[see also 732.D.4.]
- h. To obtain oils, fats, and waxes
- i. To obtain resins and other products

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the extraction and conversion of industrial raw materials

Conservation of Natural Resources	Industrial Glass
Forestry and Wood Production	Industries, Extraction and Processing
Industrial Ceramics	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>alloys:</i>	coke	<i>forest products—</i>	wrought iron
alloy	lignite	<i>other:</i>	zinc
aluminum bronze	<i>forest products—</i>	cork	<i>mineral sources of</i>
amalgam	<i>lumber:</i>	lignin	<i>nonmetals:</i>
babbitt metal	balsa	paper pulp	asbestos
brass	ebony	tannin	barite
bronze	fir	<i>glassmaking:</i>	chrysotile
calamine brass	greenheart	Bakewell glass	feldspar
cupronickel	hardwood	blow molding	fluorite
Duralumin	lancewood	fiberglass	graphite
electrum	logging	flint glass	gypsum
ferroalloy	mahogany	glassblowing	kaolin
misch metal	narra	Jena glass	kimberlite
pewter	oak	mirror	limestone
stainless steel	pine	Orrefors glass	mica
steel	rosewood	Pitkin glass	phosphorite
<i>animal fibres, furs,</i>	seasoning	Pittsburgh glass	pumice
<i>and hides:</i>	spruce	plate glass	quartz
alpaca	teak	Pyrex	shale
camel hair	wood	safety glass	spodumene
cashmere	<i>forest products—oils</i>	silvering	sulfur
fur	<i>and resins:</i>	soda-lime glass	<i>mining and</i>
horsehair	balsam	South Jersey glass	<i>quarrying:</i>
leather	copal	<i>metals of major</i>	Frasch process
mohair	dammar	<i>economic</i>	mining
rabbit hair	dragon's blood	<i>importance:</i>	placer mining
silk	drying oil	aluminum	quarry
wool	gamboge	calcium	stopping
<i>ceramics:</i>	gum	cast iron	surface mining
adobe	lac	chromium	<i>oils, fats, and</i>
brick	mastic	cobalt	<i>waxes—edible:</i>
cement	myrrh	copper	See Section 731
ceramics	naval stores	gold	<i>oils, fats, and</i>
firebrick	pine oil	iron	<i>waxes—inedible:</i>
kiln	resin	lead	castor oil
mullite	rosin	magnesium	Chinese wax
porcelain	tall oil	mercury	drying oil
enamelling	turpentine	nickel	essential oil
portland cement	wood tar	platinum	fat
pottery	<i>forest products—</i>	potassium	fish oil
refractory	<i>rubber:</i>	silver	grease
tile	balata	sodium	lanolin
<i>coal and its</i>	chicle	tin	lavender
<i>processing:</i>	gutta-percha	titanium	linseed
coal	latex	tungsten	oil cake
coal tar	rubber	uranium	oil extraction

oil palm	chromite	naphtha	treated gem
oil plant	cobaltite	natural gas	Verneuil process
perilla oil	cuprite	oil shale	zone melting
pine oil	dolomite	paraffin wax	<i>vegetable fibres:</i>
sperm oil	erythrite	petrochemical	abaca
spermaceti	galena	petroleum	bast fibre
tall oil	halite	refining	bombax cotton
wax	hematite	salt dome	cantala
whale oil	limestone	tar sand	coir
<i>ore processing:</i>	linnaeite	well logging	cotton
basic oxygen	magnesite	<i>pharmaceuticals from</i>	flax
process	magnetite	<i>plant and animal</i>	hemp
Bessemer process	pitchblende	<i>sources:</i>	henquen
blast furnace	pyrite	alkaloid	jute
crucible process	rutile	Apocynaceae	kapok
cupola furnace	scheelite	belladonna	kenaf
electroplating	sphalerite	Cinchona	leaf fibre
flotation	tetrahedrite	cocaine	Mauritius hemp
hydrometallurgy	uraninite	codeine	milkweed floss
ingot	wolframite	Colchicum	phormium
matte	<i>petroleum recovery,</i>	Ephedra	ramie
metallurgy	<i>refining, and</i>	foxglove	sisal
mineral processing	<i>products:</i>	heroin	sun
open-hearth	alkylation	insulin	urena
process	asphalt	morphine	<i>other:</i>
parting	bitumen	Strophanthus	kiln
patio process	distillation	Strychnos	man-made fibre
reverberatory	drilling machinery	vitamin A	natural fibre
furnace	gasoline	<i>reclamation and</i>	pitch
smelting	kerosine	<i>salvage:</i>	prospecting
<i>ores of major metals:</i>	liquefied	materials salvage	retting
bauxite	natural gas	scrap metal	tanning
carnallite	liquefied	<i>synthetic gems and</i>	
carnotite	petroleum gas	<i>crystals:</i>	
cassiterite	microcrystalline	assembled gem	
chalcocite	wax	paste	
chalcopyrite	mineral oil	synthetic diamond	

Biographies

See Section 732

INDEX: See entries under all of the terms above

Section 725. Technology of Industrial Production Processes

- A. Materials processing: the operations that are used to transform industrial materials from a raw-material state into finished parts or products
 1. Preliminary processing of raw materials
 - a. Mechanical processing; *e.g.*, crushing, mixing, blending, separating, grading
 - b. Chemical processing; *e.g.*, leaching, smelting, coagulation, polymerization
 2. Forming: processes in which parts are produced by casting or molding liquid materials or by applying pressure to solid materials
 - a. Processing liquid materials
 - i. Casting metals; *e.g.*, sand casting, die casting
 - ii. Casting and molding nonmetals; *e.g.*, slip casting, injection molding
 - b. Processing solid materials; *e.g.*, rolling, forging, stamping, pressing
 3. Material removal: processes for shaping parts by removing portions of a solid piece of material

4. Joining: processes for bonding materials to each other
 - a. Thermal joining: welding, brazing, and soldering
[see B.4., below]
 - b. Adhesive bonding: natural and synthetic adhesives and their uses
5. Property modification: alteration or improvement of the properties of materials
 - a. Thermal processing
 - i. Basic heat-treating operations: annealing, stress relieving, and hardening
 - ii. Radio-frequency heating: induction and dielectric heating
 - iii. Zone melting: zone refining and other techniques
 - iv. Exposure to cryogenic temperatures
 - b. Processing of materials by exposure to physical conditions other than heat or cold
 - i. Processing of materials in a vacuum
 - ii. Use of ultrasonic and infrasonic waves
 - iii. Other processes; *e.g.*, exposure to radiation
 - c. Mechanical and chemical processing
6. Finishing processes: modification of the surfaces of materials
 - a. Mechanical and chemical processes; *e.g.*, cleaning, polishing, embossing, coating
 - b. Electrochemical processes: electroplating

B. Metallurgy

1. Mineral processing: crushing and grinding of ores, concentration of metallic minerals
2. Extractive metallurgy: separation of metallic elements from mineral form
 - a. Pyrometallurgy: processes that involve the use of heat
 - i. Roasting: oxidizing, reducing reactions
 - ii. Smelting: processes for removing molten metal from molten slag
 - iii. Converting: techniques for making steel, blister copper
 - iv. Refining: techniques for purifying copper, lead, gold, and other extracted metals
 - b. Electrometallurgy: processes that involve electrochemical reactions
 - i. Electrolytic smelting; *e.g.*, the Hall-Héroult process
 - ii. Electrowinning: techniques for recovering metals from solution
 - iii. Electrorefining: techniques for purifying copper, silver, and other metals
 - c. Hydrometallurgy
 - i. Leaching: techniques for dissolving metallic minerals
 - ii. Recovery techniques; *e.g.*, solvent extraction, chemical precipitation
3. Physical metallurgy
 - a. Cold and hot working; *e.g.*, forging, rolling, drawing
 - b. Foundry processes; *e.g.*, sand casting, die casting
 - c. Surface treatments; *e.g.*, galvanizing, carburizing
 - d. Powder metallurgy: powder manufacture, processes, and products
 - e. Nuclear engineering metallurgy: production, fabrication, and application of uranium and other metals of importance in nuclear engineering
 - f. Heat treatment; *e.g.*, annealing, quenching, tempering
 - g. Metallography
[see also 125.D.1.]
 - h. Inspection and testing: mechanical and nondestructive testing

4. Welding, brazing, and soldering
 - a. Basic principles: the metallurgy of metal joining
 - b. Welding processes; *e.g.*, forge welding, arc welding, resistance welding, brazing, soldering
 - c. Types of joints; *e.g.*, fillet welds, brazed joints
 - d. Weldability of metals
 - e. Testing and inspection of welds: nondestructive and destructive methods
 - f. Applications; *e.g.*, construction of bridges, storage tanks, and ships
 - g. Recent developments; *e.g.*, plasma welding, laser welding, ultrasonic welding
- C. Materials handling in the production process
 1. Types of materials-handling systems by process
 2. Materials-handling equipment; *e.g.*, wheeled carts, power trucks, trailer trains, racks, bins, conveyors
 3. Transportation of materials
[see also 734]
 4. Technology of storage and warehousing
- D. Technology of packaging

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major article dealing with the technology of the industrial production processes
Industries, Extraction and Processing

MICROPAEDIA: Selected entries of reference information

General subjects

<i>adhesives, fasteners, and joining</i>	conveyor	sintering	<i>packaging:</i>
<i>processes:</i>	hose	wire	aerosol container
adhesive	industrial truck	<i>metal treating and</i>	barrel
bolt	materials handling	<i>finishing:</i>	bottle
brazing	pipeline	annealing	drum
cement	stoker	anodizing	packaging
joint	storage	electroless plating	<i>thermal processing:</i>
mortar	<i>metal forming:</i>	electroplating	cryogenics
rivet	anvil	galvanizing	dielectric heating
screw	die-casting	plating	induction heating
soldering	forging	porcelain	radio-frequency
water glass	founding	enamelling	heating
welding	grinding machine	surface hardening	zone melting
<i>materials handling:</i>	investment casting	tempering	
Archimedes screw	mint	terneplate	
containerization	powder metallurgy	tinplate	
	rolling		

Biographies

See Section 732

INDEX: See entries under all of the terms above

Division III. Major Fields of Technology

[For Part Seven headnote see page 265.]

Division I of Part Seven is concerned with the nature and effects of technology as a whole. Division II deals with technical processes not specific to any of the major fields of technology. The outlines in the eight sections of Division III deal with the major fields of technology, differentiated by the various needs, purposes, products, and services that have elicited technological development.

- Section 731. Agriculture and Food Production 280
 - 732. Technology of the Major Industries 283
 - 733. Construction Technology 286
 - 734. Transportation Technology 288
 - 735. Technology of Information Processing and of Communications Systems 290
 - 736. Military Technology 293
 - 737. Technology of the Urban Community 296
 - 738. Technology of Earth and Space Exploration 297

Section 731. Agriculture and Food Production

- A. The history of agriculture
- B. Farm management
 - 1. Basic management problems and practices
 - 2. Farm labour, draft animals, and farm machinery
 - 3. Farm buildings
 - 4. Farming in relation to other disciplines; *e.g.*, weather, pollution control
- C. Crop farming
 - 1. Soil preparation and care
 - 2. Plant propagation, seeding and cultivation
 - 3. Harvesting and crop processing
 - 4. Specialized crop farming techniques: dryland farming, tropical farming, hydroponic farming, greenhouse farming
 - 5. Control of pests and disease organisms
[see also 321.E.2.]
 - 6. Major crops
 - a. Horticultural crops: vegetables and legumes, fruits and nuts, flowers
 - b. Cereals
 - c. Forest crops: trees, rubber
 - d. Production of other major field crops; *e.g.*, coffee, tea, cocoa, sugar, tobacco
- D. Livestock farming
 - 1. Animal breeding
 - 2. Major flock and stock animals
 - a. Cattle
 - b. Swine
 - c. Sheep and goats
 - d. Horses
 - e. Poultry
 - f. Bees
 - g. Other livestock; *e.g.*, buffalo, asses and mules, camels
 - 3. Disease and pest control
- E. Technology of hunting and fishing, whaling

F. Food processing

1. Fruit and vegetable processing
2. Cereals, cereal products, and other starch products
3. Bakery products: basic ingredients, types of products and production methods, market preparation, quality maintenance and testing
4. Confectionery and candy production
5. Meat and meat products
6. Fish and marine products
7. Dairying and dairy products
 - a. Milk production and handling techniques
 - b. Dairy products: fluid and concentrated milk, dried milk, ice cream, butter, and cheese
8. Beverage production
 - a. Technology of brewing
 - b. Technology of wine making
 - c. Technology of producing distilled liquor
 - d. Technology of producing nonalcoholic beverages: soft drinks, coffee, tea
9. Spices, herbs, and flavourings
10. Cane sugar, beet sugar, and other sweeteners
11. Oils, fats, and waxes
12. Eggs and egg products
13. Cocoa and chocolate products

G. Food preservation

1. Methods of preservation
 - a. Low-temperature preservation: refrigeration and freezing
 - b. Preservation by drying and by smoking
 - c. High-temperature preservation: canning and pasteurization
 - d. Fermentation and pickling
 - e. Chemical preservation
 - f. Preservation by heat radiation and by ionizing radiation
2. Food storage and packaging

H. Techniques for controlling the quality of food

1. Evaluation of food quality: sensory evaluation; objective evaluation by chemical, instrumental, and microbiological methods
2. Control of food quality
3. Regulation of food quality by legislation, grading, and inspection

I. Food sources and new product development

1. History and development of new foods and new food products
2. Utilization of new food sources; *e.g.*, oilseeds, leaves, grasses, single-cell protein
3. Development of new market forms
4. Development of special foods; *e.g.*, for space exploration

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with agriculture and food production

Agricultural Sciences	Forestry and Wood Production
Agriculture, The History of	Gardening and Horticulture
Beverage Production	Gastronomy
Farming and Agricultural Technology	Industries, Extraction and Processing
Fishing, Commercial	Public Works
Food Processing	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>beekeeping:</i>	paella	harrow	seafood
beekeeping	pasta	hog house	shellfish
beeswax	polenta	millstone	sponge
honey	tamale	plow	tuna
nectar	<i>cooking:</i>	reaper	whaling
<i>beverages:</i>	baking	scarecrow	<i>food preservation:</i>
absinthe	boiling	silo	canning
alcoholic beverage	braising	thresher	dehydration
aquavit	broiling	tractor	fermentation
beer	cookbook	windrower	food preservation
brandy	frying	<i>farming techniques:</i>	freezing
champagne	leavening agent	chinampa	pasteurization
cider	pressure cooker	contour farming	preservative
coffee	sauce	crop rotation	refrigeration
cognac	shortening	drainage	smoking
distilled liquor	tandoori cookery	dry farming	<i>horticulture:</i>
gin	wok	fertilizer	graft
liqueur	<i>egg and dairy</i>	hacienda	horticulture
maté	<i>products:</i>	hydroponics	pruning
proof	butter	irrigation	transplant
pulque	butterfat	Norfolk	<i>livestock and feeds:</i>
rum	buttermilk	four-course	cattle
sake	candling	system	feed
soft drink	cheese	open-field system	goat
tea	churn	organic farming	hay
tequila	cream	paddy	livestock
vodka	dairying	ranch	pig
whiskey	egg	shifting agriculture	sheep
wine	ice cream	spraying and	silage
<i>cereal crops:</i>	milk	dusting	<i>meat products:</i>
barley	yogurt	tenant farming	aspic
buckwheat	<i>farm equipment and</i>	terrace cultivation	bacon
cereal	<i>buildings:</i>	three-field system	beef
corn	barbed wire	till-less agriculture	frankfurter
millet	barn	<i>fishing and sea</i>	game
oats	cellar	<i>products:</i>	gelatin
popcorn	combine	agar	ham
rice	corn harvester	ambergis	hamburger
rye	cotton gin	aquaculture	lamb
sorghum	cotton harvester	baleen whale	meat
wheat	cream separator	bêche-de-mer	pork
<i>cereal grain products:</i>	crib	caviar	sausage
bran	crop duster	commercial fishing	veal
breakfast cereal	cultivator	factory ship	venison
couscous	farm machinery	fishery	<i>oils, fats, and</i>
dumpling	fence	lobster pot	<i>waxes—edible:</i>
hominy	grain drill	net	babassu palm
noodle	grain elevator	roe	beeswax
			butter

butterfat	oil plant	sugarcane	food processing
cocoa butter	perilla oil	sweetener	food processor
cod-liver oil	sperm oil	<i>tobacco:</i>	forestry
cohune oil	spermaceti	chewing tobacco	fowl
copra	wax	cigar	fruit
corn oil	whale oil	cigarette	pectin
cottonseed	<i>oils, fats, and</i>	pipe	sago
fat	<i>waxes—inedible:</i>	smoking	spice and herb
fish oil	See Section 724	snuff	straw
linseed	<i>sugars:</i>	tobacco	tapioca
margarine	honey	<i>other:</i>	tree ear
oil	maple syrup	additive	vegetable
oil cake	molasses	arrowroot	vinegar
oil extraction	sugar	emulsifier	
oil palm	sugar beet	food colouring	

Biographies

Burbank, Luther

Carver, George Washington

McCormick, Cyrus Hall

See also Section 10/34 of Part Ten

INDEX: See entries under all of the terms above

Section 732. Technology of the Major Industries**A. Principles of organization of work and production**
[see 712]**B. Major manufacturing industries**

1. The aerospace industry
2. The automotive industry
3. The clothing and footwear industry
4. The furniture industry

C. The major fabrication industries

1. The textile industry
2. The steel industry
[see also 725.B.]
3. The leather and hide industry
4. The fur industry
5. The floor-covering industry
6. The electronics industry
7. The tool and die industry
8. The lumber industry
9. The cutlery industry
10. The abrasives industry

D. The major processing industries

1. The chemical industry
2. The petroleum industry
[see also 724.B.2.]
3. The paper industry
4. The pharmaceuticals industry
[see also 10/35.C.4.]
5. The plastics industry

6. The rubber industry
 7. The surface-coating industry
 8. The dye and pigment industry
[see also 122.G.1.t.]
 9. The man-made fibre industry
 10. Production of industrial and residential gases
[see also 724.C.7.]
 11. The cosmetics and personal care industry
- E. The construction industries
[see 733]
- F. The service industries
1. Hotels and motels
 2. Restaurants
 3. Food service systems
 4. The transportation industry
[see 734]
 5. Security and protection systems
- G. The utilities industries
- H. The merchandising and marketing of consumer goods
[see 533.H.5.]
- I. Industrial research and development
- J. Technology of industrial safety

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and a biography dealing with the technology of the major industries

Dress and Adornment	Industries, Chemical Process
Ford, Henry	Industries, Extraction and Processing
Forestry and Wood Production	Industries, Manufacturing
Industrial Ceramics	Industries, Textile
Industrial Glass	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>abrasives:</i>	blimp	turbojet	<i>chemical processing:</i>
abrasive	Delta	turboprop	ammonia-soda
corundum	flight simulator	V-1 missile	process
emery	fuselage	V-2 missile	autoclave
silicon carbide	glider	wind tunnel	contact process
synthetic diamond	helicopter	zeppelin	detergent
<i>aerospace:</i>	instrument landing	<i>automotive:</i>	drug
air-cushion	system	automobile	dye
machine	jet engine	bus	fertilizer
airframe	launch vehicle	diesel engine	Haber-Bosch
airplane	monoplane	electric automobile	process
airport	ramjet	gasoline engine	man-made fibre
airship	rocket	motorcycle	paper
Atlas rocket	Saturn	tire	pigment
autogiro	seaplane	tractor	pitch
automatic pilot	STOL airplane	truck	retort
balloon	supersonic flight	vehicular safety	
biplane	Thor rocket	devices	

- rubber
 soap
 surface-active agent
clothing and footwear industry:
 button
 fur
 glove
 hat
 hosiery
 leather
 needle
 sewing machine
 shoe
 zipper
cosmetics and personal care:
 ambergris
 attar of roses
 cologne
 cosmetic
 emollient
 lavender
 musk
 myrrh
 perfume
cutlery:
 cleaver
 cutlery
 flatware
 razor
 scissors
 sword
dyes and pigments:
 acid dye
 anthraquinone
 anthraquinone dye
 azo dye
 carmine
 catechu
 cochineal
 Congo red
 direct red
 dye
 India ink
 indigo
 naphthol
 pigment
 quercitron bark
 sulfur dye
 vat dye
electronics:
 See Section 721
floor coverings:
 See Section 629 of Part Six
food service and lodging:
 café
 cafeteria
- hotel
 inn
 motel
 public house
 tavern
 youth hostel
furniture:
 bed
 cabinet
 chair
 chest of drawers
 couch
 cupboard
 davenport
 desk
 home appliance
 settee
 stool
 table
gases, industrial and domestic:
 argon
 carbon dioxide
 carbon monoxide
 chlorine
 fluorine
 helium
 hydrogen
 liquefied natural gas
 liquefied petroleum gas
 natural gas
 nitrogen
 oxygen
 sulfur dioxide
industrial safety:
 fire prevention and control
 flash point
 safety
 safety engineering
 sprinkler system
lumber:
 chipboard
 ebony
 fibreboard
 fir
 greenheart
 hardwood
 lancewood
 mahogany
 narra
 oak
 particleboard
 pine
 plywood
 rosewood
 softwood
 spruce
 teak
 wood
- man-made fibres and films:*
 azlon
 cellophane
 cellulose acetate
 metallic fibre
 modacrylic
 nylon
 polyacrylonitrile
 polyester
 polyolefin
 polyurethane
 rayon
 spinneret
papermaking:
 Fourdrinier machine
 kraft process
 paper
 paper pulp
 parchment
 sulfite process
petroleum:
 See Section 724
plastics:
 Bakelite
 celluloid
 foamed plastic
 Formica
 Lucite
 melamine
 nylon
 plastic
 polyacrylonitrile
 polychlorotrifluoroethylene
 polyolefin
 polystyrene
 polysulfone
 polytetrafluoroethylene
 polyurethane
 polyvinyl alcohol
 resin
 silicone
 urea-formaldehyde resin
rubber:
 accelerator
 foam rubber
 hose
 tire
 vulcanization
security and protection:
 barbed wire
 cipher
 code
 cryptology
 fence
 key
 lock
- police
 security and protection systems
steel:
 basic oxygen process
 Bessemer process
 blast furnace
 Cowper stove
 crucible process
 cupola furnace
 ingot
 open-hearth process
 ore dressing
 smelting
 stainless steel
 steel
surface coatings:
 black varnish
 Brunswick black
 drying oil
 Formica
 paint
 porcelain
 enamelling
 shellac
 varnish
textile industry:
 batik
 bleach
 braiding
 dye
 felting
 knitting
 loom
 mercerization
 plain weave
 resist printing
 sizing
 spinning
 spinning wheel
 textile
 twisting
 weaving
 yarn
textiles:
 bombazine
 calico
 cambric
 canvas
 cheviot
 corduroy
 crash
 crepe
 crepe de Chine
 damask
 duck
 flannel
 fustian

gabardine	pile	<i>transportation:</i>	postal system
gauze	taffeta	See Section 734	public enterprise
gingham	tweed	<i>utilities:</i>	public utility
khaki	<i>tool and die industry:</i>	broadcasting	regulatory agency
muslin	See Section 722	electric power	
Biographies			
Bagehot, Walter	du Pont family	Nuffield, William	Siemens,
Beach, Alfred Ely	Ford, Henry	Richard Morris,	Werner von
Bessemer, Sir	Guggenheim, Meyer	Viscount	Siemens, Sir
Henry	and Daniel	Pew, J. Howard;	William
Carnegie, Andrew	Hughes, Howard	and Pew, Joseph	Squibb, E.R.
Drake, Edwin	Hunt, H.L.	N., Jr.	Thyssen family
Laurentine	Kelly, William	Rockefeller, John D.	Yerkes, Charles
		Schwab, Charles M.	Tyson

INDEX: See entries under all of the terms above

Section 733. Construction Technology

A. General building construction

1. Preconstruction planning: design programming, drafting
2. Surveying procedures: techniques for laying out building foundations
[see also 723.D.2.c.ii.]
3. Building materials
 - a. Earth, clay, and sod
 - b. Vegetable matter: thatch, reeds, and other materials
 - c. Lumber
 - d. Bricks and tiles: other fired clay and ceramics
[see 724.C.5.d.]
 - e. Stone
 - f. Mortar, cement, portland cement, and plaster
[see 724.C.5.b.]
 - g. Metals; *e.g.*, iron, steel, aluminum, copper
[see 724.C.3.]
 - h. Glass
[see 724.C.5.a.]
 - i. Concrete, reinforced concrete, and prestressed concrete
 - j. Composition materials, plastics
 - k. Structural fabrics
4. Testing of building materials
5. Construction machinery
 - a. Transport machinery
 - b. Lifting machinery; *e.g.*, cranes, cables, ropes
6. Construction techniques
 - a. Wood and timber construction
 - b. Masonry construction
 - c. Concrete construction
 - d. Steel construction
7. Building components
 - a. Foundations and footings
 - b. Structural systems
 - c. Floor systems

- d. Roof systems
 - e. Space-enclosure systems
 - f. Interior finishes: *e.g.*, carpeting, hardware, ceiling systems
 - g. Auxiliary systems
 - i. Plumbing systems
 - ii. Heating, ventilating, and air-conditioning systems
 - iii. Electrical wiring
 - iv. Systems for illumination: interior and exterior lighting
 - v. Vertical transport systems; *e.g.*, elevators, moving stairways
 - vi. Life-safety systems
 - 8. Acoustics and sound-control techniques
- B. Construction of civil engineering works
- 1. Dams
 - 2. Aqueducts
 - 3. Bridges
 - 4. Underground construction
 - 5. Harbour and hydraulic works
 - 6. Lighthouses and lightships
- C. Prefabrication and shop fabrication

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with construction technology

Analysis and Measurement, Physical and Chemical
 Building Construction
 Drafting
 Public Works

MICROPAEDIA: Selected entries of reference information

General subjects

<i>bridges:</i>	scaffold	putty	fan
bridge	skyscraper	rammed earth	fireplace
covered bridge	truss	shingle	furnace
military bridge	wall	shotcrete	heat pump
movable bridge	wattle and daub	tile	heating
pontoon bridge	<i>building foundations:</i>	wallboard	hypocaust
suspension	cofferdam	<i>construction</i>	stove
bridge	pier	<i>machinery:</i>	ventilating
viaduct	retaining wall	bulldozer	<i>lighting devices:</i>
<i>building construction:</i>	settling	crane	arc lamp
beam	shoring	dredge	Argand burner
box frame	soil mechanics	drilling machinery	candle
construction	<i>building materials:</i>	power shovel	electric discharge
cantilever	aggregate	<i>engineering graphics:</i>	lamp
carpentry	brick	blueprinting	flare
ceiling	cement	drafting	flash lamp
Chicago School	clapboard	isometric drawing	fluorescent lamp
drywall	concrete	<i>heating, ventilating,</i>	incandescent lamp
construction	lath	<i>and air-conditioning</i>	kerosine lamp
framed building	mortar	<i>systems:</i>	lamp
half-timber work	nail	air-conditioning	lantern
hypostyle hall	paris, plaster of	chimney	rushlight
log cabin	portland cement	chimneypiece	safety lamp
post-and-lintel	pozzolana	electric heater	
system			

searchlight	<i>roof types:</i>	tunnel	escalator
spotlight	dome	tunneling shield	gate
<i>masonry construction:</i>	geodesic dome	<i>other:</i>	hippodrome
arch	hip roof	acoustics	jetty
cyclopean masonry	roof	aqueduct	levee
masonry	vault	construction	plumbing
mortar	<i>tunneling:</i>	dam	porch
pointing	air lock	dock	prefabrication
reticulated work	caisson	drydock	stadium
rubble masonry		elevator	

Biographies

Brunel, Sir Marc Isambard
 Eads, James Buchanan
 Fuller, R. Buckminster

Nervi, Pier Luigi
 Roebling, John Augustus
 Roebling, Washington Augustus

See also Section 10/37 of Part Ten

INDEX: See entries under all of the terms above

Section 734. Transportation Technology**A. History of transportation**

1. Primitive transportation; *e.g.*, travois, slide car, sledge, pack animal, dugout
2. The wheel and the road: development of the vehicle wheel, roads of the ancient world, beginnings of the modern road
3. Sails and oars: beginnings of shipping and shipbuilding, growth of inland waterways
4. Steam transportation
 - a. The railroad: the first locomotives, the spread of railways, the construction of railroad bridges and tunnels
 - b. Steam navigation: the first steamships, introduction of iron ships, decline of sailing fleets
5. Development of modern transportation
 - a. Construction of road vehicles, roads, bridges, and tunnels
 - b. Development of mass urban transport and traffic networks
 - c. Development of the air transport industry

B. Roads and highways and their construction**C. Vehicles and devices for transportation across country and on roads and highways**

1. Nonwheeled transportation devices; *e.g.*, bridles, saddles, harnesses, stirrups
2. Animal-drawn wheeled vehicles: wagons, coaches, and carriages
3. Bicycles
4. Automobiles
5. Trucks and buses

D. Rail transportation**E. Stationary conveyance systems; *e.g.*, pipelines, conveyor belts**
[see 725.C.2.]**F. Water transportation**

1. Types of ships and other waterborne vessels
2. Ship design and construction
 - a. Ship design: hydrodynamic and hydrostatic factors that influence ship stability and maneuverability, structural strength and safety considerations
 - b. Shipbuilding, shipyard layout and construction; planning, fabrication, and assembly; launching, outfitting, and trials

- c. Power units for propulsion: steam generators, internal-combustion engines, gas turbines, and nuclear reactors
 - 3. Canals and inland waterways
 - 4. Harbour works: docks and quays, bulk terminals
[see 733.B.5.]
- G. Air transportation
- 1. Aircraft: configurations, flight characteristics, missions, and special uses
 - a. Lighter-than-air craft: balloons, airships
 - b. Heavier-than-air craft: fixed-wing aircraft, rotary-wing aircraft, experimental and research aircraft
 - c. Air-cushion machines
 - 2. Airports
 - 3. Air transport industry
 - 4. Space travel
[see 738.C.]
 - 5. Aeronautical and space research
- H. Traffic control: history, problems associated with traffic, government regulations, conventional and computerized techniques of control

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major article dealing with transportation technology

Transportation

MICROPAEDIA: Selected entries of reference information

General subjects

<i>air transport:</i>	Conestoga wagon	<i>rail transport:</i>	raft
air-cushion machine	curricle	coach	rigging
airframe	gig	freight car	road at sea, rules of the
airplane	hansom cab	locomotive	rowboat
airport	harness	marshalling yard	rudder
airship	horsecar	railroad	sail
autogiro	landau	sleeping car	ship
automatic pilot	one-horse shay	turbo train	shipyard
balloon	phaeton	unit train	square sail
biplane	post chaise	<i>water transport:</i>	steamboat
blimp	ricksha	anchor	tanker
glider	rockaway	buoy	trawler
helicopter	saddle	canal	tugboat
instrument landing system	sedan	canoe	umiak
monoplane	stage wagon	castle	<i>other:</i>
seaplane	stagecoach	clipper ship	aqueduct
STOL airplane	sulky	fog signal	bicycle
supersonic flight	troika	gondola	containerization
Zeppelin	wagon	harbour	elevator
<i>animal-powered transport:</i>	<i>highway transport:</i>	hydrofoil	escalator
brougham	automobile	jib	litter
buggy	boulevard	kayak	livery company
carriage	bus	keel	pipeline
cart	electric automobile	lateen sail	Roman road system
chaise	expressway	lifeboat	shipping route
chariot	motorcycle	lighthouse	Silk Road
coach	road	lightship	tonnage
Concord coach	tire	lock	traffic control
	tractor	longship	transportation
	truck	motorboat	velocipede
		ocean liner	
		paddle wheel	

Biographies

Cooper, Peter	MacCready, Paul	Piccard, Auguste	Tupolev, Andrey
Ford, Henry	Beattie	Sage, Russell	Nikolayevich
Fulton, Robert	Montgolfier,	Sikorsky, Igor Ivan	Wright, Orville
Gibbs, William	Joseph-Michel	Stephenson,	and Wilbur
Francis	and	George	
Langley, Samuel P.	Jacques-Étienne	Trevithick,	
Lear, William P.	Oberth, Hermann	Richard	
Lindbergh,	Julius		
Charles A.			

INDEX: See entries under all of the terms above

Section 735. Technology of Information Processing and of Communications Systems

- A. Communication and information theory
[see 10/23.F.]
- B. Calculating devices: the abacus, tally sticks, mechanical and electromechanical calculators
[see C.2., below]
- C. Office machines
 - 1. Writing and reproducing machines: typewriters, dictating and transcribing machines, word processors, duplicating machines and processes, copying machines and processes
 - 2. Calculating and accounting machines
 - 3. Miscellaneous office machines
- D. Computers
[see also 10/23.A.6. and 7.]
 - 1. Types of computers: analogue and digital computers, hybrid computer systems
 - 2. Programming systems: the encoding and entering of instructions into computer memory, the concept of software, the systems approach to writing computer programs
 - 3. Computer languages
 - 4. Applications of microcomputers, minicomputers, and supercomputers
 - 5. Developments in artificial intelligence: devising expert systems; natural-language processing; computer vision; robotics
- E. General information-recording devices
 - 1. Simple recording implements and devices; *e.g.*, writing implements, slates, chalkboards
 - 2. Typewriters and word processors
 - 3. Printing machines and processes
 - 4. Production of printing plates: engraving and other techniques
 - a. Mechanical techniques: woodcut, mechanical engraving, etching, lithography
 - b. Photomechanical techniques: photoengraving
- F. Sound and video recording and reproducing devices
[see also 128.E.]
 - 1. Mechanical systems: phonographs
 - 2. Magnetic systems: audio tape recorders, video tape recorders and players
 - 3. Optical systems: audio and video disk players
 - 4. Auxiliary equipment
 - 5. High-fidelity concepts and systems
- G. The technology of photography
 - 1. Still photography
[see also 628.D.]

2. Motion-picture and television photography

[see also 623.A.]

3. Holography: laser photography

[see also 128.B.4.c.]

H. Information processing and systems

1. Elements of information processing

- a. Analog and digital forms of information
- b. Recording and storage: image scanning and optical character recognition; mass storage via electromagnetic and electro-optical media (*e.g.*, magnetic and digital-audio tape and disk, and optical disk, respectively)
- c. Organization and retrieval: indexes and indexing; bibliographic and numeric databases; computerized catalogs in libraries and library networks
- d. Display and dissemination: television monitors and interactive computer terminals; electronic mail, bulletins, and teleconferencing; electronic printing and photocomposition; speech synthesis

2. Types of information systems

- a. Organizational systems
 - i. Management-oriented systems (executive, command and control, and decision support)
 - ii. Administration-oriented systems (financial, personnel, and project management)
 - iii. Service-oriented systems (manufacturing, transaction processing, and expert)
- b. Public information utilities (on-line database search systems)
- c. Educational and reference systems
 - i. Dictionaries and lexicons
 - ii. Encyclopaedias
 - iii. Atlases and map collections

I. Major systems of communication

1. Book, newspaper, and magazine publishing
2. Postal systems and equipment
3. Telegraph systems and equipment
4. Telephone and telecommunications systems and equipment
5. Radio communications systems and equipment
6. Television communications systems and equipment
7. Communications satellite systems and equipment
8. Electronic networks
9. Encryption and decryption techniques and devices: signal security and message authentication, history of cryptology

J. Major systems of detection and remote sensing

1. Radar systems and equipment
2. Sonar systems and equipment

K. Electronic components and techniques used in communications

1. Components
 - a. Active components: vacuum and gas-filled tubes, semiconductor devices
 - b. Passive components: resistors, capacitors, and inductors; other solid-state devices; antennas and waveguides
 - c. Integrated circuits: miniature arrays of interconnected active or passive circuit elements (*e.g.*, microprocessors)
2. Sensing devices and transducers; *e.g.*, piezoelectric devices, photomultiplier tubes
3. Circuitry

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the technology of information processing and of communications systems

Broadcasting	Encyclopaedias and	Libraries	Printing, Typography,
Computer Science	Dictionaries	Motion Pictures	and Photoengraving
Computers	Information	Photography	Publishing
Cryptology	Processing and	Postal Systems	Telecommunications
Electronics	Information Systems		Systems

MICROPAEDIA: Selected entries of reference information

General subjects

<i>computers:</i>	shortwave radio	<i>photography and</i>	incunabula
abacus	superheterodyne	<i>cameras:</i>	ink
analog computer	reception	animation	intaglio
artificial	telecommunications	camera	letterpress printing
intelligence	system	camera lucida	Linotype
computer	telegraph	camera obscura	lithography
computer-aided	telephone	CinemaScope	mezzotint
engineering	teleprinter	Cinématographe	Monotype
computer-assisted	television	Cinerama	offset printing
instruction	Telex	collotype	photocomposition
computer program	Telstar	dye-transfer process	photoengraving
computer	UHF	electrophotography	printing
programming	undersea cable	enlarger	proofreading
languages	VHF	exposure meter	rotary press
computer science	video tape recorder	filter	rotogravure
differential	videocassette	fluorescence	printing
analyzer	recorder	photography	typesetting
differentiator	videodisc	holography	machine
digital computer	videophone	Kinotoscope	<i>publishing:</i>
harmonic analyzer	waveguide	microform	book
input/output	<i>libraries and their</i>	minicam	codex
device	<i>organization:</i>	motion picture	colophon
integrator	archives	motion-picture	gazette
microcomputer	Bliss Classification	camera	journalism
microprocessor	bookmobile	negative	little magazine
supercomputer	Colon	photography	news agency
time-sharing	Classification	shutter	newsletter
word processing	Dewey Decimal	speed	newspaper
<i>electronic</i>	Classification	Technicolor	newspaper syndicate
<i>communication</i>	library	viewfinder	pamphlet
<i>systems and devices:</i>	classification	wet collodion	publishing
amateur radio	Library of	process	royalty
broadcasting	Congress	<i>postal systems:</i>	yellow journalism
cable television	Classification	airmail	<i>sound recording and</i>
citizen's band	library science	Penny Post	<i>sound devices:</i>
radio	Universal Decimal	postal system	cassette
Comsat	Classification	Thurn and Taxis	compact disc
Echo	<i>office machines:</i>	postal system	digital sound
facsimile	accounting	ZIP Code	recording
transmission	machine	<i>printing and printing</i>	flutter and wow
Intelsat	calculator	<i>materials:</i>	loudspeaker
loading	cash register	burin	magnetic recording
minicam	dictating machine	colour printing	microphone
modem	duplicating	computerized	phonograph
modulation	machine	typesetting	sound recording
Morse Code	hectograph	embossing	sound track
multiplexing	mimeograph	engraving	stereophonic sound
radio	photocopying	etching	system
satellite	machine	flatbed press	<i>other:</i>
communication	typewriter	gravure printing	database

dictionary	information	pen	qalam
encyclopaedia	processing	pencil	quill
eraser	information	public-address	stylus
	science	system	

Biographies

Alembert, Jean Le Rond d'	Fessenden, Reginald Aubrey	Macmillan, Daniel; and Macmillan, Alexander	Pearson, Drew
Armstrong, Edwin H.	Girardin, Émile de	Manutius, Aldus, the Elder	Popov, Aleksandr Stepanovich
Beaverbrook, Sir Maxwell Aitken, 1st Baron	Gollancz, Sir Victor	Marconi, Guglielmo	Pulitzer, Joseph
Bell, Alexander Graham	Greeley, Horace	Morse, Samuel F.B.	Sarnoff, David
Benton, William	Gutenberg, Johannes	Murdoch, Rupert	Siemens, Werner von
Burnham, Edward	Haley, Sir William	Muybridge, Eadweard	Siemens, Sir William
Levy-Lawson, 1st Baron	Harper brothers	Nelson, William	Stone, I.F.
Caxton, William	Hearst, William Randolph	Rockhill	Thomas, Lowell
Cotta family	Josephson, Brian D.	Niepce, Nicéphore	Vincent of Beauvais
Cowles family	Knopf, Alfred A.	Northcliffe, Alfred	Wallace, DeWitt and Lila Bell
Dana, Charles A.	Land, Edwin Herbert	Charles William Harmsworth, Viscount	Acheson
Diderot, Denis	Lippmann, Walter	Ochs, Adolph Simon	Webster, Noah
Dimpleby, Richard	Luce, Henry R.	Page, Walter Hines	Winchell, Walter
Disney, Walt	Lumière, Auguste and Louis	Paley, William S.	Zworykin, Vladimir Kosma
Ferrié, Gustave-Auguste			

INDEX: See entries under all of the terms above

Section 736. Military Technology**A. Offensive weaponry**

1. Early hand-powered weapons
 - a. Construction materials: wood, stone, precious metals, copper, bronze, iron
 - b. Shock weapons: *e.g.*, mace, axe, sword, halberd
 - c. Missile weapons: *e.g.*, spear, javelin, sling, arrow
 - d. Mechanical weapons: *e.g.*, ballista, catapult, ram, crossbow
2. Gunpowder weapons
 - a. Construction materials: cast bronze, cast or wrought iron, forged or stamped steel
 - b. Loading: muzzle-, breech-, automatic
 - c. Artillery: *e.g.*, cannon, howitzer, mortar
 - d. Small arms: *e.g.*, musket, rifle, pistol, machine gun
 - e. Ammunition
 - i. Propellant: black powder, smokeless powder
 - ii. Projectiles: *e.g.*, cannonball, shrapnel, shell, bullet
3. Explosives: *e.g.*, grenades, mines, depth charges, bombs, missile warheads
4. Self-propelled missiles
 - a. Basing
 - i. Land: *e.g.*, barrage rocket, ballistic missile, surface-to-air missile
 - ii. Sea: *e.g.*, torpedo, submarine-launched ballistic missile, antiship missile
 - iii. Air: *e.g.*, air-to-air missile, cruise missile
 - b. Propulsion: rocket, jet, propeller
 - c. Guidance: free-flight, energy-sensing, command, inertial

- d. Payloads: *e.g.*, single-warhead, cluster bomblet, multiple reentry vehicle
 - e. Warheads: *e.g.*, high-explosive, antipersonnel, nuclear
 - 5. Nuclear weapons
 - a. Energy sources: fission, fusion
 - b. Effects: blast, heat, radioactive fallout
 - 6. Chemical and biological weapons
- B. Defensive weaponry
- 1. Personal protection
 - a. Armour against early hand-powered weapons
 - i. Materials: *e.g.*, leather, bronze, iron
 - ii. Construction: *e.g.*, mail, scale, brigandine, plate
 - iii. Protection: *e.g.*, shield, helmet, cuirass, greave
 - b. Armour against gunpowder and explosive weapons
 - i. Materials: steel, plastic, Kevlar
 - ii. Protection: *e.g.*, helmet, flak jacket, bullet-proof vest
 - c. Protection against nuclear and chemical weapons: *e.g.*, gas mask, overgarments
 - 2. Fortification
 - a. Field fortification: *e.g.*, log breastwork, wooden pallisade, trench, foxhole
 - b. Permanent fortification before gunpowder: masonry citadel, motte-and-bailey castle
 - c. Permanent fortification in the early gunpowder era: sunken profile, bastioned trace
 - d. Permanent fortification in the modern gunpowder era: *e.g.*, concrete bunkers, pillboxes, reinforced aircraft hangars
 - e. Antinuclear fortification: *e.g.*, hardened missile silos, bomb shelters
 - 3. Missile defense: surface-to-air missiles, rapid-fire guns
- C. Weapon platforms
- 1. Land vehicles
 - a. Animal mounts: *e.g.*, horses, elephants, camels
 - b. Man- and animal-powered vehicles: *e.g.*, chariots, siege towers
 - c. Steam power: *e.g.*, railroad cars, early tanks
 - d. Internal combustion: *e.g.*, tanks, armoured personnel carriers
 - 2. Surface ships and craft
 - a. Oar-powered: *e.g.*, galleys, longboats
 - b. Sail-powered: *e.g.*, galleons, ships of the line, frigates
 - c. Steam-powered: *e.g.*, battleships, cruisers, aircraft carriers
 - d. Internal combustion: *e.g.*, gunboats, landing craft
 - e. Nuclear-powered: *e.g.*, aircraft carriers, cruisers
 - 3. Submarines
 - a. Propulsion: steam turbine, diesel-electric, nuclear
 - b. Vessels: attack, strategic missile launching
 - 4. Aircraft
 - a. Fixed-wing airplanes
 - i. Propulsion: internal combustion/propeller, jet
 - ii. Configuration: *e.g.*, biplane, monowing, variable-geometry wing
 - iii. Types: *e.g.*, fighter, bomber, early warning
 - b. Helicopters
 - i. Propulsion: internal combustion, gas turbine
 - ii. Types: *e.g.*, attack, naval antisubmarine, transport

D. Engineering

1. Tactical support: *e.g.*, fortification
2. Strategic support: *e.g.*, roads, bridges, ports, airfields
3. Ancillary support: *e.g.*, maps, bomb disposal

E. Logistics: supply, transport, lodging, services

F. Electronics

1. Electromagnetic sensors and transmitters: the use of radio, radar, infrared, ultraviolet, optical, and laser technology in communication, navigation, warning and detection, and weapon guidance
2. Electronic countermeasures: radar jammers, infrared flares, chaff

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with military technology

War, The Technology of

War, The Theory and Conduct of

MICROPAEDIA: Selected entries of reference information

General subjects

<i>explosives and incendiaries:</i>	B-24	monitor	ram
atomic bomb	B-29	ship of the line	repeating rifle
bomb	B-52	submarine	revolver
depth charge	bomber	U-boat	rifle
grenade	F-4	<i>weapons:</i>	sling
napalm	F-16	AK-47	spear
neutron bomb	F-86	antiaircraft gun	Spencer carbine
nitroglycerin	fighter aircraft	antitank weapon	Springfield rifle
nuclear weapon	Fw 190	Armalite rifle	Sten gun
PETN	Harrier	artillery	submachine gun
shell	Hurricane	assault rifle	sword
smart bomb	Ilyushin Il-2	automatic pistol	Thompson
thermonuclear	Ilyushin Il-76	automatic rifle	submachine gun
bomb	Me 109	battering ram	Uzi
torpedo	MiG	bayonet	submachine gun
<i>launch vehicles and rockets:</i>	Mirage	bazooka	weapon
Atlas rocket	Mosquito	Big Bertha	<i>other:</i>
cruise missile	P-38	bow and arrow	Agent Orange
missile	P-47	Bren machine gun	alcázar
Nike missile	P-51	Browning	ammunition
Peacekeeper	Spitfire	automatic rifle	biological warfare
missile	Stuka	cannon	camouflage
Polaris missile	torpedo plane	carbine	chemical warfare
Poseidon missile	trainer	catapult	flintlock
rocket	Zero	coastal artillery	fortification
Thor rocket	<i>personal protective equipment:</i>	crossbow	matchlock
Trident missile	armour	dagger	military bridge
V-1 missile	chain mail	flame thrower	military
V-2 missile	gas mask	Gatling gun	engineering
<i>mechanized ground warfare:</i>	helmet	Greek fire	sapper
armoured vehicle	<i>warships:</i>	gun	shrapnel
panzer division	aircraft carrier	lance	snorkel
tank	aircraft carrier	Lee-Enfield rifle	stealth
<i>military aircraft:</i>	battleship	Luger pistol	Strategic Defense
attack aircraft	cruiser	machine gun	Initiative
AWACS	destroyer	MAG	strategic weapons
B-1	frigate	machine gun	system
B-17	galleon	Mauser rifle	tactical weapons
	galley	MG42	system
	ironclad	musket	
	minesweeper	pistol	

Biographies

Abelson, Philip	Forsyth,	Lake, Simon	Rodman, Thomas
Hauge	Alexander John	Lewis, Isaac	Jackson
Braun,	Fulton, Robert	Newton	Sopwith, Sir
Wernher von	Gatling, Richard	Mannlicher,	Thomas Octave
Brialmont,	Jordan	Ferdinand,	Murdoch
Henri-Alexis	Goddard, Robert	Ritter von	Teller, Edward
Browning, John	Hutchings	Maxim, Sir Hiram	Tupolev, Andrey
Moses	Heinkel, Ernst	Maxim, Hudson	Nikolayevich
Bushnell, David	Heinrich	Messerschmitt,	Vauban, Sébastien
Chappe, Claude	Holland, John	Willy	Le Prestre de
Colt, Samuel	Philip	Minié,	Whitehead, Robert
Congreve,	Ilyushin, Sergey	Claude-Étienne	Whittle, Sir Frank
Sir William	Vladimirovich	Oppenheimer, J.	Zeppelin,
Curtiss, Glenn	Krupp, Alfred	Robert	Ferdinand,
Dornier, Claudius	Krupp von Bohlen	Remington,	Graf von
Drebbel, Cornelis	und Halbach,	Eliphalet	
Fermi, Enrico	Alfried	Rickover,	
Fokker, Anthony	Krupp von Bohlen	Hyman G.	
Herman Gerard	und Halbach,	Robins, Benjamin	
	Gustav		

See also Section 544 of Part Five

INDEX: See entries under all of the terms above

Section 737. Technology of the Urban Community

- A. Basic engineering services of the city
 1. Water-supply systems
 2. Sanitation systems
 - a. Development and operation of sewage disposal systems
 - b. Construction and operation of street clearance and refuse disposal systems
 3. Urban transportation systems
 4. Interurban transportation systems
[see 734]
 5. Technology of electric power
[see 721.C.7.]
 6. Fire prevention and control
- B. Technology of the basic social services of the city
 1. Police technology
 - a. Traffic control technology
[see 734.H.]
 - b. Crime control technology
 2. Design, construction, and maintenance of recreational facilities; *e.g.*, parks, stadiums, racetracks, planetariums, aquariums
- C. Technological responses to new urban problems
 1. Control of air, water, land, and other pollution
 2. The planning of cities and urban environments: the systems approach to urban design and construction, the development of new towns

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with technology of the urban community

Conservation of Natural Resources
Police

Public Works
Transportation

MICROPAEDIA: Selected entries of reference information

General subjects

<i>fire prevention and control:</i>	<i>police technology:</i>	pollution	refuse disposal system
fire alarm	criminal investigation	smog	sedimentation tank
fire engine	electronic	<i>urban transport:</i>	sewage system
fire escape	eavesdropping	elevated transit line	<i>water-supply systems:</i>
fire extinguisher	fingerprint	monorail	conduit
fire fighting	handcuffs	streetcar	desalination
fire prevention and control	lie detector	subway	qanat
fireboat	<i>pollution control:</i>	taxicab	reservoir
halon	acid rain	trolleybus	water purification
smoke detector	electrostatic	<i>waste disposal:</i>	water softener
sprinkler system	precipitation	activated-sludge method	water-supply system
	emission-control system	incinerator	
	muffler		

Biographies

See Section 10/37 of Part Ten

INDEX: See entries under all of the terms above

Section 738. Technology of Earth and Space Exploration

- A. Techniques and equipment of surface and underground exploration
 1. Types and purposes of exploration
 - a. Scientific exploration: the determination of the properties of the Earth's interior
 - b. Resource exploration: the discovery of sources of ores, building materials, fuels, water, and geothermal energy
 - c. Exploration for construction: the planning of tunnels, foundations, and other works
 2. Methods of exploration
 - a. Indirect methods: geophysical and geochemical methods
 - b. Direct methods: on-site testing by means of excavation, boring, and sampling of soil and rock
- B. Techniques and equipment of undersea exploration
 1. Platforms for exploratory work
 - a. Surface vessels; *e.g.*, deep-sea drilling ships and twin-hull vessels
 - b. Submersibles
 - c. Aircraft and satellites: application of remote sensing and satellite telemetry
 - d. Buoys and other unmanned units; *e.g.*, the Self-Propelled Underwater Research Vehicle (SPURV)
 2. Navigational methods and systems for establishing the precise location of discoveries
 3. Developments in oceanographic sampling and measurement techniques; *e.g.*, acoustic methods and solid-state microelectronic ocean-current measuring devices
- C. Techniques and equipment of space exploration
 1. History of space flight prior to Sputnik I: early speculations and fictional accounts, development of space flight theory and technology during the 20th century
 2. Space programs since 1957
 - a. Space launch vehicles: rockets designed to provide orbital or escape velocity for manned or unmanned spacecraft
 - b. Unmanned space probes
 - i. The use of sounding rockets to explore the upper atmosphere of Earth

- ii. The use of orbiting satellites for scientific purposes; *e.g.*, to study the natural phenomena of space, to test instrumentation and communication techniques
 - iii. The use of unmanned spacecraft to probe the Moon and the planets and their satellites
 - c. Manned space programs: the Mercury, Gemini, Apollo, and Space Shuttle programs of the U.S.; the Vostok, Voskhod, and Soyuz/Salyut programs of the U.S.S.R. and the Russian Federation
 - d. The use of Earth-oriented satellites: communications, Earth survey, and navigation satellites
 - 3. Elements of space flight
 - a. The environment of space: the definition of space, characteristics affecting space flight
 - b. Technology of spacecraft subsystems
 - c. Launch principles and techniques: staging of propulsion systems, acceleration rates
 - d. Mechanics and techniques of space flight
 - i. Types of trajectories: suborbital, Earth orbital, Earth escape, and interplanetary
 - ii. Navigation in space
 - iii. Rendezvous and docking
 - iv. Reentry and recovery
 - 4. Contributions of space exploration to advances in the physical sciences
- D. Techniques of life-support systems for exploration
- 1. Systems used in undersea exploration
 - 2. Systems used in space exploration

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the technology of Earth and space exploration

Exploration

Public Works

MICROPAEDIA: Selected entries of reference information

General subjects

<i>launch vehicles:</i>	Surveyor	<i>unmanned Earth</i>	Vanguard
Delta	Zond	<i>satellites:</i>	Vela
launch vehicle	<i>ocean and seafloor</i>	Aryabhata	<i>other:</i>
Saturn	<i>exploration:</i>	Biosatellite	European Space
<i>man in space:</i>	bathymetry	Cosmos	Agency
Apollo program	bathyscaphe	Discoverer	exploration
astronaut	bathysphere	Earth satellite	Hohmann orbit
Gemini	Challenger	Landsat	interplanetary
life-support system	Expedition	Orbiting	exploration
Mercury	diving bell	Astronomical	National
Mir	Glomar Challenger	Observatory	Aeronautics
Skylab Program	mesoscaphe	Orbiting	and Space
Soyuz	<i>translunar probes:</i>	Geophysical	Administration
space shuttle	Galileo	Observatory	prospecting
space station	Helios	Pegasus	seismic survey
Voskhod	Mariner	satellite	sounding rocket
Vostok	Pioneer	observatory	space exploration
<i>Moon probes:</i>	Venera	Seasat	spacecraft
Apollo program	Viking	Sputnik	unidentified flying
Luna	Voyager	TIROS	object
Moon exploration	Zond	Transit	

Biographies

Armstrong, Neil
 Oberth, Hermann
 See also Section 721

INDEX: See entries under all of the terms above

Introduction to Part Eight: Religion as Symbolism

by Wilfred Cantwell Smith

There is more to human life than meets the eye. More to oneself; more to one's neighbour; more to the world that surrounds us. There is more to the past out of which we come; and especially, it would seem, more to the present moment, maybe even infinitely more. There is more to the interrelationships that bind us together as persons. And the further we probe, we have always found, the deeper the mystery, or the reward, or the involvement. It is this "more," perhaps, that provides at least one of the bases for human religion. We have seldom been content to be "superficial," to remain on the surface, to imagine that reality does not transcend our finite grasp; and throughout most of our history on this planet we have ordered our lives, both personal and cultural, in terms of that transcendence.

Yet how is one to point to what one does not visually see? How to resort to a milieu beyond all space? How to talk or to think about what transcends not only words but the reach of the mind? How even to feel about what one does not touch? Man's inherent and characteristic capacity to do these things finds expression through his special relation to symbols. These have proven over the centuries sometimes more, sometimes less, adequate to such a task, but in any case indispensable, and ubiquitous. Such symbols, it turns out, have the power not merely to express man's otherwise inchoate awareness of the richness of what lies under the surface, but also to nurture and to communicate and to elicit it. They have an activating as well as a representational quality, and an ability to organize the emotions and the unconscious as well as the conscious mind, so that into them we may pour the deepest range of our humanity and from them derive an enhancement of the personality. Without the use of symbols, including religious symbols, man would be radically less than human.

Quite diverse types of things have served the purpose: a beaver, the sky, a ceremonial procedure, silence; erotic love, or austere asceticism; the Qur'ān; a historical figure; reason. The variety has been immense, different groups having chosen different things to serve them as symbols, not all equally successful. Virtually universal, however, is that peoples have found it possible to designate some item from within the visible world and to sacralize it in such a way that it becomes then for them the symbol or locus of the invisible, the transcendent. In Japan, a simple open gateway (*torii*) marks off the shrine precincts: one passes through it, leaving behind psychologically, symbolically, the humdrum ordinary world to enter the sacred space of the temple; and after worship, one again moves through the gate in the other direction, to reenter now the realm of everyday life, but as a renewed person. Virtually all peoples have set aside some portion of what outsiders would regard as ordinary terrain to serve for them as sacred space, erecting in it temple, church, or shrine whereby is then

represented for them, often with great force, quite another dimension of reality.

Similarly with time: the Jew, for instance, sets apart one day in seven, whereby the other six days symbolize the mundane world with its bitter imperfections, perhaps its devastating pain, and at best its transient successes, while the Sabbath creatively represents the inviolate splendour of transcendence—with which therefore the other six days, however bleak, cannot keep him out of touch. Every people has its festivals, weekly or seasonal or occasional, its sacred times when life in its empirical and work-a-day aspects is transcended and life in its timeless dimension is reaffirmed, reactivated: moments when truth, significance, worth are recognized and cultivated—and carried back then into the ordinary world.

We are somehow aware, if only through imaginative vision or sensibility or our special capacity for hope, not only of what is but also of what ought to be. We have sensed that the *status quo* (nowadays, the *fluxus quo*) is not the final truth about man or the world. We have felt, to take one example, that social justice and concord, personal righteousness, health, joy stand over against the current observable condition of strife, loneliness, wickedness, poverty, and sorrow not as fancy against truth, wishful and irrational dreaming against reality, but in some fashion *vice versa*—as a norm by which the present imperfect world is judged, in some sense a truth in relation to which empirical actuality is in some sense an error. This too has been affirmed symbolically. One rather common way of doing so has been by representing a more perfect world elsewhere. Some have located their utopias chronologically in the past ("Once upon a time"; or Golden Age theories, as in Greece and India); or in the future (millennialisms, a coming just ruler, secular ideas of progress, a life after death); or geographically, somewhere else (the medieval Irish "Isle of the Blessed" in the then inaccessible Western Sea); or high above the sky (heaven, the heaven of heavens); or in a domain beyond time (Paradise); or in another realm than this universe (a metaphysical order, idealist realities).

However it be symbolized and articulated, a moral dimension to human life has been perceived and affirmed. Man has been aware not only of the profitable and the disadvantageous but also of the better and the worse, and has been inspired by some power to pursue the better; he has known that some actions are right, some wrong, and that it matters. At most times and most places, morality has been an integral part of the religious complex (although situations have on occasion arisen when the two have become historically dislocated—when a given form of religion has seemed not good; or to put it another way, when man's sense of what is worthwhile, and the inherited symbols by which worth used to be formulated, have no longer converged).

If the panorama of man's religious life is, in its outward form, selected mundane data symbolizing the more than mundane, then the task of the student of religion is to know those data but to consider them not in themselves but in their role in our lives. Our concern is not primarily the doctrines and scriptures and prayers and rites and institutions; but rather, what these do to us. Not the tribal dance, so much as what happens to the African dancing; not the caste system, so much as what kind of person the Hindu becomes within it, or without it; not the events at Sinai, so much as what role the recounting of these events has played in both Jewish and Christian life over the centuries since; not the Qur'an, so much as what the Qur'an means to a Muslim.

In illustration, let us consider as an example a statue of the Buddha, and take note specifically of one small part of it, the pose of the right hand. Among several such stylized poses used throughout the Buddhist world, we may choose just one, the *abhaya mudra* ("fearlessness pose"), in which the right arm is somewhat raised, that hand held straight up, palm facing out. Over and above the more universal significance of such a gesture (power, authority, benediction), in the Buddhist case this represents also an incident from the life of the Buddha, in which reputedly a wild elephant charging him and his group was stopped in its tracks when the Teacher raised his hand so, and became tame. The gesture gives artistic expression, then, to the Buddha's fearlessness in the face of the threat, and also to his conferring of fearlessness, and of grounds for fearlessness, on his disciples: his serene triumph over danger.

To say that this particular feature of sculpture symbolizes for Buddhists the overcoming of fear is to indicate not merely that it depicts an event in someone else's life, but also that it effects a change in one's own—since, to repeat, symbols not only represent but activate. The animal in its fury in the remembered anecdote may itself be taken as symbolic, representative of the pressures and assaults of life, which faith in the Buddha gives one the inner resources to withstand: the passions, for instance, to which such faith bestows on one the power quietly to say "no." To understand this particular item in the religious life of Buddhists, accordingly, is to know the history of how a Japanese emperor or a Thai merchant or a Chinese peasant through contemplating it in some nearby temple has had his life transformed, his fear removed, his personality healed. A parallel may be observed of the role in the lives of Christians, over the centuries, of the story of Christ's stilling of the tempest. His words, "Peace, be still!" read in the Lesson, and the portrayal of the scene in stained-glass windows, have served to symbolize, for people of faith, on the one hand Christ's power over the elements in his own life, and on the other hand the power that their faith in Him has in their lives, they have then found, to confer peace, to quell storms.

A special sort of symbolization, developed characteristically in, for instance, the Western world but by no means only there, has been the conceptual. A few recent philosophers have itched to legislate that concepts must be used to refer only to the sensible or phenomenal world; that it is illegitimate to use them symbolically to refer to a transcendent order. It would be manifestly stultifying to apply so austere a restriction to art or to most other human

pursuits, apart from the natural sciences (from which these persons have learned it). Such an orientation has seemed to work rather well with the "objective" world—better, with the objective facets of the world (at least, until one raises moral questions about atomic bombs or ecology); but it appears stubbornly to misunderstand life in its distinctively human form.

One of the most powerful symbols in human history has, without question, been the *concept* "God." This concept, like other religious and other human symbols, has demonstrably meant different things to different persons and groups and ages; yet it is hardly too drastic an oversimplification to suggest that the concept has on the whole at least subsumed, integrated, deepened, and made operationally effective in the lives of many hundreds of millions of persons and in the life and social cohesion of many thousands of communities their awareness and their potential awareness of the entire range of transcendence with which they are surrounded or endowed—of grandeur, order, meaning, aspiration, awe, hope, virtue, responsibility, rapport, integrity, worth, renewal. The highest, deepest, most comprehensive that they were capable of attaining, individually and socially, was organized, focused, and nurtured in and through this concept. (Given the distinction, observed by all believing theorists, between God and people's ideas of God, such theorists may themselves make this same point by saying that God has used the idea of God to enter people's lives; that the concept has served as a sacrament. More recent developments, with the concept "God" no longer serving so effectively, as a symbol, for many, will be touched on below.)

Although correlative conceptualizations are virtually worldwide and history-long, this particular concept was developed in its most powerful and characteristic form in the Near East and has permeated, at times dominated, the civilizations that have emerged from there to cover almost half the planet, especially the Islamic and the Judeo-Christian. The Indian counterpart has been in many respects closely similar; in many, subtly different. China and Japan, although also employing symbolic concepts richly, have tended toward other religious and cultural patterns than this particular one.

Even so major a symbol, however, as the concept "God," however all-embracing it may seem, is in the end significant not in isolation but within a whole system of ideas, practices, values, and the like, forming a pattern of which it is no doubt the keystone but not the totality. Certainly minor symbols like the pose of the right hand in a piece of sculpture or medium ones like the ceremonial holiness of the Sabbath, however significant they have been in the lives of many millions of persons, derive their meaning and their power from each being one item within a large pattern of symbolic structures, such as the Buddhist complex or the Christian.

And even these great complexes, each of which has an elaborate and ever-changing history, constitute systems to be understood not in themselves, as structures to be looked at, but rather in terms of the ambience that they make available for men and women to live within. "In order to understand Buddhists, one must look not at something called Buddhism, but at the universe, so far as possible through Buddhist eyes." It is not the symbols themselves

that one must grasp, so much as the orientation that they induce: how the whole complex of symbols enables those who live in terms of it to see a sunset, a broken marriage, prosperity, the onset of cancer, one's election to public office.

The religious history of the Hindu community is a history, in part, of traditional ceremonial and ideological and sociological patterns. Yet in more significant part it is a history, however difficult this may be to discern, of fortitude and of quiet humaneness, of a conviction that life is worth living and death worth dying, that goals are worth striving for, that the immediate is caught up in the eternal. The Buddhist metaphors have served to kindle in the mind and heart of the Buddhist the perhaps unconscious awareness that one's own fortune is not a reason for gloating, or one's neighbour's fortune, for envy; that knowledge is more important than wealth, and wisdom than knowledge; that the world is to be appreciated and not merely exploited; that one's fellow is to be treated as an end, not merely as a means; that sorrow is not a reason for despair. Islāmic law, theology, architecture, and the rest have been symbols that at their best have crystallized and nurtured, for Muslims, the courage and serenity, the sense of order and the aspiration to justice, the forbearance, the humility, the participation in community, that the Islāmic system traditionally inspired. Christian symbols have given both form and actuality, among Christians, to many things, including for instance the ability of human suffering to become redemptive.

Of course, religious symbols and sets of symbols have been used also for mean and destructive purposes. Man's wickedness, and not only his capacity for virtue, has been expressed and even encouraged by his symbol systems, at times. Through them he has found his freedom, his transcendence of the immediately given, his ability to move beyond being merely an organism reacting to its environment; but sometimes he has used these destructively, or has become a victim of their inherent ambiguities. Nothing has turned a society into a community so effectively as religious faith: to share common symbols is about the most powerful of social cohesions. And yet few gulfs have been greater than those that separate differing religious communities, few hostilities so fierce as those between groups whose symbols differ.

Religious symbols do not raise man above the human level; only to it.

A final word about history. The history of religion has at times been mistaken for the history of its symbols; but this is superficial. The same symbols have discernibly changed their meanings over time, and indeed from person to person, and even within one person's life; also,

persisting or widespread orientations and perceptions have been expressed in strikingly different symbolizations. The true history of religion is more deeply personalist—not in the sense of individualist: the personal is also the social, and especially so in the religious realm. The true history of religion, not yet written, is the history of the depth or shallowness, richness or poverty, genuineness or insincerity, splendid wisdom or inane folly, with which men and women and their societies have responded to such symbols as were around them. It is also, however, the tale, and to some degree this can be told, of when and in what fashion they have forged new symbols, or neglected or found themselves unable to respond to old. And nowadays it is also the story of how they deal or fail to deal with a plurality of symbolisms.

One's faith is in some sense the meaning that religious symbols have for one; but more profoundly, it is the meaning that life has, and that the universe has, in the light of those symbols. For religious symbols do not "have" meanings of their own; they crystallize in various ways the meaning of the world, of human life. There is a history of their varying ability to do this, at various times and places (or of people's varying ability to have them do it). How new symbols or patterns of symbols emerge is too complex or controversial a question to be summarized here; but how they develop once launched, how they are reinterpreted (sometimes radically) over the centuries, how their success in pointing beyond themselves often gives way to a rigidity and narrowness in which they or their institutions are prized or defended simply in themselves; how iconoclastic movements arise, to shatter the symbols (literally, smashing idols; or figuratively, attacking concepts and mores), whether in the name of something higher or out of misunderstanding, and often both; saddest of all, how a time may arrive when the symbols no longer serve a community, no longer communicate a transcendent vision, and then a profound malaise settles on the society and life comes to seem without meaning, and people become alienated from each other and even from themselves and from the world in which they live—all this the historian can trace.

In recent Western history an aberrational tendency has arisen to imagine that human life is fundamentally or naturally "secular," and that religion has been an added extra, tacked on here and there to the standardly human. This view now appears to be false. Rather, the various religious systems have expressed varying ways of being human. The unbiased historian cannot but report that it has been characteristic of man to find that life has meaning and to formulate that meaning in symbolic ways, whether grotesque or sublime.

Part Eight. Religion

The outlines in the eleven sections of Part Eight set forth studies of religion in general and studies of the particular religions. The ways in which religion is related to studies of human society, the fine arts, the history of civilizations, and science and philosophy are dealt with in Parts Five, Six, Nine, and Ten.

Division I. Religion in General 303

II. The Particular Religions 306

Division I. Religion in General

The outlines in the two sections of Division I deal with diverse views of the nature, purpose, validity, and value of religion, and with the problems, methods, and results of the empirical, comparative, and phenomenological study of religions and of religious experience.

Section 811. Knowledge and Understanding of Religion 303

812. The Religious Life: Institutions and Practices 305

Section 811. Knowledge and Understanding of Religion

- A. The philosophy of religion: diverse views of the nature and characteristics of religion
 - 1. Basic questions and problems
 - a. The existence of the divine or sacred (God)
 - b. The attributes of the divine or sacred
 - c. The extent to which mankind can have knowledge of the divine or sacred
 - d. The special problems of free will, evil and suffering, and immortality
 - 2. Questions about the nature and character of the divine or sacred
 - a. Whether the divine or sacred is personal or impersonal
 - b. Whether the divine or sacred is one or more unique beings or powers
- B. Religious experience: its nature, elements, and varieties
- C. Religious phenomenology: the basic patterns of religious thought, action, and association
- D. Theology as an attempt to understand and state the rationale of religious belief
 - 1. Theology in relation to divine revelation
 - a. The role of Sacred Scriptures
 - b. Doctrine and dogma
 - c. Articles of faith: religious creeds
 - 2. Mystical theology: immediate experience of the divine or sacred
 - 3. Doctrines concerning God or the gods
 - a. Polytheism
 - b. Religious dualism
 - c. Monotheism
 - i. Theism

- ii. Deism
 - iii. Pantheism and panentheism
 - d. Atheism and agnosticism
 - 4. Doctrines of creation
 - 5. Angelology
 - 6. Doctrines of divine government and providence
 - 7. Eschatological theories
 - 8. Doctrines of grace and salvation
 - 9. Sacramental doctrines
 - 10. The doctrine of the Covenant
 - 11. Miracles
- E. The study and classification of religions
- F. Other systems of belief
- 1. Myth and mythology
 - 2. Magic
 - 3. Witchcraft
 - 4. Shamanism
 - 5. Astrology and alchemy
 - 6. Ancestor worship
 - 7. Hero worship
 - 8. Nature worship
- G. Religion in relation to other aspects of human experience
- 1. Religion and art
[see also Part Six]
 - 2. Religion and science
 - 3. Religion and society
[see also 521.D.6.]
 - 4. Religion and morality
[see also 10/52.B.6.]
 - 5. Religion and philosophy
[see also Part Ten, Division V]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the knowledge and understanding of religion

Doctrines and Dogmas, Religious	Religions, The Study and Classification of
Myth and Mythology	Religious and Spiritual Belief, Systems of
Occultism	Sacred Offices and Orders
Philosophies of the Branches of Knowledge	Theology

MICROPAEDIA: Selected entries of reference information

General subjects

<i>basic concerns and phenomena of religion:</i>	heaven	sacrament	<i>conceptions of the divine or sacred:</i>
covenant	hell	sacrifice	agnosticism
creation myth	immortality	salvation	animism
creed	miracle	scripture	anthropomorphism
eschatology	moral theology	sin	atheism
evil, problem of	mysticism	soul	Deism
faith	myth	superstition	deus otiosus
first cause	paradise	theodicy	dualism
free will	prayer	theology	extrinsicism
	prophet	theophany	
	revelation		

fideism	Neo-Paganism	religious	secularism
High God	pantheism	syncretism	theism
monotheism	polytheism		

Biographies

Campbell, Joseph	Frazer, Sir James	Malinowski,	Tiele, Cornelius
Durkheim, Émile	George	Bronislaw	Petrus
Eliade, Mircea	James, William	Müller,	Tylor, Sir Edward
Evans-Pritchard, Sir	Jung, Carl (Gustav)	(Friedrich) Max	Burnett
Edward (Evan)	Lang, Andrew	Otto, Rudolf	Wach, Joachim
Frankfort, Henri	Lévi-Strauss, Claude	Söderblom, Nathan	Weber, Max

INDEX: See entries under all of the terms above

Section 812. The Religious Life: Institutions and Practices
A. Religious rites and customs

1. Rituals of worship
 - a. Prayer
 - b. Confession
 - c. Pilgrimage
 - d. Sacrifice
2. Passage and purification rites: birth, puberty, marriage, death
3. Religious regulation of personal and social behaviour
 - a. Religious law
[see 551.B.3.d. and 827.F.6.a.]
 - b. Dietary customs
 - c. Monasticism
 - d. Celibacy
 - e. Asceticism
 - f. Prophecy and divination
4. Religious feasts and festivals

B. Religious leaders and institutions

1. The religious state: theocracies, sacred kingships
2. Forms of religious organization: church, temple, congregation, sect, council; the priesthood
3. Sainthood
4. Institutions of religious education

C. Material manifestations of religious beliefs

1. Sacred writings
2. Art and architecture. religious symbolism and iconography
3. Ceremonial and religious objects, the sacraments
4. Religious dress and vestments

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the religious life: institutions and practices

Doctrines and Dogmas, Religious
 Religious Experience
 Religious Symbolism and Iconography
 Rites and Ceremonies, Sacred
 Sacred Offices and Orders

MICROPAEDIA: Selected entries of reference information

General subjects

<i>disciplines and practices:</i>	<i>places of worship:</i>		
asceticism	altar	monasticism	cremation
celibacy	church	priesthood	embalming
fasting	high place	prophet	marriage
feast	mosque	sacred kingship	passage rite
human sacrifice	synagogue	saint	purification
meditation	<i>religious offices, orders, and personages:</i>	shaman	<i>other:</i>
pilgrimage	abbot	<i>rites of passage and associated practices:</i>	amen
prayer	canonization	anointment	aniconism
sacrament	hagiography	Baptism	confession of faith
sacrifice	hermit	burial	creed
tonsure	martyr	circumcision	idolatry
		clitoridectomy	relic
			scripture

Biographies

See Section 811

INDEX: See entries under all of the terms above

Division II. The Particular Religions

[For Part Eight headnote see page 303.]

The outlines in the nine sections of Division II treat the particular religions of mankind, in different historical eras and world areas.

- Section 821. Prehistoric Religion and Primitive Religion 306
 - 822. Religions of Ancient Peoples 308
 - 823. Hinduism and Other Religions of India 312
 - 824. Buddhism 315
 - 825. Indigenous Religions of East Asia: Religions of China, Korea, and Japan 317
 - 826. Judaism 320
 - 827. Christianity 323
 - 828. Islām 334
 - 829. Other Religions and Religious Movements in the Modern World 336

Section 821. Prehistoric Religion and Primitive Religion

A. Prehistoric religion

1. The study of prehistoric religion: nature, scope, methods of interpretation, problems special to the subject
[see also 10/41.B.]
2. Inferred prehistoric religious beliefs and practices
 - a. Burial customs and cults of the dead
 - b. Cannibalism
 - c. Sacrifices: human, animal, and other offerings
 - d. Hunting rites and animal cults
 - e. Female fertility deities
 - f. Shamanism, sorcery, and magic
3. Religions attributed to various prehistoric cultural stages and regions

B. Primitive religion

1. The nature and significance of primitive religion

2. Primitive views of reality
 - a. The distinction between the sacred and the profane
 - b. Dynamistic, daemonistic, and theistic views of the sacred: the concept of mana
 - c. Animism: external reality viewed as living presence
 - d. Sacred time and times, sacred space and places, and man's nature, origin, and destiny: primitive cosmogonies, cosmologies, eschatologies
3. The nature and function of myth and symbol in primitive religion: their role in ritual, the iconographic character of primitive art
4. Primitive religious practices and institutions
 - a. Sacrifice, purification, passage rites
 - b. Worship or veneration centred on natural objects or forces
 - c. Totemism: the socioreligious system in which men are intimately related to plants, animals, or other natural phenomena
 - d. Worship of ancestors, kings, and heroes
 - e. The roles of asceticism, shamanism, divination, and spiritualistic practices
5. The primitive religions of the major world areas
 - a. Africa: traditional religions of the indigenous African peoples
 - b. Australia and Oceania: religions of the Pacific Island peoples
 - c. The Americas: religions of the indigenous peoples of North, Central, and South America [see also 822.I.]
 - d. Asia: aboriginal religions of Asian peoples
 - e. The Arctic: religions of the Eskimo, Aleuts, Sami (Lapps), Chukchi, Yakuts, Nganasan, Nenets, and other Arctic peoples

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with prehistoric religion and primitive religion

Doctrines and Dogmas, Religious
Prehistoric Peoples and Cultures
Sacred Offices and Orders

MICROPAEDIA: Selected entries of reference information

General subjects

amulet	devarāja	moon worship	sun dance
animal worship	Dreaming, the	mother goddess	sun worship
animals, master of the	Earth Mother	phallicism	taboo
animism	fire walking	rain dance	thunder cult
Blessing Way	headhunting	Rice Mother	tjurunga
bull cult	hieros gamos	sacred clown	totemism
cannibalism	High God	sacred pipe	vision quest
Corn Mother	mana	shaman	world tree
dema deity	medicine society	skull cult	
	megalith	Stonehenge	

Biographies

See Section 811

INDEX: See entries under all of the terms above

Section 822. Religions of Ancient Peoples**A. Religions of the ancient Near Eastern peoples**

1. Characteristics of the ancient Near Eastern religions
2. Mesopotamian religions
3. Egyptian religion
 - a. Historical developments from the late Neolithic Period to the Hellenistic Age
 - b. Religious literature and mythology
 - c. Beliefs and doctrines: the Egyptian pantheon
 - d. Major forms of Egyptian religion
 - e. Religious symbolism and iconography
4. Religions of the ancient peoples of Asia Minor
5. Syrian and Palestinian religions
6. Religions in the Arabian Peninsula

B. Religions of the Iranian peoples

1. General characteristics of the Iranian religions
2. Early Indo-Iranian religion: nature-polytheism
[see also 823.A.1.]
3. Religion of the Scythians, Sarmatians, and Alani
[see F., below]
4. The cult of Ahura Mazdā (Ormazd): its influence on the preaching of Zoroaster and the priestly institutions of the Magi
5. Mithraism
6. Zurvanism
7. Manichaeism
[see E.3., below]

C. Greek religion

1. Historical development
2. Greek mythology and other religious literature
3. Religious beliefs and speculation: the Greek pantheon
4. Worship, practices, institutions
5. Religious art and iconography

D. Roman religion

1. Historical development
2. Roman gods, goddesses, numina, and genii and their place in family and civic religion
3. Worship, practices, institutions
4. Religious art: sculpture, metalwork, painting, mosaic

E. Religions of the Hellenistic world

1. Mystery religions
2. Gnosticism
3. Manichaeism
4. Hellenistic religious philosophies: neoplatonism, stoicism, epicureanism
[see also 10/51.A.1.c.]
5. Quasi-scientific and magical cults: *e.g.*, numerology, astrology
6. Judaism
[see 826]

7. Christianity

[see 827]

F. Religions of the early peoples of eastern and central Europe

1. Scythian religion
2. Religions of the Sarmatians and associated peoples
3. Religion of the pre-Christian Slavic peoples

G. Religions of the ancient Celtic and Germanic peoples

1. Religion of the Celts
2. Religion of the Germanic peoples

H. Religions of the early peoples of northeastern Europe

1. Religion of the Baltic peoples
2. Religion of the Finno-Ugric peoples

I. Religions of pre-Columbian American civilizations

1. Inca religion
2. Mayan religion
3. Aztec religion

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with religions of ancient peoples

Doctrines and Dogmas, Religious
European Religions, Ancient
Middle Eastern Religions, Ancient

Mystery Religions
Pre-Columbian Civilizations
Zoroastrianism and Parsiism

MICROPAEDIA: Selected entries of reference information

General subjects

<i>Anatolian religions:</i>	Laima	Aton	<i>Egyptian worship,</i>
Hebat	lauma	Atum	<i>practices, and</i>
Kubaba	Mēness	Bastet	<i>institutions:</i>
Tarhun	Pērkons	Bes	Book of the Dead
Teshub	Saule	Buto	Canopic jar
<i>Arabian religion</i>	<i>Celtic religion:</i>	Geb	Egyptian religion
(<i>pre-Islāmic</i>):	Belenus	Hapi	Heb-Sed festival
hanif	Brân	Hathor	Hermetic writings
Ilumquh	Brigit	Horus	mortuary temple
Lāt, al-	Celtic religion	Hu, Sia, and Heh	Opet
<i>Aztec religion:</i>	Cernunnos	Isis	reanimation rite
Chicomecóatl	Dôn	Khnum	scarab
Coatlucue	Druid	Ma'at	<i>Finno-Ugric religion:</i>
Huitzilopochtli	Esus	Mont	Finno-Ugric
nagual	Llyr	Mut	religion
Ometecuhtli	Lugus	Nekhbet	haltia
Quetzalcóatl	Medb	Nun	Kekri
Tezcatlipoca	Ogmios	Nut	kobdas
Tlaloc	Pwyll	Osiris	lud
Tlazoltéotl	Sucellus	Ptah	maa-alused
Tonatiuh	Teutates	Re	Madderakka
Xipe Totec	Tuatha Dé Danann	Sarapis	Manala
Xiuhtecuhtli	<i>Egyptian pantheon:</i>	Sebek	noiade
<i>Baltic religion:</i>	Amon	Seth	Peko
Baltic religion	Anubis	Shu	saivo
Dievs	Apis	Taurt	sampo
gabija	Apopis	Thoth	Tapio
Kalvis			tietäjä

Ved-ava	Amphitryon	Laomedon	Trojan horse
Veraldén-radién	Ananke	Leto	Typhon
voršud	Ancaeus	Leucothea	Uranus
<i>Germanic mythology:</i>	Andromache	Linus	<i>Greek pantheon:</i>
Aurgelmir	Andromeda	Lotus-Eater	Aphrodite
Balder	Antigone	Lycaon	Apollo
Fenrir	Antiope	Marsyas	Ares
Freyja	Arethusa	Medea	Aristaeus
Germanic religion	Argonaut	Medusa	Artemis
and mythology	Ariadne	Meleager	Asclepius
Heimdall	Arion	Memnon	Athena
Hel	Asclepius	Menelaus	Chaos
Idun	Atalanta	Midas	Cronus
Kvasir	Athamas	Minos	Demeter
Loki	Atlas	Minotaur	Dionysus
Midgard	Atreus	Myrmidon	Eros
Mimir	Autolycus	Narcissus	Fury
Norn	Bellerophon	Neoptolemus	Grace
Odin	Briareus	Niobe	Hades
Ragnarök	Britomartis	Nisus	Hebe
Skadi	Busiris	nymph	Hecate
Svadilfari	Cadmus	Odysseus	Helios
Thor	Caeneus	Oedipus	Hephaestus
Tyr	Calchas	Orestes	Hera
Ull	Calliope	Orion	Hermes
Valhalla	centaur	Palamedes	Hestia
Valkyrie	Cephalus	Pandora	Hippolytus
Yggdrasil	Cyclops	Paris	Hora
<i>Gnosticism,</i>	Daedalus	Pegasus	Hygieia
<i>Manichaeism, and</i>	Danaus	Peleus	Muse
<i>related movements:</i>	Daphne	Pelias	Nemesis
aeon	Daphnis	Pelops	Nereus
Archon	demon	Penelope	Nike
Cainite	Dido	Perseus	Pan
Carpocratian	Echo	Phaethon	Persephone
Cathari	Endymion	Philoctetes	Poseidon
Docetism	Eos	phoenix	Priapus
Encratite	Erechtheus	Pirithous	Prometheus
Gnosticism	Erigone	Pleiades	Rhea
Hellenistic	Fama	Polyphemus	Selene
religion	Fate	Priam	Themis
Mandaeism	Fury	Protesilaus	Tyche
Manichaeism	Galinthias	Proteus	Zeus
Marcionite	Gorgon	Pyramus and	<i>Greek worship,</i>
Mazdakism	Greek mythology	Thisbe	<i>practices, and</i>
Ophite	Hector	Sarpedon	<i>institutions:</i>
Paulician	Hecuba	Satyr and	Anthesteria
<i>Greek mythology</i>	Helen	Silenus	Bacchanalia
<i>and legend:</i>	Helenus	Scylla and	baetylus
Acestes	Heracles	Charybdis	Daphnephoria
Achilles	Hesperides	Semele	Delphi
Actaeon	Hyacinthus	Seven Against	Didyma
Admetus	Hyperborean	Thebes	Dodona
Adonis	Hypnos	Sibyl	Eleusinia
aegis	Idomeneus	Siren	Greek religion
Agamemnon	Ilos	Sisyphus	Heraeum
Aglauros	Io	Tantalus	herm
Ajax	Iphigeneia	Theseus	lectisternium
Alcmaeon	Ixion	Thetis	oracle
Amazon	Jason	Tiresias	Palladium
Amphitrite	Laocoön	Titan	

Panathenaea	Ninsun	Diana	Perun
Pyanopsia	Ninurta	Dioscuri	rusalka
Scirophoria	Shamash	Faunus	<i>Syrian and</i>
Thargelia	Sin	Fides	<i>Palestinian</i>
Thesmophoria	Tammuz	Fortuna	<i>pantheon:</i>
<i>Inca religion:</i>	<i>Mesopotamian</i>	Fury	Anath
Chosen Women	<i>religious literature</i>	Janus	Asherah
huaca	<i>and mythology:</i>	Juno	Astarte
Inti	Adapa	Jupiter	Atargatis
Pachacamac	Enmerkar	Lar	Baal
Viracocha	Eridu Genesis	Liber and Libera	Dagon
<i>Iranian religion</i>	Etana Epic	Libitina	El
<i>(pre-Islāmic):</i>	Gilgamesh	Mars	Kothar
Mithra	Lahmu and	Mercury	Melqart
Mithraism	Lahamu	Minerva	Resheph
Yima	Lament for the	Neptune	Shadrafa
<i>Mayan religion:</i>	Destruction of Ur	Penates	Tanit
Ah Kin	Mesopotamian	Picus	Yamm
Bacab	mythology	Psyche	<i>Zoroastrianism:</i>
Chac	<i>mystery religions:</i>	Quirinus	Ahriman
Cizin	Andania mysteries	Salus	Ahura Mazdā
Dresden Codex	Attis	Saturn	amesha spenta
Itzamná	Cabeiri	Silvanus	Avesta
Madrid Codex	Corybantes	Sol	fravashi
Paris Codex	Eleusinian	Venus	Gabar
Popol Vuh	Mysteries	Vesta	Gahanbar
<i>Mesopotamian</i>	Eumolpus	<i>Roman worship,</i>	Gayōmart
<i>pantheon:</i>	galli	<i>practices, and</i>	haoma
Adad	Great Mother of	<i>institutions:</i>	magus
Anu	the Gods	fetial	Nōrūz
Ashur	hierophant	flamen	Parsi
Bel	Iacchus	genius	Rashnu
Belit	Jupiter Dolichenus	Haruspices	Saoshyans
Damu	mystery religion	lectisternium	Sraosha
Ea	Orpheus	Lupercalia	Verethraghna
Ereshkigal	Taurobolium	Matronalia	Vohu Manah
Ishkur	<i>Roman pantheon:</i>	Parilia	yazata
Ishtar	Aeneas	pontifex	Zoroastrianism
Lamashtu	Ascanius	Roman religion	Zurvanism
Marduk	Asclepius	Salii	
Mesopotamian	Bona Dea	supplicatio	
religion	Cacus and Caca	Vestal Virgin	
Nabu	Camilla	<i>Slavic religion:</i>	
Nergal	Ceres	domovoy	
Ningishzida	Cupid	leshy	
Ninhursag			
<u>Biographies</u>			
Akhenaton		Kartēr	
Anquetil-Duperron, A(braham)- H(yacinthe)		Mani	
Basilides		Valentinus	
Imhotep		Zoroaster	

INDEX: See entries under all of the terms above

Section 823. Hinduism and Other Religions of India

A. History of Hinduism

1. The origins of Hinduism: Indo-European roots and other influences
2. The prehistoric and protohistoric periods, through the 2nd millennium BC: the religions of the indigenous prehistoric peoples and of the Indus Valley civilization
3. The Vedic period (2nd millennium–7th century BC)
 - a. The religion of the Ṛgveda
 - b. The religion of the later Vedas and *Brāhmaṇas*
 - c. The religion of the *Upaniṣads*
4. The heterodox period (7th–2nd century BC): challenges to Brahmanism by reformers and ascetic groups
[see also D.1., below, and 824]
5. The early Hindu period (2nd century BC–4th century AD): the rise of the major sects and other developments
6. The Purāṇic period (4th–8th century)
7. The rise of devotional Hinduism (8th–11th century): the Tamil hymnists, the *Bhāgavata-Purāṇa* after Hinduism
8. The age of *bhakti* (11th–19th century)
9. The modern period (19th–20th century)
10. Hinduism today

B. Intellectual, spiritual, and imaginative expressions of Hinduism

[see also C.4., below]

1. Hindu sacred literature
 - a. Primary scriptures regarded as eternal revelations: the Veda
 - b. Post-Vedic Sanskrit literature; *e.g.*, epics, *Purāṇas*, *Tantras*
 - c. Sacred literature in Indian regional languages
2. Hindu mythology: varieties of myths, modes of representation and themes
3. Hindu philosophy: the integral relation of philosophy and religion in Hinduism
4. Hindu mysticism: its general characteristics, varieties, goals, and methods

C. Beliefs, practices, and institutions of Hinduism

1. Common characteristics of Hindu belief
 - a. Views about God or the sacred
 - b. Views about the universe
 - c. Views about mankind
 - i. *Ahiṃsā*, the obligation to respect all living beings
 - ii. The doctrines of *karman*, *saṃsāra*, and transmigration
 - iii. The three *mārgas*: the paths of duties, of knowledge, and of devotion
2. The forms of Hinduism
 - a. Vedism and Brahmanism
 - b. Vaiṣṇavism
 - c. Śaivism
 - d. Tantrism and Shaktism
 - e. Folk Hinduism
 - f. Ethical, social, and nationalist movements in modern Hinduism

3. Rituals, social practices, and institutions
 - a. Sacrifice and worship
 - b. Sacred times and places
 - c. The class hierarchy: the caste system
 - d. Religious orders, holy men, the four stages of life
 4. Cultural expressions of Hindu values and ideas
 - a. The traditional religious functions of Indian art: symbols and images
 - i. Types of symbols: *yantras*, *maṇḍalas*, *liṅgas*, *yonis*
 - ii. Icons: their role in expressing theological elements of Hinduism
 - b. The religious expression of particular arts
- D. Other religions of India
1. Jainism
 - a. History of Jainism
 - i. Early background: traditional accounts of Mahāvīra's predecessors
 - ii. The life, work, and teachings of Vardhamāna Mahāvīra
 - iii. Later developments (6th century BC–20th century AD)
 - b. Myths about Jaina “great souls”: Tirthaṅkaras, ascetic and monastic figures, and lesser deities
 - c. Beliefs, practices, and institutions of Jainism
 2. Sikhism
 - a. History of Sikhism
 - i. Islāmic and Hindu background (11th–15th century)
[see also A., above, and 828.A.]
 - ii. The origin of Sikhism in the life and work of Nānak, first of the ten Gurūs (15th–16th century)
 - iii. The establishment and growth of Sikhism under the nine succeeding Gurūs, the establishment of Sikh militarism (16th–18th century)
 - iv. The condition of Sikhism during the Sikh empire (18th–19th century)
 - v. The condition of Sikhism under British rule (19th–20th century)
 - vi. Sikhism in independent India and Pakistan
 - b. Sikh religious literature
 - c. Beliefs, practices, and institutions of Sikhism
 3. Parsiism: Zoroastrianism in India
[see 822.B.4.]
 - a. History of Parsiism
 - b. Sources of beliefs and doctrines in Zoroastrian literature
 - c. Beliefs, practices, and institutions of the Parsis

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with Hinduism and other religions of India

Hinduism
 Indian Philosophy
 Jainism
 Sikhism

MICROPAEDIA: Selected entries of reference information

General subjects

<i>Hinduism—</i>	Matsya	Saura sect	Vaisheshika
<i>caste system:</i>	Meru, Mount	Shaktism	Vedānta
Agarwālā	Murugaṇ	Smārta sect	Viśiṣṭādvaita
Bania	naga	Śrīvaiṣṇava	yama
bhāiband	Nandi	Swāmī-Nārāyaṇī	Yoga
Brahman	Narasimha	Tantric Hinduism	<i>Hinduism—ritual</i>
Camār	Naṭarāja	Teṅkalai	<i>and practice:</i>
caste	Paraśurāma	Vaḍakalai	antyeṣṭi
Christian caste	Pārvatī	vairāgin	ārti
Dāsa	Prajāpati	Vaiṣṇavism	aśvamedha
Devadāsī	Rādhā	Vaiṣṇava-	darshan
Dom	rakshasa	Sahajiyā	dikṣā
dvija	Rāma	Vallabhācārya	Dīwālī
gotra	Rāvaṇa	<i>Hinduism—</i>	guru
Islāmic caste	Saptamātrkā	<i>philosophy and</i>	Holi
jajmānī system	Sarasvatī	<i>doctrine:</i>	Janmāṣṭamī
jāti	Śītā	Advaita	kīrtana
Kshatriya	Śiva	ahankara	Kumbh Mela
kul	Skanda	ānanda	liṅga
Mahar	Sūrya	anumāna	Mahā-śivarātri
Marāṭhā	vāhana	artha	mudra
Nambūdiri	Vāmana	asana	navaratra
Nāyar	Varāha	ashrama	Om
outcaste	Varuṇa	āstika	Poṅgal
panchayat	Vāsudeva	atman	pradakṣiṇa
sabha	Vishnu	avatar	puja
Sudra	yaksha	bhedābheda	Rathayātrā
untouchable	Yama	brahma	saṃskāra
Vaisya	yuga	Cārvāka	soma
varna	<i>Hinduism—forms,</i>	chakra	sraddha
<i>Hinduism—deities</i>	<i>sects, movements,</i>	cow, sanctity	Śrī-Nāthajī
<i>and mythology:</i>	<i>and orders:</i>	of the	suttee
Aditi	Ājīvika	deva	tapas
Agni	Arya Samaj	dharma	tilak
Ardhanārīśvara	Bhāgavata	Dvaita	tīrtha
Balarāma	bhakti	Haṭha Yoga	upanayana
bhut	Brahmo Samaj	indriya	yajña
Brahmā	Caitanya	jnana	<i>Hinduism—</i>
Caṇḍī	movement	karma	<i>sacred and secular</i>
churning of the	daśnāmī sannyāsin	kuṇḍalinī	<i>literature:</i>
milky ocean	Gānapatya	mārga	agama
Dharma-Thākur	Kānphaṭa Yogi	maya	Āraṇyakas
Durgā	Kāpālika and	Mimamsa	Artha-śāstra
Gaṇeśa	Kālāmukha	nirguṇa	Aṣṭchāp
Garuḍa	Kashmir Śaivism	Nyāya	Bhagavadgītā
grāmadevatā	Līngāyat	prakṛiti	Bhāgavata-Purāṇa
Hanumān	Nātha	pramāṇa	Brāhmaṇa
Harihara	Pāñcarātra	prana	dharmashastra
Indra	Pāśupata	prāñāyāma	dharmasutra
Jagannātha	Prarthana Samaj	pratyakṣa	Gītagovinda
Kālī	Rādhā Soāmī	purusha	Gṛhya-sūtra
Kalkīn	Satsaṅg	śabda	Kalpa-sūtra
Kāma	sadhu and swami	samadhi	Mahābhārata
Krishna	Śaiva-siddhānta	Samkhyā	maṅgal-kāvya
Kubera	Śaivism	saṃsāra	Manu-smṛti
Kūrma	sampradāya	tat tvam asi	Nāyanār
Lakṣmī	sannyasi	upādhi	Purāṇa
Manasā	Satnāmī sect		
Manu			

Rāmāyaṇa	Bāhubali	Pārśvanātha	gurdwārā
Smṛti	Diḡambara	Paryuṣaṇa	Gurū
Śrauta-sūtra	dravya	Rṣabhanātha	Hari mandir
Śruti	gaccha	Siddha	Khālsā
sūtra	guṇasthāna	Sthānakavāsī	Nāmdhāri
Tantra	Jaina canon	Śvetāmbara	Niraṅkāri
Upanishad	Jaina vrata	syādvāda	Rām Rāiyā
Veda	Jainism	Tīrthaṅkara	Sikhism
<i>Jainism:</i>	jiva	<i>Sikhism:</i>	Singh Sabhā
ahimsa	Kālakācāryakathā	Ādi Granth	Udāsī
ajiva	Kalpa-sūtra	Akāl Takht	<i>other:</i>
Ariṣṭanemi	leśyā	Akāli	Parsi
aṣṭamaṅgala	nirjarā	Dasam Granth	Vedic religion
Biographies			
Aurobindo, Śri	Gobind Singh	Mirā Bāi	Rāmānuja
Caitanya	Keshab	Nānak	Roy, Ram Mohun
Dādū	Chunder Sen	Ram Singh	Śāṅkara
Dayananda	Madhva	Ramakrishna	Tara Singh
Sarasvati	Mahāvira	Ramana Maharshi	Vivekananda
Fateh Singh, Sant	Meher Baba		

INDEX: See entries under all of the terms above

Section 824. Buddhism

A. History of Buddhism

1. The cultural context: its background in Hinduism; its geographical, ethnic, and cultural base [see also 823]
2. The founding of Buddhism: the life, work, and teachings of Siddhārtha Gautama (6th–5th century BC)
3. Developments in India (6th century BC–12th century AD)
4. Buddhism in Central Asia and China [see also 825.A.]
5. Buddhism in Korea and Japan [see also 825.D. and E.]
6. Buddhism in Tibet and the Himalayan kingdoms
7. Buddhism in Ceylon (Sri Lanka) and Southeast Asia to the mid-19th century
8. Buddhism in the late 19th and 20th centuries

B. Intellectual, spiritual, and imaginative expressions of Buddhism

[see also C.4., below]

1. Buddhist sacred literature
2. Buddhist mythology: basic types, contents, and functions of myths
3. Buddhist philosophy: the role and contribution of systematic reflective thought
4. Buddhist mysticism: universal characteristics; regional and historical variations; goals, techniques, and approaches

C. Beliefs, practices, and institutions of Buddhism

1. Traditional beliefs and doctrines
 - a. Views of the nature of reality; *e.g.*, the impermanence of all existence, the absence of self, the underlying state of suffering and its causes
 - b. The Eightfold Path to salvation or release
 - c. The goal of the Eightfold Path: Nirvāṇa
 - d. The Threefold Refuge—in the Buddha, the doctrine, and the community

- e. Views of the gods, spirits, and demons: the role of miraculous powers
2. The main forms of Buddhism
 - a. The Theravāda school and other ancient schools
 - i. Views of the nature of things: cosmology, the classification of *dharmas*
 - ii. The emphasis on self-cultivation and self-salvation: the stages leading to *arhatship*, the levels of meditation
 - iii. Doctrines concerning Buddha and Buddhahood
 - iv. Characteristics of the individual ancient and transitional schools
 - b. The Mahāyāna version
 - i. Views of the nature of absolute reality: the ultimate realization of the meditative quest
 - ii. Views of the transcendence of the Buddha: the three aspects of the Buddha, the *bodhisattva* ideal
 - iii. Characteristics of the individual Mahāyāna schools; e.g., Mādhyamika, Yogācāra, Avatamsaka, Zen, devotional schools
 - c. Esoteric Buddhism: Tantrism, Tibetan Buddhism, Shingon
3. Practices and institutions
 - a. Universal or prevalent ethical and religious practices
 - b. Monastic institutions: the characteristics and role of the *saṅgha*
 - c. Ceremonies and festivals: the religious year, popular traditions, passage rites
 - d. Regional variations in practices
4. The religious and cultural role of Buddhist art
 - a. Symbolism and iconography
 - b. Religious expression in the arts
5. The relationship of Buddhism to nationalist movements: its contemporary situation, its prospects

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major article dealing with Buddhism

Buddhism, The Buddha and

MICROPAEDIA: Selected entries of reference information

General subjects

<i>deities and mythology:</i>	Ni-ō	Nichiren	<i>offices and personages:</i>
Amitābha	Śaṃvara	Buddhism	bhikku
Avalokiteśvara	Shih Wang	Pure Land Buddhism	bodhisattva
Bhaiṣajya-guru	Tārā	Reiyū-kai	cakravartin
brahma-loka	Vairocana	Rinzai	Dalai Lama
dharmapāla	Vajrapāṇi	Risshō-Kōsei-kai	lama
Dhyāni-Buddha	Vajrayogini	Ritsu	mahāsiddha
Five Great Kings	yi-dam	Rnying-ma-pa	Nechung oracle
Hārīti	<i>forms, sects, schools, and orders:</i>	Sammattīya	Panchen Lama
Hevajra	Bka'-brgyud-pa	Sarvāstivāda	pratyeka-buddha
Kṣitigarbha	Dge-lugs-pa	Sautrāntika	upāsaka
lokapāla	eighteen schools	Shingon	<i>philosophy and doctrine:</i>
Lumbinī	Hinayāna	Sōka-gakkai	Abhidharmakośa
Mahā Māyā	Jōjitsu	Sōtō	abhijñā
mahāpuruṣa	Kegon	Theravāda	akriyāvāda
Maitreya	Kusha	Tibetan Buddhism	ālaya-vijñāna
Mañjuśrī	Mādhyamika	T'ien-t'ai	anatta
Māra	Mahāsaṅghika	Vajrayāna	arhat
Myō-ō	Mahāyāna	Yogācāra	ariya-puggala
nāman		Zen	

arūpa-loka	Buddhist	Bhadracaryā-	but Sudan
āsrāva	meditation	prañidhāna	caitya
bhava-cakra	dhārāni	bhāṇavāra	Gandhāra art
bhūmi	gcod	Bka'-gyur	Jōgan style
bodhi	gtor-ma	Bstan-'gyur	kapāla
brahma-loka	koan	Buddhacarita	kara-yō
brahmacharya	kyūdō	Dhammapada	Mai-chi-shan
brahmavihāra	mandala	Diamond Sūtra	mandala
dharma	mantra	gsung-'bum	Mathurā art
dukkha	mudra	Guhyasamāja	mudra
Eightfold Path	nang-mchod	Tantra	Northern Wei
Four Noble Truths	pabbajjā	Heart Sūtra	sculpture
kammaṭṭhāna	pāramitā	Jāta	pagoda
karman	pātimokkha	Khuddaka Nikāya	prayer wheel
Kegon	phyi-mchod	Lalitavistara	Sānchi sculpture
Kusha	sadhana	Lañkāvatāra-sūtra	stūpa
Mādhyaṃika	sangha	Lotus Sūtra	Sukhothai style
mahāmudrā	Smon-lam	Mahāvairocana-	Tempyō style
Nirvāṇa	chen-mo	sūtra	Tenjiku
pāramitā	upasampadā	Mahāvastu	thang-ka
prajñapti	uposatha	Mahāyāna-śrad-	thread cross
Pramāṇa-vārttika	vassa	dhotpāda-śāstra	T'ien-lung Shan
pratītya-samutpāda	vihāra	Milinda-pañha	Tōdai Temple
pratya	zazen	Mūlamadhyama-	U Thong style
puñña	<i>sacred and secular</i>	kakārikā	vajra
saddhā	<i>literature:</i>	Prajñāparamitā	yab-yum
samadhi	Abhidhamma	Pramāṇa-vārttika	Yün-kang caves
saṃsāra	Piṭaka	Pure Land Sūtra	<i>other:</i>
saṃvṛti-satya	Abhidhammattha-	Satyasiddhi-śāstra	Abhayagiri
Sarvāstivāda	saṅgaha	sūtra	Bon
Satori	Abhidhammāvatāra	Sutta Piṭaka	Buddhist council
śīla	Abhidharmakośa	Suttanipāta	Mahāvihāra
skandha	Abhisamayālaṅ-	Ta-ts'ang Ching	mappō
smṛtyupasthāna	kārāloka	Tiṭiṭaka	rock edicts
Triratna	Amitāyur-dhyāna-sūtra	Vinaya Piṭaka	
trivabhāva	aṅgā	<i>symbolism,</i>	
<i>practices and</i>	aṭṭhakathā	<i>iconography, and</i>	
<i>institutions:</i>	Avadāna	<i>ritual objects:</i>	
abhiṣeka	Avataṃsaka-sūtra	Borobudur	
<u>Biographies</u>			
Asaṅga	Fa-hsien	Hui-neng	Padmasambhava
Aśoka	Hasegawa Tōhaku	Kūkai	Shinran
Bodhidharma	Hōnen	Nāgārjuna	
Dōgen	Hsüan-tsang	Nichiren	

INDEX: See entries under all of the terms above

Section 825. Indigenous Religions of East Asia: Religions of China, Korea, and Japan

A. Characteristics and development of Chinese religion

1. The distinction and relationship between the folk religions and the literate religions in China
2. History of religion in China
 - a. The emergence of Chinese religion: ancestor worship, early cosmological beliefs
 - b. The formulation of the Great Tradition: the development of the Confucian and Taoist ways (6th–1st century BC)
 - c. The dominance of the Buddhist Way and the rise of Taoist-inspired cults (1st–16th century)
 - d. The modern period: the effects of Western religions and of nationalism and secularism on familial and social systems

3. Traditional concepts in Chinese religious thought: the relation of the individual to the cosmos and to society
4. Ritual practices and institutions
5. Chinese religious symbolism
6. Chinese mythology

B. Confucianism

1. History of Confucianism

- a. Background in the institutions of the predynastic sage-emperors and the founders of the first three dynasties
- b. Origin in the life and teachings of Confucius (551–479 BC), the first Sage
- c. The Confucian school and its various forms: the teachings of Mencius, the second Sage, and of Hsün-tzu (c. 5th–3rd century BC)
- d. Establishment of Confucianism as the state orthodoxy of the Han Empire: eclectic tendencies, skeptical and rationalistic reactions (2nd century BC–3rd century AD)
- e. Introduction of Confucianism into Korea and Japan (1st and 4th centuries AD)
[see D. and E., below]
- f. Confucianism during the time of Buddhist ascendancy: its continued role in the family system, the government bureaucracy, and the examination system; textual studies
- g. The emergence and development of Neo-Confucianism (11th–20th century): metaphysical and humanistic emphases, the teaching of Chu Hsi, the development of Neo-Confucian schools
- h. Varied responses to intellectual and material challenges of the West and to other developments: reformist and conservative movements, the effect of political developments on Confucian ideology and scholarship
- i. Confucianism today: its current demographic and social aspects

2. Confucian literature

3. Confucianism as a religion and as a philosophy

C. Taoism

1. History of Taoism

- a. Origin and early developments: the first evidence of the teachings of Lao-tzu and Chuang-tzu (c. 4th–3rd century BC)
- b. Developments during the Ch'in and Han periods (3rd century BC–3rd century AD): esoteric traditions, the Huang-Lao tradition, revolutionary messianism, developments in philosophy
- c. Developments from the 2nd to the 6th century: brief recognition of Taoism as the state religion; interaction with Buddhism; ceremonial, alchemical, and scriptural traditions
- d. Developments under the T'ang, Sung, and later dynasties: internal developments, the role of alchemy, syncretistic tendencies
- e. The later development of philosophical and religious Taoism from the 14th century to the present time

2. Taoist literature

3. Taoism as a religion and as a philosophy

D. The religions of Korea

1. History of Korean religion from prehistoric times to the present: the influence of Chinese, Japanese, and Western religions
2. Religious literature and mythology
3. Beliefs and doctrines
4. Practices and institutions

E. The religions of Japan

1. History of Japanese religion

- a. Early clan religion before the 6th century AD

- b. Early historic and medieval periods (6th–16th century): the introduction of Buddhism, the impact of Chinese influences on Shintō, other developments
 - c. The Tokugawa era (1603–1867): Neo-Confucian Shintō, Sect Shintō, other developments
 - d. The Meiji era and after (1868 to the present): new religious movements
2. Shintō: the Way of the Gods
 - a. History of Shintō
[see E.1., above]
 - b. Characteristics of primitive Shintō: the role of guardian shrines and shamans
 - c. Shintō literature and mythology: the form and content of the *Kojiki*, *Nihon shoki*, and other writings
 - d. Basic beliefs and doctrines: concepts of mankind, the sacred and related precepts and principles
 - e. Ritual practices and institutions
 3. Japanese religious art and symbolism
 4. Japanese mythology

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with indigenous religions of East Asia: religions of China, Korea, and Japan

Chinese Literature	Shintō
Confucianism, Confucius and	Taoism
Japanese Literature	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>Chinese deities and mythology:</i>	shen	Shu Ching	Susanoō
Chang Kuo-lao	Shen Nung	Ssu shu	tengu
Ch'ang O	Shou Hsing	Ta hsüeh	ujigami
Ch'eng Huang	Shun	Tso chuan	Ukemochi no
ch'i-lin	Ta Yü	Wu ching	kami
Chih Nü	T'ien	<i>Japanese deities and mythology:</i>	Yama-no-kami
Chung-li Ch'üan	Ts'ai Shen	Amaterasu	Yorimitsu
feng-huang	Tsao Chün	Amenouzume	<i>Japanese religious movements:</i>
Fu Hsi	Ts'ao Kuo-chiu	Benten	Hito-no-michi
Fu Shen	Tsao Shen	Daikoku	Hōtoku
Han Hsiang	T'u-ti	Ebisu	Kirishitan
Ho Hsien-ku	Wen Ti	Fukurokuju	Kokugaku
Hou Chi	Wu hsing	goryō	Konkō-kyō
Hou I	Yao	Hachiman	Kurozumi-kyō
Hou T'u	Yü Ti	hitogami	Neo-Confucianism
Hsi Wang Mu	<i>Confucianism—philosophy:</i>	Ho-musubi	Ōmoto
Huang-ti	Confucianism	Inari	PL Kyōdan
Kuan Ti	hsiao	Izanagi and	Shinbutsu shūgō
K'uei Hsing	jen	Izanami	Shingaku
Lei Kung	li	Jimmu	Tenshō Kōtai
Li T'ieh-kuai	li	kami	Jingū-kyō
Lu Hsing	T'ien Ming	kappa	<i>Korean religion:</i>
Lü Tung-pin	<i>Confucianism—sacred literature:</i>	Kusanagi	Ch'ōndogyo
lung	Chou li	Ninigi	mudang
Men Shen	Ch'un-ch'iu	Ōkuninushi	P'alkwanhoe
Nü Kua	Chung yung	Sarudahiko	Poch'ōngyo
Pa Hsien	I Ching	Shichi-fuku-	p'ungsuchirisol
P'an Ku	Li chi	jin	Sansin
p'an-t'ao	Lun yü	Sugawara	<i>Shintō—precept and practice:</i>
San Kuan	Mencius	Michizane	harai
She Chi	Shih ching	Sukunahikona	

jinja	shinten	Sannō Ichijitsu	hsü
kami	shōzoku	Shintō	Huai-nan-tzu
kamidana	tamaya	Shrine Shintō	Lieh-tzu
Kojiki	torii	Shugen-dō	p'ō
matsuri	ujigami	State Shintō	p'ū
musubi	<i>Shintō—sects and</i>	Tajong-gyo	tao
Nihon shoki	<i>schools:</i>	Tangun	Tao-te Ching
norito	Fukkom Shintō	Tenrikyō	te
Shichi-go-san	Ise Shintō	<i>Taoism:</i>	tzu-jan
shinsen	Kyōha Shintō	Five Pecks of Rice	wu-wei
shinshoku	Ryōbu Shintō	hsien	
shintai		hsin-shu	
Biographies			
Ch'eng Hao and	Hayashi Razan	Lieh-tzu	Tung Chung-shu
Ch'eng I	Hsün-tzu	Mencius	Wang Ch'ung
Chu Hsi	Lao-tzu	Motoori Norinaga	Wang Yang-ming
Chuang-tzu	Liang Shu-ming	Shao Yung	Yen Yüan

INDEX: See entries under all of the terms above

Section 826. Judaism

A. History of Judaism

1. The biblical era
2. The Hellenistic era
[see also 822.E.]
3. The Talmudic era in Palestine and Babylonia: the foundations of rabbinic Judaism
[see also B.3., below]
4. The medieval era: the European and Islāmic phases of rabbinic Judaism (7th–18th century)
5. The modern era from c. mid-18th century: developments in modern Judaism
6. Judaism today: its current demographic and social aspects

B. Intellectual, spiritual, and imaginative expressions of Judaism [see also C.4., below]

1. Biblical literature
 - a. Canons, texts, and vernacular versions of the Bible; *e.g.*, Septuagint, Targum
 - b. TaNaKh, the Hebrew Bible: Torah, Nevi'im, Ketuvim
 - c. Noncanonical literature: Apocrypha, pseudepigrapha
2. Qumrān literature (Dead Sea Scrolls)
3. Talmud and Midrash
4. Judaic exegesis and hermeneutics
5. Mystical and devotional writings
6. Jewish philosophical writings
7. Jewish myth and legend

C. Beliefs, practices, and institutions of Judaism

1. Basic beliefs and doctrines
 - a. Doctrines concerning God
 - b. Doctrines concerning the Jewish people: the concept of Covenant
[see also 811.D.10.]
 - c. Doctrines concerning mankind
 - d. Doctrines concerning the universe

- e. Eschatology: views about the future age of mankind and the world, the King-Messiah and his reign
[see also 811.D.7., 827.F.1.d., and 829.A.]
2. Basic practices and institutions
 - a. Individual and familial practices
 - b. Synagogue practices and other public institutions: the role of the rabbi, chief rabbinate, and general councils and conferences
 - c. Sacred times: the sabbath, the Jewish holidays
 - d. Sacred places: the land of Israel and Jerusalem
 - e. The sacred language: Hebrew
 3. Present-day forms of Judaism
 - a. Orthodox Judaism
 - b. Reform, or Liberal, Judaism
 - c. Conservative Judaism
 - d. Other variations in belief and practices: Reconstructionism, Ḥasidism, regional or ethnic groups
 4. Art and iconography
 - a. The anti-iconic principle: the influence of the biblical prohibition against idolatry
 - b. Uses of the visual arts in ceremony and ritual: ceremonial objects, synagogue architecture, paintings, manuscript illumination
 - c. Music: Jewish liturgical modes, the influence of folk traditions, vocal and instrumental music
 - d. Literature: traditional legends and poetic exegesis, later religious poetry and tales

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and a biography dealing with Judaism

Doctrines and Dogmas, Religious
Judaism
Moses

MICROPAEDIA: Selected entries of reference information

General subjects

<i>beliefs and doctrines:</i>	Dead Sea Scrolls	Jonah, Book of	Solomon, Song of
agunah	Deuteronomy	Joshua, Book of	Ten
‘avera	Ecclesiastes	Judges, Book of	Commandments
chosen people	Eden, Garden of	Ketuvim	Torah
Derekh Eretz	Esther, Book of	Kings, books of	Zechariah, Book of
eschatology	Exodus	Lamentations of	Zephaniah,
Gehenna	Ezekiel, Book of	Jeremiah	Book of
gemilut ḥesed	Ezra and	Leviticus	<i>forms, sects, and</i>
Halakhah	Nehemiah,	Malachi, Book of	<i>movements:</i>
Hebraic law	books of	Masoretic text	Ashkenazi
Israeli law	Genesis	Micah, Book of	Bene-Israel
messiah	Habakkuk,	Nahum, Book of	Conservative
minhag	Book of	Nevi'im	Judaism
mitzvah	Haggai, Book of	Noahide laws	Falasha
‘olam ha-ba	Hexapla	Numbers	Ḥasidism
Shekhina	Holiness, Code of	Obadiah, Book of	Oriental Jew
<i>Bible:</i>	Hosea, Book of	Old Testament	Orthodox Judaism
Amos, Book of	Isaiah, Book of	Proverbs	Reconstructionism
Babel, Tower of	Israel, Kingdom of	Psalms	Reform Judaism
Chronicles, books	Jeremiah, Book of	Ruth, Book of	Samaritan
of the	Job, Book of	Samuel, books of	Sephardi
Daniel, Book of	Joel, Book of	Septuagint	Zionism

<i>history:</i>	Sambation	cantor	seder
Ammonite	sanhedrin	chief rabbinat	selihoth
amora	savora	cohen	Shabuoth
Ark of the	scapegoat	David, Star of	shadkhan
Covenant	shewbread	derasha	shaharith
Asher	Simeon	Elijah's cup	Shema
Babylonian Exile	Sinai, Mount	etrog	shivah
Benjamin	Sodom and	exegesis	siddur
Bethel	Gomorrhah	gabbai	sidra
Boethusian	sofer	gematria	Simhath Torah
Canaan	Tabernacle	genizah	siyyum
Dan	tanna	get	Sukkot
Diaspora	Ten	Haftarah	synagogue
Elohim	Commandments	ḥalitza	takkanah
ephod	Ten Lost Tribes of	Hallel	tallit
Ephraim	Israel	hands,	Tammuz, Fast of
Essene	Therapeutae	imposition of	tashlik
Gad	Twelve Tribes of	Ḥanukka	terefah
gaon	Israel	Ḥavdala	Three Weeks
golden calf	Western Wall	Hebraic law	Tisha be-Av
Hasidean	Yahweh	hermeneutics	yahrzeit
Haskala	Zealot	ḥol ha-mo'ed	yeshiva
high priest	Zebulun	Kaddish	yizkor
Holocaust	Zion	kashruth	Yom Kippur
Holy of Holies	<i>mysticism:</i>	ketubba	<i>Talmud and</i>
Issachar	ba'al shem	Kiddush	<i>Midrash:</i>
Jerusalem,	Ḥabad	Kol Nidre	Baraita
Temple of	Kabbala	kosher	Gemara
Judah	kavvanah	Lag ba-'Omer	Midrash
Judaism	maggid	maarib	Mishna
K'ai-feng Jew	Merkava	mahzor	Mishne Torah
Karaim	Sefer ha-bahir	matzeva	Mo'ed
Kenite	Sefer ha-temuna	menorah	Nashim
Kneset ha-Gedola	Sefer ha-zohar	mezuzah	Neziqin
Levite	Sefer Yetzira	middot	Qodashim
ma'amadot	sefira	mikvah	responsa
Manasseh	Shabbetaianism	minhah	Shulḥan 'arukh
manna	tzaddiq	minyán	Talmud
Midianite	<i>rites, practices, and</i>	musaf	Thirteen Articles
Mitnagged	<i>institutions:</i>	neilah	of Faith
Moabite	'alenu	Paschal lamb	Ṭohorot
Musar	aliyah	Passover	tosafot
Naphtali	amidah	peshaṭ	Tosefta
Nazirite	anno mundi	phyllactery	Zera'im
Pharisee	arba' kanfot	pidyon ha-ben	<i>other:</i>
Qumrān	ark	piyyut	anti-Semitism
Rechabite	Avinu Malkenu	prosbul	Gentile
red heifer	Bar Mitzvah	Purim	I-Thou
Reuben	berakha	rabbi	Jew
Sadducee	bet din	Rosh Hashana	
Samaritan	bimah	Sabbath	
<u>Biographies</u>			
<i>Biblical figures:</i>	Jeremiah	Samson	Eleazar ben Judah
Abraham	Jezebel	Samuel	of Worms
Amos	Jonah	Saul	Elijah ben
David	Jonathan	Solomon	Solomon
Deborah	Joseph	<i>commentators.</i>	Heller, Yom Ṭov
Ezekiel	Melchizedek	<i>scholars, teachers:</i>	Lipmann ben
Isaiah	Moses	Akiba ben Joseph	Nathan ha-Levi
Jacob	Noah	Ba'al Shem Ṭov	Hillel

Hirsch, Samson	<i>Jewish philosophers:</i>	Baeck, Leo	Josephus, Flavius
Raphael	Buber, Martin	Dubnow,	Kohler, Kaufmann
Ishmael ben Elisha	Israeli, Isaac ben	Simon M.	Maccabees
Johanan ben	Solomon	Ezra	Magnes, Judah
Zakkai	Maimon, Salomon	Frank, Jacob	Leon
Judah ben Samuel	Maimonides,	Günzburg, Horace,	Manasseh ben
Judah ha-Nasi	Moses	Baron	Israel
Karo, Joseph ben	Mendelssohn,	Günzburg, Joseph,	Shabbetai Tzevi
Ephraim	Moses	Baron	Wise, Isaac Mayer
Luria, Isaac ben	Philo Judaeus	Hertz, Joseph	Zuckerman,
Solomon	Rosenzweig, Franz	Herman	Itzhak
Moses de León	<i>other:</i>	Herzl, Theodor	
Rashi	Anielewicz,	ibn Tibbon, Judah	
Sa'adia ben Joseph	Mordecai	ben Saul	

INDEX: See entries under all of the terms above

Section 827. Christianity

- A. History of Christianity before the schism of 1054
 1. The development of the Christian Church from the time of Jesus to the reign of Constantine
 - a. The origins and growth of the primitive church (c. AD 30–70)
 - b. Post-apostolic developments in the early Christian Church (c. AD 70–325)
 2. The early Christian Church from the reign of Constantine to the pontificate of Gregory I the Great (c. 4th–6th century)
 - a. The establishment of Christianity as the state religion of the Roman Empire: the problem of the alliance between church and empire, the increasingly important role played by the bishop of Rome as pope
 - b. Doctrinal controversies that occasioned the further development of Christian theology: reaction to the teachings of Novatian, Donatus, Pelagius, and Arius; the role of St. Augustine; the councils of Nicaea (AD 325), Constantinople (381), Ephesus (431), and Chalcedon (451)
 - c. The relation of the Christian religion to the culture of the late empire
 3. The growing division between Eastern and Western Christianity
 - a. The political and religious bases of increasing tensions between Rome and Constantinople
 - b. The relation of Christianity to Western and Byzantine cultures (7th–11th century)
 - c. Developments affecting institutions and practices in the East and the West: the expansion of Christianity in the West, the rise of the independent churches in the East
 - d. The Photian schism and the beginnings of the great East–West schism
- B. History of Eastern Orthodoxy from the schism of 1054 to the present
 1. The church of imperial Byzantium (up to 1453)
 2. Developments from the fall of Constantinople (1453) to the early 19th century
 - a. Eastern Orthodoxy under the Ottomans (1453–1821)
 - b. The Church of Russia (to 1800)
 3. The Orthodox churches in the 19th century: developments in various areas
 4. The Orthodox Church since World War I
- C. History of the Roman Catholic Church from the schism of 1054 to the present
 1. The medieval and Renaissance eras (c. 11th–16th century)
 - a. Development of the papacy as the chief spiritual and temporal power in the West
 - b. Religious and cultural characteristics of Latin Christianity
[see also F.6.a., below, 10/51.A.2., and 10/53.A.1.j.]

2. The era of the Reformation and the wars of religion: from Luther's reform to the Peace of Westphalia (16th–17th century)
 - [see also 961.A.3. and A.4.]
 - a. Background of the Protestant Reformation in late medieval and Renaissance Catholicism
 - b. The Protestant Reformation
 - [see D.1., below]
 - c. The Catholic Reformation and Counter-Reformation
 - d. The wars of religion
 - [see D.1.h., below]
 - e. Missionary endeavours in other areas: the role of the church in the explorations and colonial policies of the European powers
3. The transition era: from the Peace of Westphalia to the French Revolution (17th–18th century)
4. The modern age: from the French Revolution to World War I (18th–20th century)
5. Developments in the 20th century

D. History of Protestantism

1. The Protestant Reformation and its aftermath, to the Peace of Westphalia (16th–17th century)
 - [see also 961.A.3. and A.4.]
 - a. Its background in European Roman Catholic Christendom
 - [see C., above, and 961.A.]
 - b. Luther and the German Reformation
 - [see also 961.A.5.f.]
 - c. The Reformation in Switzerland, France, and the Low Countries
 - [see also 961.A.5.c., g., and h.]
 - d. The English, Scottish, and Irish reformations
 - [see also 961.A.5.d.]
 - e. Expansion of the Reformation to Scandinavia, the Baltic states, and eastern, central, and southern Europe
 - f. Radical reform movements
 - g. The Catholic Reformation and Counter-Reformation
 - [see C.2.c., above]
 - h. The wars of religion: church–state relations and the gradual development of the concept of religious liberty during the 16th and 17th centuries
 - [see also 961.A.4.]
 2. The transition era: from the Peace of Westphalia to the French Revolution (17th–18th century)
 - a. Political developments affecting the continental Protestant churches
 - b. Developments in German Protestantism
 - c. The challenge of rationalism, Deism, and the Enlightenment: the Protestant response
 - d. Developments in English Protestantism
 - e. Developments in American Protestantism during the Colonial period
 - f. Developments in the Dutch Reformed churches
 - g. Developments in other continental European churches
 3. The modern age: from the American and French revolutions to World War I (18th–20th century)
 4. Developments in Protestantism after World War I
- #### E. Intellectual, spiritual, and imaginative expressions of Christianity
- [see also F.7., below]
 - 1. Biblical literature: the Old Testament, the New Testament, the Apocrypha
 - 2. Biblical exegesis and hermeneutics
 - 3. Patristic literature: the writings of the Church Fathers
 - 4. Formal, official statements of beliefs and doctrines: creeds, dogmas, confessions of faith
 - [see also F.5., below]
 - 5. Writings of the post-patristic theologians, reformers, and church leaders

6. Christian mysticism
 7. Christian philosophy
[see also 10/51.A.2.]
 8. The role of myth and legend in Christianity
- F. Beliefs, practices, and institutions of Christianity
1. Doctrines concerning the nature and activity of God
 - a. The nature of God: the oneness of God, the transcendence of God, God as Father
 - b. The self-revelation of God: the understanding of God as Creator, Sustainer, and Judge
 - c. Christology: teachings concerning the person of Jesus Christ
 - d. Eschatology: political and apocalyptic messianic concepts, expectation of the Kingdom of God
[see also 826.C.1.e.]
 - e. The role of the Holy Spirit in the church: the tensions between continuity and revolution, institutional authority and charismatic activity, and order and freedom
 - f. The doctrine of the Holy Trinity
 2. Doctrines concerning intermediary beings, powers, or principles; *e.g.*, the angels, Satan
[see also 811.D.5.]
 3. Doctrines concerning the physical world
 4. Doctrines concerning mankind
 5. Doctrines concerning the church: Scripture, tradition, creeds, and confessions as normative expressions of Christian belief; the nature and role of doctrine and dogma
 6. Practices and institutions common or predominant among the various traditional forms of Christianity
 - a. The structure of church institutions: canon law and church polity
 - b. The role and characteristics of the liturgy: the church as a worshiping community, the church year
 - c. Forms of Christian life: monasticism, the saintly life
 7. Art and iconography
 - a. Major eras, regions, and schools of Christian art
 - b. The expression of Christian faith and themes in the arts
- G. The major traditional forms of Christianity
1. Eastern Orthodoxy
 - a. Historical development
[see A. and B., above]
 - b. The Orthodox Church: general characteristics deriving from its historical development
 - c. Teachings, forms of worship, and principles of organization that distinguish Eastern Christianity from Roman Catholicism and Protestantism
 - d. The relationship of Eastern Orthodoxy to recent social movements
 - e. Traditional (national) Eastern Orthodox churches; *e.g.*, the Russian Orthodox Church, the Church of Greece
 - f. Eastern Christian Independent churches: Syrian Orthodox Patriarchate of Antioch; Armenian Apostolic Church; Coptic Orthodox Church; Ethiopian Orthodox Church; Malabar Christians; Nestorian (Assyrian) Church
 2. Roman Catholicism: Latin and Eastern rite churches
 - a. Historical development
[see A. and C., above]
 - b. The Roman Catholic Church: general characteristics deriving from its historical development
 - c. Teachings, forms of worship, and principles of organization that distinguish the Catholic tradition from that of Eastern Orthodoxy and Protestantism

- d. The response of the Catholic Church to recent social and political developments
 - e. The Eastern rite (Uniate) churches: ethnically and nationally distinct churches in canonical communion with the Roman Apostolic See
 - f. Old Catholic churches: churches that separated from the see of Rome after the first Vatican Council
3. Protestantism
- a. The Reformation and the historical development of Protestantism
[see D., above]
 - b. Teachings, forms of worship, and principles of organization distinguishing the Protestant heritage from that of Roman Catholicism and Eastern Orthodoxy
 - c. The influence of Protestantism on modern political and social thought
 - d. Major forms of Protestantism: historical development, teachings, forms of worship, and organization
 - i. Lutheran churches
 - ii. Reformed and Presbyterian churches: Calvinism
 - iii. The Anglican Communion
 - iv. The Free churches: Baptists, Disciples of Christ, Congregationalists, Methodists
 - e. Variations of the traditional forms of Protestantism
 - i. Holiness churches
 - ii. Pentecostal churches
 - iii. Millenarian churches: Adventists, Jehovah's Witnesses
 - iv. Society of Friends (Quakers)
 - v. Unitarians and Universalists
 - vi. Old-line Protestant sects and their derivations: Mennonites (including Amish and Hutterites), the Moravian Church, Brethren
 - vii. Other independent churches: various fundamentalist, evangelical, and other sectarian groups
 - viii. Variations of traditional Protestant faiths in black American society
- H. Sects and movements tangentially related to traditional Christianity
- 1. New Thought: Unity and other groups
 - 2. Christian Science
 - 3. Mormonism
- I. Ecumenical, interdenominational, and intradenominational associations

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and biographies dealing with Christianity

Biblical Literature and Its Critical Interpretation	Jesus: The Christ and Christology
Calvinism, Calvin and Christianity	Luther
Doctrines and Dogmas, Religious	Paul, The Apostle
Eastern Orthodoxy	Protestantism
	Roman Catholicism
	Sacred Offices and Orders

MICROPAEDIA: Selected entries of reference information

General subjects

<i>belief, doctrine, and dogma:</i>	Alpha and Omega	apostasy	atonement
absolution	anathema	apostolic	benefice
adiaphorism	angel	succession	blasphemy
agape	Annunciation	Ascension	bull
	Antichrist	Assumption	catechism

catechumen	Virgin Birth	prelate	Renovated
catholic	Visitation	presbyter	Church
charity	<i>canon law:</i>	presbyterian	Romanian
cherub	annates	priest	Orthodox Church
Christ, two	benefice	primate	Russian Orthodox
natures of	canon law	Roman Curia	church
concordat	Codex Juris	schism	Serbian Orthodox
confession	Canonici	secular institute	Church
consubstantiation	conclave	synod	<i>churches—</i>
deadly sin	concordat	vicar	<i>Protestant (Anglican</i>
Erastianism	consistory	<i>churches—Eastern</i>	<i>Communion):</i>
eschatology	Corpus Juris	<i>Independent:</i>	Anglican Church
evangelical church	Canonici	Armenian	of Australia
faith	decretal	Apostolic	Anglican
God, Kingdom of	dispensation	Church	Communion
grace	ecclesiastical court	Christians of Saint	Anglican
heaven	encyclical	Thomas	Evangelical
hell	excommunication	Coptic Orthodox	Anglican
heresy	False Decretals	Church	religious
Holy Spirit	Gratian's	Ethiopian	community
hope	Decretum	Orthodox	Anglo-Catholicism
Immaculate	legate	Church	Broad Church
Conception	nomocanon	Nestorian	Canada, Anglican
imprimatur	nuncio	Syrian Orthodox	Church of
Incarnation	ordination	Patriarchate	Canterbury,
indulgence	papal infallibility	of Antioch	archbishop of
Inner Light	penitential book	<i>churches—Eastern</i>	Canterbury
justification	simony	<i>Orthodox:</i>	and York,
kerygma and	<i>church polity and</i>	Bulgarian	Convocations of
catechesis	<i>ecclesiastical</i>	Orthodox Church	Church Army
Last Judgment	<i>hierarchy:</i>	Cyprus, Church of	Church
limbo	almoner	Eastern Orthodoxy	Commissioners
logos	archbishop	Ecumenical	Church Missionary
Mariology	archdeacon	Patriarchate of	Society
martyr	autocephalous	Constantinople	England,
millennium	church	Georgian	Church of
miracle	bishop	Orthodox Church	Episcopal Church
monophysite	Bishops, Synod of	Greece, Church of	in Scotland
moral theology	cardinal	Greek Orthodox	Ireland, Church of
mystical body of	cathedral	Patriarchate of	Lambeth
Christ	chaplain	Alexandria	Conference
nomocanon	church	Greek Orthodox	New Zealand,
original sin	churchwarden	Patriarchate of	Church of the
orthodox	clergy	Antioch and All	Province of
predestination	collegiality	the East	Nonjuror
purgatory	conciliarism	Greek Orthodox	Oxford movement
resurrection	cong� d'�lire	Patriarchate of	Protestant
Sacred Heart	congregation	Jerusalem	Episcopal Church
saint	council	Japanese Orthodox	South Africa,
saints,	deacon	church	Church of the
communion of	diocese	Jerusalem,	Province of
Satan	elder	Synod of	Wales, Church in
Second Coming	episcopacy	Old Believer	<i>churches—Protestant</i>
seraph	episcopus vagans	Orthodox Church	<i>(Baptist):</i>
sin	free church	in America	American Baptist
soul	holy order	Orthodox	Association
stigmata	metropolitan	Church of	American Baptist
Theotokos	ministry	Czechoslovakia	Churches in the
tongues, gift of	papacy	Orthodox Church	U.S.A.
transubstantiation	parish	of Finland	Baptist
Trinity	patriarch	Orthodox Church	Baptist Federation
Turin, Shroud of	pope	of Poland	of Canada

Baptist Missionary Association of America	Evangelical Church in Germany, The	Christian Catholic Church	Evangelical Church of Czech Brethren
Baptist Union of Great Britain and Ireland	Evangelical Lutheran Church in America	Jehovah's Witness	Free Church of Scotland
National Association of Free Will Baptists	Evangelical Lutheran People's Church of Denmark	Plymouth Brethren	Iona Community
National Baptist Convention of America	Finland, Church of	Shaker	Netherlands
National Primitve Baptist Convention, Inc.	Lutheran Church in Württemberg	<i>churches—Protestant (old-line):</i>	Reformed Church, The
Southern Baptist Convention	Lutheran Church—Missouri Synod	Amish	Presbyterian Church (U.S.A.)
<i>churches—Protestant (Congregationalist):</i>	Lutheran Church of Oldenburg	Bohemian Confession	Presbyterian Church in Ireland
Congregational Church of England and Wales	Lutheran Council in the United States of America	Brethren	Presbyterian Church of England
Congregational Council for World Mission	Lutheran Synodical Conference	Ephrata Community	Presbyterian Church of Wales
Congregationalism	Lutheran World Federation	Hussite	Presbyterian churches
<i>churches—Protestant (Disciples of Christ):</i>	Lutheranism	Hutterite	Reformed church
Disciples of Christ	National Church of Iceland	Mennonite	Reformed Church in America
<i>churches—Protestant (Friends):</i>	Norway, Church of	Moravian church	Reformed Church of France
Friends, Society of	Sweden, Church of	Taborite	Reformed Church of Hungary
Friends World Committee for Consultation	United Evangelical Lutheran Church	Unitas Fratrum	Reformed Churches in The Netherlands
<i>churches—Protestant (Holiness):</i>	United Evangelical Lutheran Church of Germany	Utraquist	Scotland, Church of
Christian and Missionary Alliance	Wisconsin Evangelical Lutheran Synod	<i>churches—Protestant (Pentecostal):</i>	United Church of Canada
God (Anderson Ind.), Church of	<i>churches—Protestant (Methodist):</i>	Assemblies of God	United Free Church of Scotland
Holiness movement	African Methodist Episcopal Church	God, Church of	United Presbyterian Church
Nazarene, Church of the	African Methodist Episcopal Zion Church	God in Christ, Church of	<i>churches—Protestant (Unitarian and Universalists):</i>
Pillar of Fire	Christian Methodist Episcopal Church	International Church of the Foursquare Gospel	Unitarian
United House of Prayer for All People	Evangelical United Brethren Church	Jesus Only	Universalist Association
Wesleyan Church	Methodism	Latter Rain revival	Unitarianism
<i>churches—Protestant (Lutheran):</i>	United Methodist Church	Pentecostal	Universalism
American Evangelical Lutheran Church	World Methodist Council	Assemblies of the World, Inc.	<i>churches—Protestant (United Church of Christ):</i>
Augustana Evangelical Lutheran Church	<i>churches—Protestant (millenarian):</i>	Pentecostal Church of God of America, Inc.	Evangelical and Reformed Church
Batak Protestant Christian Church	Adventist	Pentecostal Holiness Church, Inc.	General Council of Congregational Christian Churches
	Christadelphian	Pentecostalism	United Church of Christ
		<i>churches—Protestant (Reformed and Presbyterian):</i>	<i>churches—Protestant (other):</i>
		Christian Reformed Church in North America	Christ, Church of
		Cumberland Presbyterian Church	
		Dutch Reformed Church	
		Dutch Reformed Church in Africa	
		Dutch Reformed Mission Church in South Africa	
		Evangelical Church in Germany, The	

- Conservative Baptist Association of America
 Evangelical Alliance
 Evangelical Free Church of America
 National Association of Evangelicals
 New Church
 Protestantism
 Undenominational Fellowship of Christian Churches and Churches of Christ
churches—Roman and Eastern Catholic:
 Armenian Catholic Church
 Bulgarian Catholic Church
 Chaldean Catholic Church
 Coptic Catholic Church
 Eastern rite church
 Italo-Albanian Church
 Malabarese Catholic Church
 Malankarese Catholic Church
 Maronite Church
 Old Catholic church
 Old Catholic Church of The Netherlands
 Polish National Catholic Church of America
 Roman Catholic Church of Romania
 Roman Catholicism
 Russian Catholic church
 Syrian Catholic Church
 Ukrainian Catholic Church
churches—other:
 Christian Science
 Mormon
- New Apostolic Church
 Peace Mission Reorganized Church of Jesus Christ of Latter-day Saints
 Unity School of Christianity
heresies:
 Adoptionism
 Albigenses
 Anomoean
 Aphetartodocetism
 Arianism
 Cathari
 Macedonianism
 Monarchianism
 Montanism
 Pelagianism
 Sabellianism
 semi-Arianism
history:
 Acacian Schism
 Anabaptist anticlericalism
 antinomianism
 Antioch, Council of
 antipope
 Apology of the Augsburg Confession
 Apostle Ariminum, Council of
 Arles, Council of
 Arminianism
 Augsburg, Peace of
 Augsburg Confession
 Augsburg Interim
 auto-da-fé
 Avignon papacy
 Barmen, Synod of
 Basel, Council of
 Belgic Confession
 Brest-Litovsk, Union of
 caesaropapism
 Cambrai, League of
 Cameronian camp meeting
 Chalcedon, Council of
 Children's Crusade
 Chinese Rites Controversy
 Christian Socialism
- circuit rider
 Clergy Reserves
 collegia pietatis
 Confessing Church
 Constance, Council of
 Constantine, Donation of
 Constantinople, Council of
 Counter-Reformation
 covenant theology
 Covenanter
 crusade
 Dead Sea Scrolls
 Death of God movement
 Desert Fathers
 devotio moderna
 Diamper, Synod of
 Donatist
 Dort, Synod of
 Douai-Reims Bible
 Dukhobor
 Eastern Orthodoxy
 Ebionite
 ecumenism
 Eight Saints, War of the
 Elvira, Council of
 Ephesus, councils of
 Familist
 Ferrara-Florence, Council of
 fundamentalism
 Gallican Confession
 Gallicanism
 Geneva Bible
 Geneva Catechism
 German Christian
 Great Awakening
 Guarantees, Law of
 Half-Way Covenant
 Hampton Court Conference
 Helvetic Confession
 Holiness movement
 Holy League
 Homoean
 homoousian
 Hsi-an monument
 Huguenot
 Iconoclastic Controversy
 Independent
- Inquisition
 Institutes of the Christian Religion
 Investiture Controversy
 Jerusalem, Council of
 Jesuit Estates controversy
 Lambeth Quadrilateral
 Lateran Council
 Lateran Treaty
 Lollard
 Lutheranism
 Lyon, councils of
 Marburg, Colloquy of
 Marprelate Controversy
 Melchite
 Milan, Edict of mission
 Modernism
 Monothelite
 Moral Re-Armament
 Neoorthodoxy
 Nicaea, Council of
 Ninety-five Theses
 Nisibis, School of
 Oneida Community
 Orange, councils of
 Oxford movement
 Papal States
 Parliament, Admonition to
 Paschal controversies
 Penal Laws
 pentarchy
 Pietism
 Pilgrim Fathers
 Pisa, Council of
 Pistoia, Synod of
 Pragmatic Sanction of Bourges
 Protestant Orthodoxy
 Puritanism
 Quietism
 Quinisext Council
 Raskol
 Reformation
 Reformed League
 regium donum

- revivalism
 Roman
 Catholicism
 Saint
 Bartholomew's
 Day, Massacre of
 Sandemanian
 Sardica, Council of
 Savoy Conference
 Savoy Declaration
 Schmalkaldic
 Articles
 Schmalkaldic
 League
 Schwabach,
 Articles of
 Scots Confession
 Seeker
 semi-Pelagianism
 Social Gospel
 Socinian
 Solemn League
 and Covenant
 Sonderbund
 stylite
 Sunday school
 1054, Schism of
 theological
 liberalism
 Thirty-nine
 Articles
 Treatise on the
 Power and
 Primacy of the
 Pope
 Trent, Council of
 Troubles,
 Council of
 Twenty-five
 Articles of
 Religion
 Ultramontanism
 Unigenitus
 Vatican Council,
 first
 Vatican Council,
 second
 Vienne,
 Council of
 Vulgate
 Waldenses
 Warsaw,
 Compact of
 Western Schism
 Westminster
 Assembly
 Whitby, Synod of
 Worms,
 Concordat of
 Worms, Diet of
- literature—New Testament:*
 Acts of the
 Apostles, The
 Beatitude
 Benedictus
 Colossians,
 The Letter of
 Paul to the
 Corinthians,
 The Letter of
 Paul to the
 Diatessaron
 Ephesians, Letter
 of Paul to the
 Galatians,
 The Letter of
 Paul to the
 Gethsemane
 Golden Rule
 Gospel
 Hebrews, Letter
 to the
 James,
 The Letter of
 John, Gospel
 According to
 John, letters of
 Jude, Letter of
 Lord's Prayer
 Luke, Gospel
 According to
 Magnificat
 Mark, The Gospel
 According to
 Matthew, Gospel
 According to
 Nazarene
 New Testament
 Nunc Dimittis
 Peter, letters of
 Philippians, Letter
 of Paul to the
 Revelation
 to John
 Romans, Letter of
 Paul to the
 Thessalonians,
 letters of Paul
 to the
 Timothy,
 The Letter of
 Paul to
 Titus, The Letter
 of Paul to
- literature—
New Testament
apocrypha:*
 John, Acts of
 Paul, Acts of
- Peter,
 Apocalypse of
 Peter, Gospel of
 Protevangelium of
 James
*literature—Old
Testament:*
 Amalekite
 Ammonite
 Amos, Book of
 Babel, Tower of
 Bethel
 Chronicles, books
 of the
 Daniel,
 The Book of
 Deuteronomy
 Ecclesiastes
 Eden, Garden of
 Elohim
 Esther, Book of
 Exodus
 Ezekiel,
 The Book of
 Ezra and
 Nehemiah,
 books of
 Genesis
 golden calf
 Habakkuk,
 The Book of
 Haggai,
 The Book of
 Hexapla
 Holiness, Code of
 Hosea, Book of
 Isaiah, Book of
 Israel
 Jeremiah,
 The Book of
 Job, The Book of
 Joel, Book of
 Jonah, Book of
 Joshua, Book of
 Judges, Book of
 Kenite
 Ketuvim
 Kings, books of
 Lamentations of
 Jeremiah, The
 Leviticus
 Malachi,
 The Book of
 Masoretic text
 Micah, Book of
 Midianite
 Moabite
 Nahum, Book of
 Nevi'im
 Numbers
 Obadiah, Book of
- Old Testament
 Proverbs, The
 Psalms
 Rechabite
 Ruth, Book of
 Samuel, books of
 Septuagint
 Sodom and
 Gomorrah
 Solomon, Song of
 Ten
 Commandments
 Torah
 Yahweh
 Zechariah, Book of
 Zephaniah,
 Book of
- literature—
Old Testament
apocrypha:*
 Adam and Eve,
 Life of
 Ahikar, The
 Story of
 Aristeas, Letter of
 Azariah, The
 Prayer of
 Baruch,
 Apocalypse of
 Baruch, Book of
 Damascus
 Document
 Ecclesiasticus
 Enoch, First
 Book of
 Enoch, Second
 Book of
 Esdras, First
 Book of
 Esdras, Second
 Book of
 Genesis
 Apocryphon
 Isaiah,
 Ascension of
 Jeremiah,
 The Letter of
 Jubilees, Book of
 Judith, Book of
 Maccabees, The
 Books of the
 Manual of
 Discipline
 Moses,
 Assumption of
 Prophets, The
 Lives of the
 Solomon,
 Psalms of
 Solomon,
 Wisdom of

- Tobit
 Twelve Patriarchs,
 Testaments of the
 War of the Sons
 of Light Against
 the Sons of
 Darkness, The
literature—patristic:
 Ambrosiaster
 Apologist
 Apostolic
 Constitutions
 Apostolic Father
 Barnabas, Letter of
 Clement, First
 Letter of
 Clementine
 literature
 Didachē
 Diognetus,
 Letter to
 Hippolytus,
 Canons of Saint
 Martyrdom of
 Polycarp
 patristic literature
 Peregrinatio
 Etheriae
 Shepherd of
 Hermas
 Testamentum
 Domini
literature—other:
 apocalyptic
 literature
 apocrypha
 biblical criticism
 Douai-Reims Bible
 exegesis
 Geneva Bible
 hermeneutics
 Imitation of Christ
 logia
 Mormon, Book of
 Peshitta
 Philokalia
 polyglot Bible
 Targum
 Vulgate
liturgical year:
 Advent
 All Saints' Day
 All Souls' Day
 Ascension of the
 Lord, Feast of the
 Ash Wednesday
 Candlemas
 Christmas
 church year
 Corpus Christi,
 Feast of
 Easter
 Ember Days and
 Ember Weeks
 Epiphany
 Good Friday
 holy days of
 obligation
 Holy Family, Feast
 of the
 Holy Innocents,
 Feast of the
 Holy Saturday
 Holy Week
 Jubilee, Year of
 Lent
 Maundy Thursday
 Michaelmas
 Palm Sunday
 Pentecost
 Reformation Day
 Rogation Days
 Shrove Tuesday
 Sunday
 Transfiguration,
 Feast of the
*religious communities
 and orders:*
 Anglican religious
 community
 Augustinian
 Basilian
 Benedictine
 Bridgettine
 Camaldolese
 Capuchin
 Carmelite
 Carthusian
 Charity of Saint
 Vincent de Paul,
 Daughters of
 Christian Brother
 Cistercian
 Common Life,
 Brethren of the
 Divine Word
 Missionary
 Dominican
 Franciscan
 Good Shepherd
 Sister
 Grandchamp
 and Taizé
 communities
 Hesychasm
 Holy Ghost Father
 Jesuit
 Knights of Malta
 Little Brothers of
 Jesus and Little
 Sisters of Jesus
 Marianist
 Marist Brother
 Marist Father
 Mary Immaculate,
 Oblates of
 Maurist
 Mechitarist
 mendicant
 Mercedarian
 Mercy, Sisters of
 Minim
 monasticism
 Oratorian
 Passionist
 Poor Clare
 Premonstratensian
 Redemptorist
 Sacred Heart,
 Society of the
 Salesian
 Servite
 Spiritual
 Templar
 Teutonic Order
 Trappist
 Trinitarian
 Ursuline
 Vincentian
 Visitandine
 White Father
 Zoe
*worship, liturgy,
 ritual, and
 iconography:*
 acolyte
 Agnus Dei
 Alexandrian rite
 anointment
 Antiochene rite
 Apostles' Creed
 Armenian rite
 Athanasian Creed
 Baptism
 Basil, Liturgy of
 Saint
 bell, book, and
 candle
 benediction
 breviary
 Byzantine rite
 cantor
 Chaldean rite
 chalice
 chrismation
 Common Order,
 Book of
 Common Prayer,
 The Book of
 Concord, The
 Book of
 confession
 confessional
 Confessions,
 Book of
 confirmation
 creed
 cross
 cross, sign of the
 Cross, Stations
 of the
 crucifixion
 Dies Irae
 divine office
 doxology
 Ecce Homo
 epiclesis
 Eucharist
 exorcism
 feet, washing of
 godparent
 Hail Mary
 hands,
 imposition of
 Heidelberg
 Catechism
 Holy Family
 Holy Sepulchre
 holy water
 icon
 iconostasis
 James, Liturgy of
 Saint
 Jesus prayer
 kanōn
 Last Supper
 lector
 Liturgical
 Movement
 Lord's Prayer
 Madonna
 Magnificat
 mass
 missal
 monstrance
 Nativity
 Nicene Creed
 orant
 Pietà
 prayer
 Preconsecrated
 Offerings, Liturgy
 of the
 procession
 pyx
 rosary
 Sabbatarianism
 sacrament
 shepherd,
 adoration of the
 thurible
 tite
 troparion

True Cross
 vespers
 Westminster
 Catechism

Westminster
 Confession
 See Section 624 of
 Part Six for
 sacred music

other:
 Christianity
 Eastern
 Orthodoxy
 liberation theology

Protestantism
 Roman
 Catholicism
 World Council of
 Churches

Biographies

early Christian figures—to 1054:

Ambrose, Saint
 Anastasius the
 Librarian
 Ansgar, Saint
 Anthony of Egypt,
 Saint
 Aphaates
 Aristedes
 Arsenius the Great
 Athanasius, Saint
 Athenagoras
 Augustine, Saint
 Augustine of
 Canterbury, Saint
 Basil the Great,
 Saint
 Bede the
 Venerable, Saint
 Benedict Biscop,
 Saint
 Benedict of Nursia,
 Saint
 Berengar of Tours
 Chad, Saint
 Chrysostom, Saint
 John
 Clement I, Saint
 Clement of
 Alexandria, Saint
 Colman of
 Lindisfarne, Saint
 Cuthbert, Saint
 Cyprian, Saint
 Cyril and
 Methodius, Saints
 Cyril of
 Alexandria, Saint
 Damasus I, Saint
 Diadochus of
 Photice
 Dionysius of
 Alexandria, Saint
 Dustan of
 Canterbury, Saint
 Ennodius, Magnus
 Felix
 Ephraem Syrus,
 Saint
 Erigena, John
 Scotus
 Eusebius of
 Caesarea

Eusebius of
 Nicomedia
 Euthymius I
 Euthymius the
 Great, Saint
 Evagrius Ponticus
 Fursey, Saint
 Gennadius of
 Marseilles
 Germanus I, Saint
 Germanus of
 Auxerre, Saint
 Gregory I, Saint
 Gregory VII, Saint
 Gregory of
 Nazianzus, Saint
 Gregory of Nyssa,
 Saint
 Gregory of Tours,
 Saint
 Gregory
 Thaumaturgus,
 Saint
 Hesychius of
 Jerusalem
 Hilarion, Saint
 Hincmar of Reims
 Hippolytus of
 Rome, Saint
 Honorius I
 Humbert of Silva
 Candida
 Ignatius of
 Antioch, Saint
 Irenaeus, Saint
 Isaac the Great,
 Saint
 Isidore of Seville,
 Saint
 Jerome, Saint
 Joan, Pope
 John of Damascus,
 Saint
 John of Jerusalem
 Justin Martyr,
 Saint
 Kenneth, Saint
 Leo I, Saint
 Leo III, Saint
 Leo IX, Saint
 Liberius
 Lucifer
 Macarius the
 Egyptian
 Mark the Hermit

Martin of Tours,
 Saint
 Nemesis of
 Emesa
 Nestorius
 Nicephorus I, Saint
 Nicetas of
 Remesiana
 Nicholas, Saint
 Nicholas I
 Nicholas I, Saint
 Nilus of Ancyra,
 Saint
 Ninian, Saint
 Novatian
 Origen
 Oswald of York,
 Saint
 Palladius
 Paschal I, Saint
 Paschasius
 Radbertus, Saint
 Patrick, Saint
 Pelagius I
 Pelagius II
 Philoponus, John
 Philostorgius
 Philoxenus of
 Mabbug
 Photius, Saint
 Polycarp, Saint
 Priscillian
 Rabanus Marus
 Sergius I, Saint
 Severian of Gabala
 Severus of Antioch
 Simplicius, Saint
 Sophronius
 Stephen VI
 Sulpicius Severus
 Symmachus, Saint
 Tertullian
 Theodore Ascidas
 Theodore of
 Canterbury, Saint
 Theodore of
 Cyrrhus
 Theodosius of
 Alexandria
 Theodorus Abū
 Qurrah
 Theophilus of
 Alexandria, Saint
 Ulfilas
 Vigilus

Vincent of Lérins,
 Saint
 Wilfrid, Saint
 Willibrord, Saint
 Zosimus, Saint
*Christian figures—
 medieval and
 Renaissance:*
 Aelred of Rievaulx,
 Saint
 Ailly, Pierre d'
 Alexander III
 Alexander VI
 Arnold of Brescia
 Benedict (XIII)
 Bernard of
 Clairvaux, Saint
 Bonaventure, Saint
 Boniface VIII
 Borgia, Cesare, duc
 de Valentinois
 Catherine of Siena,
 Saint
 Celestine V, Saint
 Clare of Assisi,
 Saint
 Clement V
 Clement VI
 Dominic, Saint
 Duns Scotus, John
 Eckhart, Meister
 Edmund of
 Abington, Saint
 Francis of Assisi,
 Saint
 Gerson, Jean de
 Gilbert of
 Sempringham,
 Saint
 Gregory VII, Saint
 Gregory IX
 Gregory of Rimini
 Honorius III
 Hus, John
 Innocent II
 Innocent III
 Innocent IV
 Isaac of Stella
 Jerome of Prague
 Joachim of Fiore
 John XXII
 John (XXIII)
 John of Avila,
 Saint

- John of Matha,
Saint
- John of Mirecourt
- John of Salisbury
- Julius II
- Malachy, Saint
- Martin V
- Milíč, John
- Nicholas III
- Nicholas IV
- Nicholas V
- Nicholas of
Clémanges
- Nicholas of Cusa
- Nicholas of
Hereford
- Paschal II
- Paul II
- Peter Lombard
- Petrus Aureoli
- Pius II
- Prester John
- Rokycana, Jan
- Savonarola,
Girolamo
- Seven Holy
Founders
- Sixtus IV
- Suso, Heinrich
- Thomas Aquinas,
Saint
- Urban II
- Urban VI
- William de la
Mare
- William of
Auvergne
- William of
Auxerre
- William of
Champeaux
- William of Hirsau
- William of
Saint-Amour
- William of
Saint-Thierry
- Wycliffe, John
- Eastern Orthodox
figures—from 1054:*
- Akindynos,
Gregorios
- Alexis I
- Alexis II
- Anthony of Kiev
- Anthony
Khrapovitsky
- Bartholomew I
- Bulgakov,
Macarius
- Cydones,
Demetrius
- Dimitrios
- Eugenikos,
Markos
- Euthymius of
Turnovo
- Gemistus Plethon,
George
- Gennadios II
Scholarios
- Gregory of Sinai
- Isidore of Kiev
- Jeremias II
- John XI Becchus
- Joseph of
Volokolamsk,
Saint
- Maximus the
Greek
- Mogila, Peter
- Nicephorus
Callistus
- Xanthopoulos
- Nikon
- Palamas, Saint
Gregory
- Planudes,
Maximus
- Prokopovich,
Feofan
- Sergius
- Theophylactus of
Ochrida
- Tikhon, Saint
- New Testament
figures:*
- Anne and
Joachim, Saints
- James, Saint
- John the Apostle,
Saint
- John the Baptist,
Saint
- Joseph, Saint
- Judas Iscariot
- Luke, Saint
- Mark, Saint
- Mary
- Mary Magdalene,
Saint
- Peter the Apostle,
Saint
- Pilate, Pontius
- Stephen, Saint
- Thomas, Saint
- Old Testament
figures:*
- Abraham
- Amos
- David
- Deborah
- Ezekiel
- Isaiah
- Jacob
- Jeremiah
- Jezebel
- Jonathan
- Joseph
- Melchizedek
- Moses
- Noah
- Samson
- Samuel
- Saul
- Solomon
- Protestant figures:*
- Agricola, Johann
- Arminius, Jacobus
- Ballou, Hosea
- Baxter, Richard
- Beecher, Henry
Ward
- Beza, Theodore
- Biddle, John
- Bonhoeffer,
Dietrich
- Bucer, Martin
- Bultmann, Rudolf
- Bunyan, John
- Bushnell, Horace
- Carey, William
- Chalmers, Thomas
- Channing, William
Ellery
- Clauberg, Johann
- Cranmer, Thomas
- Dávid, Ferenc
- Eddy, Mary Baker
- Edwards, Jonathan
- Erastus, Thomas
- Farel, Guillaume
- Flacius Illyricus,
Matthias
- Fox, George
- Franck, Sebastian
- Harnack,
Adolf von
- Hembyze, Jan van
- Henderson,
Alexander
- Hooker, Richard
- Huntingdon,
Selina Hastings,
Countess of
- Jewel, John
- Joris, David
- Judson, Adoniram
- Karlstadt,
Andreas Rudolf
Bodenstein von
- Keble, John
- Knox, John
- Kuyper, Abraham
- Labadie, Jean de
- Lefèvre d'Étaples,
Jacques
- Leighton, Robert
- McPherson, Aimee
Semple
- Mather, Cotton
- Mather, Increase
- Mather, Richard
- Maurice, Frederick
Denison
- Melanchthon,
Philipp
- Melville, Andrew
- Menno Simonsz.
- Müntzer, Thomas
- Niebuhr, Reinhold
- Ochino,
Bernardino
- Oecolampadius,
John
- Penn, William
- Ritschl, Albrecht
- Robinson, John
- Rogers, John
- Schaff, Philip
- Schleiermacher,
Friedrich
- Schwenckfeld,
Kaspar
- Servetus, Michael
- Smith, Joseph
- Socinus, Faustus
- Spalatin, Georg
- Spener, Philipp
Jakob
- Strauss, David
Friedrich
- Swedenborg,
Emanuel
- Tait, Archibald
- Campbell
- Tillich, Paul
- Ussher, James
- Vermigli, Peter
Martyr
- Wesley, Charles
- Wesley, John
- Whitman, Marcus
- Williams, Roger
- Young, Brigham
- Zinzendorf,
Nikolaus Ludwig,
Graf von
- Zwingli, Huldrych
- Roman Catholic
figures—
post-Reformation:*
- Arnauld, Antoine
- Arnauld family
- Bellarmino, Saint
Robert

Benson, Edward White	Jansen, Cornelius Otto	Paul III Paul IV	Uganda, Martyrs of
Bérulle, Pierre de	John XXIII	Paul VI	Urban VIII
Borromeo, Saint Charles	John of Saint Thomas	Pius IV Pius V, Saint	Wiseman, Nicholas
Bossuet, Jacques-Bénigne	John of the Cross, Saint	Pius VI Pius VII	Xavier, Saint Francis
Cajetan	John Paul II	Pius IX	
Calasanz, Saint Joseph	Lacordaire, Henri Lamennais,	Pius X, Saint Pius XI	
Carroll, John	Félicité	Pius XII	
Clement VII	Laval, François de Montmorency	Ricci, Matteo Sarpi, Paolo	
Clement XI	Lefebvre, Marcel	Sixtus V	
Coindre, André	Leo X	Smet, Pierre-Jean de	
Döllinger, Johann Joseph Ignaz von	Leo XII Leo XIII	Stein, Edith	
Drexel, Katharine, Blessed	Loyola, Saint Ignatius of	Teilhard de Chardin, Pierre	
Erasmus, Desiderius	Maritain, Jacques Newman, John	Teresa, Mother Teresa of Ávila	
Innocent XI, Blessed	Henry Paul II	Tyrell, George	

INDEX: See entries under all of the terms above

Section 828. Islām

A. History of Islām

1. The pre-Islāmic setting in Arabia
[see also 822.A.6.]
2. The origin of Islām in the life and teachings of the Prophet Muḥammad, the Messenger of Allāh (6th–7th century AD)
3. The foundations of the Islāmic community and the early expansion of Islām beyond Arabia (7th and 8th centuries)
4. The development of Islāmic religion, culture, and society during the first centuries of the caliphate of the ‘Abbāsids (8th–11th century)
5. The Middle Ages of Islām: developments in theology, law, and culture (11th–18th century)
6. Islām in the modern world (18th–20th century)
7. Islām today

B. Intellectual, spiritual, and imaginative expressions of Islām

[see also C.4., below]

1. The Qur’ān: its form and contents, views about its origin, interpretations or translations
2. The Ḥadīth: the oral tradition
3. Islāmic law: Shari’ah, *fiqh*
4. Islāmic theology and philosophy: philosophic and antiphilosophic trends in Islām, the major schools of Islāmic philosophy
5. The mystical path: Ṣūfism
6. Mythical elements and elaborations of Islāmic beliefs and doctrines

C. Beliefs, practices, and institutions of Islām

1. Beliefs and doctrines
 - a. Doctrines concerning God
 - b. Doctrines concerning the universe
 - c. Doctrines concerning mankind

- d. Doctrines concerning Satan and other intermediate beings, powers, or principles
[see also 811.D.5.]
 - e. Doctrines concerning Muḥammad and the nature of prophecy
 - f. Eschatological doctrines
 - g. Social and ethical doctrines
2. The forms of Islām: the orthodox community and its variations
 - a. Khārijism: the doctrines of the Khārijīs and Ibāḍīs
 - b. Mu'tazilism
 - c. Sunnism
 - d. Shī'ism and its subjects: the Ismā'īlīs and other Ismā'īlī sects
 - e. Religious groups of Islāmic origin, now considered non-Islāmic; *e.g.*, Druzes, Bahā'ī faith
[see 829.E.]
 - f. Variations among the urban and rustic Ṣūfī orders
 3. Practices and institutions
 - a. The Five Pillars of Islām: the profession of faith, the five daily prayers, the obligatory tax (zakat), fasting, the pilgrimage to Mecca
 - b. Sacred places and days: the mosque and festivals in public worship
 - c. The family: Islāmic teaching regarding marriage, divorce, chastity, and inheritance
 - d. The Shari'ah: law and jurisprudence, the schools of law
 4. Art and iconography
 - a. Major eras, regions, and schools of Islāmic art
 - b. The expression of Islāmic faith and themes in the arts
 - c. The religious and cultural context of Islāmic art and iconography: the effect of the anti-iconic principle on representational art
 5. Modern reform movements

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with Islām

Islām. Muḥammad and the Religion of
Islāmic World, The

MICROPAEDIA: Selected entries of reference information

General subjects

<i>belief, law, and philosophy:</i>	isnād	tawhid	miḥnah
'ādah	istiḥsān	uṣūl al-fiqh	Murji'ah
Ahl al-Kitāb	istiṣlāḥ	<i>history:</i>	Qarmatian
Allāh	jihād	Almohads	rāshidūn, ar-
'aql	kalām	Almoravids	Sālimīyah
'arīyah	kasb	Badr, Battle of	<i>myth, legend,</i>
bid'ah	kiswah	Bāṭiniyah	<i>eschatology:</i>
Dahriyah	Mālikīyah	caliph	Barṣiṣā
diyāh	mufti	Caliphate	Burāq
faḍl	Mu'tazilah	Companions of the	Dajjāl, ad-
ghaybah	Qadariyah	Prophet	Dhū al-faqār
Ḥadīth	qaḍī	Dīn-i Ilāhi	ghūl
Ḥanābilah	qiyas	Ditch, Battle of the	Hārūt and Mārūt
Ḥanafīyah	raḍā'	Hāshimīyah	hātif
'iddah	rahbāniyah	Hegira	hourī
ijmā'	Shāfi'iyah	Ḥudaybiyah, Pact	Iblīs
ijtihād	Shari'ah	of Al-	ifrit
ikhtilāf	shirk	Ikhwān aṣ-Ṣafā'	Isrā'
'ilm al-ḥadīth	taqlid	imam	Isrāfil
imam	tashbih	jizya	'Izrā'il
		kharāj	

jahannam	Hegira	zakat	ḥāl
Jibrīl	ʿid	zāwiyah	ḥaḥiqah
jinnī	ihram	ziyārah	kashf
Khiḍr, al-	jihād	zuhd	khirqah
mahdī	jumʿah	<i>sects, schools,</i>	Malāmātiyah
Mikāl	Kaʿbah	<i>branches:</i>	maqām
miʿrāj	khitān	ʿAlawite	Mawlawiyah
shaitan	khuṭbah	Bohrā	mujāhadah
Sheba, Queen of	mawlid	Deoband school	mushāhadah
Yājūj and Mājūj	minaret	Dönme	Naqshbandiyah
<i>offices and orders:</i>	minbar	Druze	Qādiriyah
caliph	mosque	Ismāʿilite	Qalandariyah
imam	muezzin	Ithnā ʿAshariyah	Rifāʿiyah
marabout	mullah	Khārijite	samāʿ
qurrāʾ	mutʿah	Mahdist	shaṭṭ
Shādhiliyah	purdah	Māturīdiyah	Shaṭṭariyah
<i>Qurʾānic literature:</i>	qibla	Muʿtazilah	Subud
basmalah	rajm	Rāfiḍah	Ṣūfism
fātiḥah	Ramaḍān	Shīʿite	Suhrawardiyah
fawātiḥ	salat	Ṣūfism	tariqa
Qurʾān	ṣawm	Sunnite	<i>other:</i>
surah	sayyid	Wahhābī	Ahl-e Ḥaqq
<i>ritual, practice,</i>	sharif	Yazīdī	American Muslim
<i>observance:</i>	subḥah	<i>Ṣūfism:</i>	Mission
adhān	sunna	Aḥmadiyah	Islām
ʿAshūrāʾ	tafsir	Bektashi	Muhammadiyah
Black Stone of	tahajjud	Chishtiyah	Mʿzabite
Mecca	talbiyah	dervish	sheikh
crescent	taqiya	dhikr	ulama
ghusl	tazia	fakir	
hajj	ʿumrah	fana	
Biographies			
<i>leaders and teachers:</i>	Jalāl ad-Dīn	<i>theologians and</i>	Ghazālī, al-
ʿAbd Allāh	ar-Rūmī	<i>philosophers:</i>	Ḥasan
Abū Bakr	Jamāl ad-Dīn	ʿAbduh,	al-Baṣrī, al-
Ahmad Khan, Sir	al-Afghānī	Muḥammad	Ibn al-ʿArabī
Sayyid	Junayd, Shaykh	Abū Ḥanifah	Ibn ʿAqīl
Aḥsāʾī, al-	Mahdī, al-	Aḥmad ibn	Ibn Ḥazm
ʿAlī	Muḥammad	Ḥanbal	Ibn Taymiyah
Ghaznavid	Rashid Riḍā	Ashʿarī, Abū	Muḥāsibī, al-
Dynasty	Shaʿrānī, ash-	al-Ḥasan al-	Sirhindī, Shaykh
Ḥallāj, al-	ʿUmar I	Averroës	Aḥmad
Jāʿfar ibn	ʿUmar II	Avicenna	Suhrawardī, as-
Muḥammad	ʿUmar Tal	Fakhr ad-Dīn	Ṭabarī, aṭ-
		ar-Rāzī	

INDEX: See entries under all of the terms above

Section 829. Other Religions and Religious Movements in the Modern World

- A. New religious movements reflecting the impact of dominant cultures and religions
- B. Negro cults in Western cultures
 1. The Nation of Islām, or Black Muslims
[see E.3., below]
 2. Black Jewish cults: the Church of God; the Commandment Keepers, or Black Jews; the Church of God and Saints of Christ
- C. Theosophical groups

D. Spiritualist groups

E. Religions and religious movements of Islāmic origin or influenced by Islām

1. The Bahā'ī faith
2. The Druze religion
3. The Nation of Islām, or Black Muslims

F. Residues or revivals of ancient and primitive religious beliefs and practices in modern civilizations

1. Witchcraft, black magic, Satanism
[see also 811.F.]
2. Prophecy, divination, astrology
3. Healing cults or practices
4. Pharmacological cults or practices

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with other religions and religious movements in the modern world

Doctrines and Dogmas, Religious
Occultism

MICROPAEDIA: Selected entries of reference information

General subjects

Aladura	Hare Krishna	Maria Legio	Rizalist cult
alchemy	Harris movement	mashriq al-adhkār	Rosicrucian
anthroposophy	Hauhau	Moorish Science	Santería
astrology	healing cult	Temple of	Scientology
Azalī	ḥudūd, al-	America	spiritual assembly
Bahā'ī faith	I Am movement	Native American	Telakhon
Braid movement	Iglesia ni Kristo	Church	theosophy
Cao Dai	Indian Shaker	Church	Unification
cargo cult	Church	New Thought	Church
divination	Islam, Nation of	Peace Mission	'uqqāl
Druze	Kimbanguist	Psychiana	voodoo
Ethiopianism	church	Rastafarian	witchcraft
faith healing	Kuga Sorta	Ratana church	Zionist church
Ghost Dance	Macumba	Religious Science	
Handsome Lake	magic	Ringatu	
cult			

Biographies

Bāb, the	Divine, Father	Mahesh Yogi,	Muhammad,
Bhaktivedanta,	Fard, Wallace D.	Maharishi	Elijah
A.C.	Gurdjieff, Georges	Moon, Sun Myung	Smohalla
Blavatsky, Helena	Ivanovitch		Steiner, Rudolf
Petrovna			

INDEX: See entries under all of the terms above

Introduction to Part Nine:

The Point and Pleasure of Reading History

by Jacques Barzun

Everything that we call the arts and the humanities comes out of some natural desire and acquires value by satisfying it. Painting and music and literature are important not because there are museums and concert halls and libraries to be kept supplied but because human beings want to draw and sing and tell stories as well as enjoy seeing others fulfill these native and universal impulses.

Among the humanities, history holds a special place in that its origin within each of us is not even dependent on impulse. A person may lack altogether the wish to sing or the knack of telling a story, but everybody without exception finds occasion to say: "I was there; I saw it; I remember it very well." In saying (or even thinking) these words, every man is a historian. History is inescapably a part of consciousness. The Greeks expressed this truth by describing *Clio*, the muse of history, as the daughter of memory.

Without going into the subtleties of how we are able to remember and what the contents of memory actually are, it is clear that as soon as we take thought about our experiences, whether the farthest back or the nearest and most immediate, we are dealing with what is past. The so-called present vanishes in the very act of reflecting upon it, and the future is all surmise and imagination. Hence the greater our interest in the facts and truths of human existence—our own existence included—the greater, necessarily, is our concern with the past. "To live in the past" ought not, therefore, to be the phrase of reproach that it commonly is. The larger part of the thoughtful life that one leads during the intervals of action cannot be anything but some form of living in the past. If this part of our lives is to be criticized, it should be in words different from the cliché. One should ask, *How* does he or she live in the past? *What past* does he or she recall, prefer, imagine?

It is at this point that history as the organized story of the whole human past comes in to contribute its pleasures and its illumination to the thoughtful life. A person who remembered only his own past would be pretty poor indeed—living on a starvation diet. Actually, it is a question whether such a life is not an impossible supposition. Everybody remembers pieces of other people's pasts; everybody, whether he means to or not, finds that he has learned about his country, his town, his street, his business office, or his factory many things that came to pass well before his time. To possess that information, if it is accurate, is in essence a knowledge of history. It differs in extent but not in kind from a knowledge of how Rome rose and fell. And this relation tells us what reading history affords in the first instance. Just as knowing about our neighbours' and friends' histories adds to our sense of reality, so does reading history: it gives us vicarious experience.

If we add to the habitual, unconscious intake of personal and local history the daily filling of the mind by news

reports—which is contemporary history and which usually brings with it fragments of a remoter past—we begin to see that every man who lives in a modern, communicative society is forced to become in some sense a conscious historian. His interest begins with himself and his environment, but it is soon stretched out, haphazardly, into such domains of history as chance or special interests have developed. And special interests need not mean explicitly intellectual ones; baseball and chess, model trains and furniture, pottery and boat-building have their heroes and revolutions too, and whoever cares about these activities or artifacts for themselves inevitably becomes engrossed in their histories.

It is of course true that when we ordinarily speak of someone having an interest in history we mean the political, social, or cultural history of great civilizations; and for a long time history was arbitrarily taken to mean the sequence that leads from the ancient civilizations of the eastern Mediterranean to the modern ones of the West. It is a tremendous spectacle, even though concentrated on a relatively small territory. But now that certain dynamic elements of Western civilization have aroused the rest of the world to both imitation and resistance, it has become imperative to widen the panorama and see behind the vast and confused modern scene the several histories of the great Eastern civilizations as well as the traditions and vicissitudes of the African societies.

Two questions readily occur at the mere thought of so much to know. Can a reader who is not a professional historian find his way in this huge maze of names, dates, and facts? And if he can, why should he? The answer to the first question is the old reply of the mathematician to the nervous student: "What one fool can do, another can." A real compliment is concealed in this gruff retort, for what it implies is that given an interest, a motive, any man can inform himself about any part of world history through secondary accounts such as are digested in an encyclopaedia. There is no obligation to master every detail, to dispute or criticize sources—in a word, to ape the professional, who, for the best of reasons, limits himself to a small segment of the whole. A *reader* of history is one who follows with his mind the steps another took on his voyage of discovery; and this is easier in history than in mathematics, for history is told in plain words and deals with ordinary human relationships.

So the main difficulty lies in the second question: Why embark on the journey? The answers are numerous and varied, for temperaments differ, as do "special interests" in the sense referred to above. But there is one answer that covers the rest; it is the answer suggested by what was said earlier about every man's unconscious absorption of haphazard fragments of history. The best motive for reading history deliberately is curiosity about the portions missing

from one's own picture of the past. Curiosity: How did things come to be as they are? How was it when they were different? Is it true that once upon a time men did thus and so? History deals with particulars, and most recorded particulars contain puzzles, contradictions, enormities, all of them spurs to curiosity: the Hudson River in the state of New York was named after the navigator often called Hendrik Hudson, who first sailed up the stream. But why Hendrik and not Henry? Well, Henry was his baptismal name; how did he acquire the other and why? The full answer leads really to a comprehensive view of exploration and colonization by the national states at the dawn of the modern age—the aims, drives, desires, errors, follies, cruelties, and incalculable consequences of a great movement that occupies two and a half centuries and that has continued in different forms down to the landings on the Moon.

The most striking feature of history is its fusion of purposeful direction and unexpected drift. For example, read about Plato, Aristotle, and the ancient mathematicians, and you will discover how their speculations and discoveries have been transformed and amplified into the methods and systems that we still work with. But you will also be told how at various times these same streams of thought or belief generated entirely new and remote, strange and absurd consequences. Again, ancient astrology led to the science of astronomy, and science (as we think) replaces superstition. Yet astrology fills columns in 20th-century newspapers and the minds of their millions of readers. What is the explanation? We lack the pythoiness of Delphi, in whom Socrates believed or affected to believe, and we have no official college of augurs to scan the entrails of birds as a guide to future political action, but fortune-tellers are never out of business and we do have Gallup polls. Truly, the wonders of cultural history are infinite.

To conjure up these beliefs and institutions in this comparative fashion is not to equate them with one another or across the centuries; it is rather to stress the identity in diversity that is the principle of human affairs and that makes human history accessible to any willing reader. In different times and places, men are the same and also different. The differences are due to the varying emphases given by one people at one time to some element of life and feeling or to some form of its expression. This is most easily seen in the plastic arts. Think of the representations of the human body in Egypt, Greece, medieval Europe, the west coast of Africa, pre-Columbian America, and the art galleries of world capitals in the second half of the 20th century: is it the same human body or different? The question is really idle, for it is both and neither. In paint or marble there is strictly no human body, only a view of it, a feeling about it. Similarly, what we see in history is not so much Man distorted in one way or another as *men* who existed *only as we see them*; that is, in their society and culture, under their skies and gods, never staying put for more than a short time, never to be reduplicated elsewhere or at a later time, even when the effort to imitate is strong and shrewd—as in the Italian Renaissance, which tried to restore the ancient culture of Greece and Rome.

Despite this irreducible plasticity, diversity, and restlessness, we draw historical parallels, we make comparisons. That we can do so is what persuades us of the unity and continuity of history. When we find the Celtic druids and

the Aztecs making human sacrifices to their gods we say we recognize a human tendency, though we profess to abhor it. Yet some future reader of history might be tempted to compare with those ancient peoples our contemporary revolutionists, who sacrifice 400,000 kulaks (or some other hapless group) for the good of the tribe and its eternal prosperity. But we also notice a strange difference: we know that fanatical faith presides over each type of human sacrifice, ancient and modern, but even as we condemn we think we understand the modern more readily: we know its background, have heard its advocates. It is one of the illuminations of history, not merely to know abstractly, but, by learning the local shape of things, to feel how the reality of each time and place differs; how the faiths diverge in contents and origins and thus in persuasiveness. We may now lump together the Celts and the Aztecs, but they were far apart in thought and character: in short, nothing is truly comparable; in history everything is *sui generis*.

The wise reader of history keeps his equilibrium between these two extremes of likeness and difference. He tries to see the unfamiliar in the familiar, and vice versa. He stands away from his own prejudices and satisfies his curiosity by trying to sympathize with what is farthest away or most alien. This is very hard to do when what is before us is a bloody sacrifice, a massacre, a piece of treachery or cynical greed that violates our sensibilities as well as our moral principles. But to sympathize is not to condone or approve, it is only to acknowledge in oneself the ever-present possibility of the same feeling or action. Certainly the enlightened 20th century has no warrant for looking down on times and places where treachery and massacre were commonplace. And it is a sobering observation to find in both past and present the evidence that inhumanities have been and are being committed by the brutish and civilized alike, the ignorant and the educated, the cynical and the devout, the selfish and the heroic.

A principal good derived from history is thus an increase in self-knowledge, through a fellow-feeling with men singly and in groups as history tells about them. That self-knowledge in turn makes the reader of history less ready to find "monsters of error" in his own time and place. Let it be said again, he need not condone or accept with indifference, but he is spared one of the very errors that perpetuates man's inhumanity to man—fanatical self-righteousness.

On the constructive side, what history tells is the long series of efforts to overcome the constraints of nature and the difficulties of living in society. Those efforts we call civilizations. They start small. In the West they first take the form of city-states. They clash, with one another or with the barbarians "outside." Trade and war, war and trade expand the scope of power, government, and law. Great men introduce broader conceptions of citizenship, morals, and religions. Others invent practical devices of administration, manufacture, and—again—war. Still others discover the workings of nature, create mathematics or art or systems of philosophy. A concentration of such activities over a given territory is what is meant by a high civilization—Egypt, Greece, the Hellenistic Age, Rome, the Saracens, the High Middle Ages, the Renaissance. And also China, Japan, the Khmers, India, the Mayas, the Incas, and so on.

Along this hazardous and always violent course, innumerable characters rise and play their parts. Their fates

provide stories within the story. Visibly, biographies are the bricks of which history is made, for the story of mankind can only be the stories of men. But by a paradox of man's social existence, the life of communities is not a simple sum of individual lives. The reader of history must therefore imagine from the printed page characteristic acts, moods, errors, disasters, achievements that are nobody's doing and everybody's doing. This imagining is another important good bestowed by historical reading, for it dispels the illusion that H.G. Wells called the "governess view" of history: They (the bad people) are doing this terrible thing to Us (the good people). The fallacy in it is to suppose that any large group acts as with one mind, clear in purpose and aware of consequences. Such a projection of the single ego upon whole masses is a form of provincialism that is encountered in most political discussions and certainly in all social prejudices: "If the President would only act . . . if those people would only see reason. . . ." A reader of history is cured of this simple-mindedness by developing a new sense—the historical sense—of how mankind in the mass behaves, neither free nor fatally pushed, and in its clearest actions mysterious even to itself.

It is this peculiarity that, while marking the difference between history and biography (where acts can be deemed individual and responsible), has led many minds to postulate a meaning in history, a meaning discoverable but obscured by the multiplicity and confusion of facts. A famous passage in Cardinal Newman's *Apologia* records in admirable prose the feelings that lead to the elaboration of philosophies of history; for Newman it is of course the traditional Christian interpretation that unifies the multiplicity and resolves the confusion:

To consider the world in its length and breadth, its various history, the many races of man, their starts, their fortunes, their mutual alienation, their conflicts; and then their ways, habits, governments, forms of worship; their enterprises, their aimless courses, their random achievements and acquirements, the impotent conclusion of long-standing facts, the tokens so faint and broken, of a superintending design, the blind evolution of what turn out to be great powers or truths, the progress of things, as if from unreasoning elements, not towards final causes, the greatness and littleness of man, his far-reaching aims, his short duration, the curtain hung over his futurity, the disappointments of life, the defeat of good, the success of evil, physical pain, mental anguish, the prevalence and intensity of sin, the pervading idolatries, the corruptions, the dreary hopeless irreligion, that condition of the whole race, so fearfully yet exactly described in the Apostle's words, "having no hope and without God in the world."—all this is a vision to dizzy and appal; and inflicts upon the mind the sense of a profound mystery, which is absolutely beyond human solution.

Other famous philosophies, from Vico's and Hegel's to Marx's and Spengler's, discover a direction in history, or a principle of action, and often a goal or terminus (as in Marx), after which history as we know it shall cease and a kind of second Eden be restored.

To the practical writer or reader of history these philosophies appeal mainly by their suggestiveness; they are valued for their scattered insights and analogies. As systems they negate the very spirit of history, which seeks the concrete and particular, the opposite of system and abstraction. True, there have been historians who took a middle course and attempted to find empirical regularities in history—again with occasionally suggestive results—but very soon their methods begin to do violence to the facts in order to group them and count them and treat them like identities in physical science. When the physical world itself has not yet been fully systematized, to assume or "find" a system in history without the means and the liberties that science uses is to think like neither a scientist nor a historian. It is in fact an attempt to remove the difficulty of history at the cost of destroying its unique merit and interest.

By the "liberties" that science takes is meant the experimenter's elimination of all but a very few components in a given trial, so as to ascertain precisely the nature and amount of a given effect. When this is done, the result is usually stated in causal terms—so much of this, under such and such conditions, will produce so much of that. Hardly anyone needs to be told that history defies a similar treatment. Its elements cannot be exactly measured, and although each historical situation presents to the discerning eye a variety of clear conditions or factors, the isolating of a cause for what happens is beyond reach.

That is but another way of saying that history is and must remain a story. And a story, if properly told, is a whole, to be understood as a whole—synthetically, not analytically. History in this regard resembles the arts. We say we "analyze" a work of art, but that is to speak metaphorically. We can enjoy and understand the products of art only as wholes. In history, the artful story is offered as a true story, and great pains are taken to see that it is true. But except in the broadest sense, the historical wholes are not given as such in the record; they are devised by the historian, to make the welter of facts intelligible and hence able to be remembered. Clio was not only the muse of history but also of eloquence, by which the Greeks meant good, intelligible prose, to be spoken before an audience unused to books. The same requirements still hold; written history must be readable with pleasure, or Clio is defeated.

But, it will be said, from many diverse writers will come divergent stories, rival interpretations. That is true, for only a divine mind could know "how it actually happened." But this limitation of history is also a merit, for it can thereby be written and read over and over again in as many versions as are plausible or accessible. There is and will be no final statement; the perspective forever changes, and with it the interest of history renews itself into infinity. As the philosopher William James once remarked, "What has been concluded that we should conclude about it?"

Part Nine. The History of Mankind

The outlines in the thirty-nine sections, in seven divisions, of Part Nine deal with the history of the peoples and civilizations of the world.

Certain points should be noted about Part Nine.

History, like philosophy, has developed methods applicable to the subject matter of other disciplines. The results of these applications are set forth in other parts. Each of the nine sections of Division II of Part Six includes a historical treatment of each of the arts. Similarly, each of the nine sections of Division II of Part Eight includes a historical treatment of each of the particular religions dealt with. Certain sections of the five divisions of Part Ten set forth the history of logic and mathematics; the history of science generally; the history of each of the natural and social sciences; the history of medicine; the history of technology; the history of philosophy; the history of humanistic scholarship; and the history of historiography and of the study of history itself.

It should also be noted that here and in the other portions of the Outline of Knowledge that treat historical matters, the level of detail is greater than that elsewhere. This reflects the editors' belief that an outline of history imposed upon a geographical or chronological base requires a high degree of particularization.

The topical breakdown of the history of mankind into seven divisions and thirty-nine sections reflects more or less traditional judgments—judgments regarding the regional divisions of world history; the identification of peoples and civilizations; the temporal periodization in historical accounts of particular civilizations; and the periods of relative isolation and of relative confluence of different civilizations.

The titles of the seven divisions in this part indicate the regional and temporal divisions used. Introductory headnotes for each of the seven divisions indicate the temporal periodizations used in the accounts of particular civilizations.

- Division I. Peoples and Civilizations of Ancient Southwest Asia, North Africa, and Europe 343
 - II. Peoples and Civilizations of Medieval Europe, North Africa, and Southwest Asia 356
 - III. Peoples and Traditional Civilizations of East, Central, South, and Southeast Asia 375
 - IV. Peoples and Civilizations of Sub-Saharan Africa to 1885 388
 - V. Peoples and Civilizations of Pre-Columbian America 394
 - VI. The Modern World to 1920 396
 - VII. The World Since 1920 443

Division I. Peoples and Civilizations of Ancient Southwest Asia, North Africa, and Europe

The outline in Section 911 first treats of the geography of the regions covered in the section, the sources for the history of the peoples in these regions, and the character and achievements of ancient Near Eastern, Aegean, and North African civilizations. It then deals separately with the history of each of the peoples in these regions in ancient times.

The outline in Section 912 begins with the history of the peoples of non-Classical ancient Europe. It then deals with the whole course of the Classical Greco-Roman civilization, extending from the emergence of Classical Greece from Archaic Greece, through the Hellenistic Age and the history of republican Rome, to the history of the Roman Empire up to AD 395.

Section 911. Early Peoples and Civilizations of Southwest Asia and Egypt, the Aegean, and North Africa 344

912. Peoples of Ancient Europe and the Classical Civilizations of the Ancient Mediterranean World to AD 395 350

Section 911. Early Peoples and Civilizations of Southwest Asia and Egypt, the Aegean, and North Africa

- A. The character and achievements of ancient Near Eastern, Aegean, and North African civilizations; the geography of these regions; archaeological and documentary historical sources; historiographic problems
- B. Mesopotamia and Iran to *c.* 1600 BC
 1. Development of river valley civilization in Mesopotamia
 - a. The Late Neolithic, Chalcolithic, and protohistoric (pre-urban) periods
 - b. The Sumerians from their origins to the end of the Early Dynastic Period (*c.* 2350 BC)
 - i. Their conjectured origins: literary and other historical sources (king lists and invention of cuneiform writing), early kings and legendary figures (Gilgamesh)
 - ii. Foundation of city-states (*e.g.*, Kish, Ur, Uruk, Lagash, Mari, Umma); rivalry among the cities, the temple city and theocracy, social and economic organization, contacts with Egyptian and Indus Valley civilizations, Sumerian culture
 - c. Sumer and Akkad from *c.* 2350 to 2000 BC
 - i. The ascendancy of the Semitic Akkadians under Sargon I of Akkad and his successors, invasions and the fall of the dynasty
 - ii. The unification of Sumer, Akkad, and Elam under the 3rd dynasty of Ur (*c.* 2112–2004 BC); administration and composition of the empire, Ur in decline
 - d. The Old Babylonian Period and the early history of Assyria
 - i. Isin and Larsa: rivalry and political fragmentation, literary texts, decentralization
 - ii. Early Assyria: Ashur, Nineveh, and Urbilum; Akkadian inscriptions and language; the economy; the reign of Shamshi-Adad I (*c.* 1813–1781 BC)
 - iii. Establishment of the Old Babylonian Empire under the dynasty of Hammurabi (*c.* 1792–1750 BC); law, society, and literature
 - e. Hurrian expansion to *c.* 1600 BC and the decline of the Old Babylonian Empire after *c.* 1750 BC
 2. Early Elam (Iran): cultural ties and political and military interaction with Mesopotamia
- C. Emergence of river valley civilization in Egypt (to *c.* 1600 BC)
 1. The Predynastic Period (to *c.* 2925 BC) and the Early Dynastic Period (1st through 3rd dynasties, *c.* 2925–*c.* 2575 BC): unification of Upper and Lower Egypt under King Menes (Narmer), capital at Memphis
 2. The Old Kingdom (*c.* 2575–2130 BC) and the First Intermediate Period (*c.* 2130–1939 BC)
 - a. The Old Kingdom (4th–8th dynasties, *c.* 2575–*c.* 2130 BC): divine kingship; the building of the great pyramids near Memphis; centralized government; class structure; foreign trade; increased provincialization; instability of the throne
 - b. The First Intermediate Period (9th–11th dynasties, *c.* 2130–1939 BC): governmental decentralization; collapse of the Old Kingdom and ensuing disunity and foreign raids; reunification by Mentuhotep I under the 11th dynasty, ruling from Thebes
 3. The Middle Kingdom (1938–*c.* 1600 BC) and the Second Intermediate Period (*c.* 1630–1540 BC)
 - a. The Middle Kingdom (12th–14th dynasties, 1938–*c.* 1600 BC): the cult of Amon; developments in the monarchical institutions; the conquest of Lower Nubia; trade; immigration
 - b. The Second Intermediate Period (15th–17th dynasties, *c.* 1630–1540 BC): internal decentralization and the Asiatic Hyksos occupation
- D. Early civilizations in Syria and Palestine, Anatolia, and the Aegean to *c.* 1600 BC
 1. Emergence of civilization in Syria and Palestine
 - a. The Stone Age cultures and their transition from the Neolithic to the Early Bronze Age until *c.* 2300 BC, agricultural and technological developments, Proto-Urban settlements, Jericho
 - i. Paleolithic and Mesolithic periods: development of horticulture and the domestication of animals

- ii. Pre-Pottery Neolithic areas, grouped houses and town walls, arrival of new peoples and their rectangular architecture, Pottery Neolithic areas, molded plaster vessels, dark-faced burnished ware and the spread of its associated culture
- iii. The Chalcolithic Period and the Early Bronze Age: migrations and spread of Halafian culture, development of trade, beginnings of urbanization, Early Bronze Age cities
- b. The Intermediate Period (c. 2300–c. 1900 BC) and the Middle Bronze Age (c. 1900–c. 1525 BC): revival of trade and connecting link between the greater states; e.g., Aleppo, Byblos, Alalakh in Syria
 - i. The Amorite invasion: breakup of settled areas by nomadic peoples, bronze weapons and votive objects
 - ii. Reappearance of urban civilization in the Middle Bronze Age: hieroglyphics, clay tablets, development of new pottery in Canaan
- 2. Emergence of civilizations in Anatolia, Cyprus, and the Aegean
 - a. Anatolia: the Neolithic, Chalcolithic, and Bronze ages; settlement by the Hittites
 - i. Neolithic farming communities: house styles, tools and weapons, pottery, foodstuffs
 - ii. Appearance of painted pottery in the Chalcolithic Period, uses of metal
 - iii. Bronze Age culture: e.g., Troy, Alaca Hüyük: jewelry, pottery, burial customs, metalworking, weaponry, migrations
 - iv. The Hittite occupation of Anatolia and establishment of the Old Hittite Kingdom (c. 1700–c. 1500 BC): expansion into northern Mesopotamia and Syria under Hattusilis and Mursilis, the Hurrian invasions, the Middle Kingdom
 - b. The Late Neolithic, Chalcolithic, and Bronze ages in Cyprus
 - c. The early Aegean civilizations (to c. 1450 BC)
 - i. The Paleolithic, Neolithic, and Chalcolithic ages in Greece, Crete, and the Aegean islands: the pre-Greek (Early Bronze or Helladic) population of Greece from c. 3000 BC; the Early Bronze or Cycladic Age in the Aegean islands; the shaft grave period on the mainland
 - ii. The Minoan civilization on Crete: the period of the Early Palaces (c. 2200–1700 BC), cultural efflorescence, Kamáres ware, commerce, Knossos, Middle Cycladic culture, period of the Later Palaces (c. 1700–c. 1450 BC) on Crete, the arts, Linear A tablets
- E. The era of the Egyptian and Hittite empires (c. 1600–1050 BC): the expansion of the Indo-Europeans
 - 1. The New Kingdom of Egypt (18th–20th dynasties, 1539–1075 BC)
 - a. The 18th dynasty (1539–1292 BC): the emergence of strong centralized administration, territorial expansion, religious and cultural developments
 - i. Expulsion of the Hyksos from Egypt under Ahmose (1539–1514 BC): cult of Amon-Re, expansion into Syria and Palestine, contacts with the Aegean and its arts
 - ii. Egyptian culture and prosperity in the reigns of Amenhotep III (1390–1353 BC) and Akhenaton (Amenhotep IV; 1353–1336 BC): domination over Nubia, erection of new temples at Thebes, cult of the god Aton, subsequent eclipse of the dynasty
 - b. The 19th and 20th dynasties (1292–1075 BC): political shift to the north, new construction, foreign policies
 - i. Reassertion of Egyptian power: campaigns against the Hittites and Libyans, succession disputes
 - ii. The reign of Ramses III (1187–1156 BC) and subsequent decline of the 20th dynasty, campaigns against the Sea Peoples, growth of influence of the priests of Amon-Re
 - c. Society and culture in the New Kingdom: the king as the embodiment of the state; the civil service; the military; the priesthood; the artisans, common people, and slaves; trade and commerce
 - 2. The Hittite Empire and its conflict with Egypt: Syria and Palestine under Egyptian and Hittite domination; the period of the migrations of new peoples
 - a. The Hittite Empire (c. 1525–1190 BC)
 - i. Expansion of the Hittite Empire under Suppiluliumas I into Syria (c. 1365 BC): reduction of the Mitannian state, ensuing conflicts and treaties with Egypt, relations with neighbouring states

- ii. The capital of the Hittite Empire at Hattusa (Boğazköy): geographical position, architecture, invasions from the West, fall of the empire and destruction of the capital (c. 1190 BC), emergence of the Indo-European Phrygians as the chief Anatolian power
 - b. Syria and Palestine under Egyptian, Mitannian, and Hittite domination, and the period of the migrations of new peoples (c. 1550–1200 BC)
 - i. The development of Levantine seafaring trade: the Levantine city-states (e.g., Ugarit), political organization, economy, culture, development of the linear alphabet by the Canaanites and the spread of its use
 - ii. The origins of the Hebrews in the patriarchal age and their sojourn in and Exodus from Egypt in the 13th century BC, their conquest of Palestine, the Sea Peoples and the Philistine conquest of the Palestinian littoral
 - iii. The Syro-Hittite states and the migration of the Semitic Aramaeans into Syria and Palestine c. 1100 BC and their foundation of states in Syria: spread of the Aramaic language, trends in religion and the arts
 - 3. Mesopotamia from c. 1600 to c. 900 BC
 - a. The Kassites in Babylonia (c. 1595–c. 1155 BC): their conjectured origins, their adoption of Mesopotamian culture, Elamite and Assyrian invasions after c. 1250, the fall of the Kassites
 - b. The kingdom of the Hurrians and the Mitanni (c. 1500–1360 BC) in northern Mesopotamia, its displacement by Assyria
 - c. The rise of Assyria (c. 1360–1076 BC): expansion under Ashur-uballit I (c. 1365–c. 1330 BC), conquest of Babylon, continued expansion to Tiglath-pileser I (c. 1115–c. 1077 BC), temporary eclipse of Assyria (to c. 900 BC)
 - 4. The Elamite kingdom and its struggle with Babylonia in the 13th and 12th centuries BC
 - 5. Mycenaean (Achaean, Late Helladic) civilization in Greece (c. 1450–1100 BC): the eruption of Thera (c. 1500 BC), the conquest of Minoan Crete (c. 1450 BC), and the arrival of the Greeks
 - a. The overthrow of the existing social order, introduction of new artistic styles, conquest of the Cyclades, the evidence of the Linear B tablets, destruction of the palace at Knossos and period of the Mycenaean Empire
 - b. The end of the Bronze Age in the Aegean: destruction of Mycenaean centres, invasion from the north and the coming of the Greeks
 - c. The people of the Bronze Age Aegean: physical types, dress, society, economy, warfare, religion, and arts
- F. The era of the new states of Southwest Asia: the beginning of the Iron Age (c. 1050–700 BC)
- 1. Egypt and Babylonia in decline, further Assyrian expansion
 - a. Egypt under the 21st–25th dynasties (c. 1075–656 BC): loss of influence in Syria, disunity and the diminution of royal power, Libyan domination, civil war and Kushite (Ethiopian) rule, the Assyrian conquest (671–664 BC)
 - b. Babylonia (c. 1050–750 BC): the brief resurgence of Babylonian power under Nebuchadnezzar I (1124–1103 BC); the cult of Marduk; Aramaean, Assyrian, and Chaldean invasions from the 11th to the 9th century BC
 - c. Emergence of Assyria as the dominant Mesopotamian state after c. 900 BC: internal dissension and the challenge of Urartu in the 8th century BC
 - 2. Palestine, Syria, Anatolia, and Iran
 - a. Development of Canaanite–Phoenician commercial city-states from c. 1100 to c. 700 BC (e.g., Tyre, Sidon): trade and colonization, Phoenician civilization
 - b. The Hebrew kingdom (c. 1020–c. 700 BC): subjection of the Philistines, territorial expansion in Syria and Palestine
 - i. The reigns of David and Solomon in the 10th century, growth of separate kingdoms of Judah (south) and Israel (north, conquered by Assyria in 722 BC)
 - ii. The cult of Yahweh and biblical literature, social and political structure, arts
 - c. The neo-Hittite states of southeastern Anatolia: Carchemish, Milid (Malatya), Tabal, and Que (c. 1180–700 BC); conquest by the Aramaeans and Assyrians
 - d. Foundation of Urartu in about the 13th century BC, rise of the Urartian kingdom (c. 840–c. 744 BC), Assyrian influences, the Cimmerian invasion (c. 714 BC) and destruction of the kingdom (c. 609 BC), influence of the Urartian state, the Armenian Empire under the Artaxiads

- e. Phrygia in central and western Anatolia (c. 1180–c. 700 BC): capital at Gordium, relations with Assyrians and Luwians, the Cimmerian invasions in the beginning of the 7th century, the cult of Cybele
 - f. The Aramaean kingdoms (e.g., Damascus) and their cultural and commercial role: conquest by Assyria
 - g. The Neo-Elamite period: the occupation of Iran by the Indo-European Medes and Persians by the 9th century BC
- G. The era of the Assyrian and Neo-Babylonian empires and the Achaemenid Persian Empire (746–250 BC)
- 1. The first imperial unification of the ancient Near East under the Assyrian Empire (746–609 BC)
 - a. Assyrian culture in the context of the Mesopotamian tradition: the great cities; e.g., Nineveh
 - b. Expansion of the empire under Tiglath-pileser III (744–727 BC), Sargon II (721–705 BC), and Sennacherib (704–681 BC); decline from the reign of Ashurbanipal (668–627 BC); conquest by the Medes (625–609 BC)
 - 2. The interval between Assyrian and Achaemenid hegemony (610–539 BC)
 - a. The Neo-Babylonian Empire (636–539 BC): conquests, treatment of Jews, decline of the empire
 - i. The reign of Nebuchadnezzar II (604–562 BC): subjection of Syria and Palestine, the Babylonian Exile of the Jews and the post-Exile period, building activities
 - ii. The last kings of Babylonia: internal dissension and early relations with Persia, surrender to Cyrus II the Great (539 BC)
 - b. The Anatolian kingdom of Lydia (c. 700–c. 547 BC): early relations with Assyria, the Cimmerian invasions, suzerainty over the Greeks in Anatolia, Greco-Lylian culture, growth of independent Cilicia in the late 7th century, conquest by Persia
 - c. Saite Egypt (26th dynasty, 664–525 BC) and its reassertion of independence after Assyrian rule; revival of traditional Egyptian culture, subjection to Persia
 - d. The Kingdom of the Medes in Iran (c. 700–550 BC) and the establishment of the Achaemenid Persian Empire
 - i. Conjectured origins of the Median state, expulsion of the Scythians, extension of control over the other Iranian peoples and into Armenia and eastern Anatolia after the downfall of Assyria
 - ii. Cyrus II the Great's (550–529 BC) establishment of his rule from Anatolia to east of Iran, relative generosity toward subject peoples
 - 3. The Achaemenid Persian Empire (529–330 BC) under the successors of Cyrus II the Great, Greek rule to c. 250 BC
 - a. The empire under Cambyses II, Darius I, and Xerxes I (529–465 BC): the subjugation of Egypt, establishment of peace in the empire, penetration of the Balkan Peninsula and the unsuccessful attempts to conquer mainland Greece
 - b. Xerxes' weak successors: continued involvement in Greek affairs; internal disunity in the 4th century, resulting in conquest by Alexander III the Great (330 BC)
 - c. Achaemenid society and culture: Zoroastrianism, Persepolis and other capitals, social structure and economy
 - d. Seleucid rule to c. 250 BC, movement of Iranian peoples, revolt of the high satrapies
- H. The Parthian and Sāsānian empires (c. 250 BC–AD 651), Armenia
- 1. The revival of Iranian power with the establishment of the Parthian Empire by Arsaces, formation of the Arsacid Parthian state
 - a. The "Philhellenistic Period" (c. 171 BC–c. AD 10): eastern and western expansion until the mid-1st century BC, wars with Rome until the settlement of 20 BC
 - b. The "Anti-Hellenistic Period" (AD 2–162): Parthian government under Artabanus III (AD 12–38), dissolution of the Parthian state
 - c. Roman invasions and the end of the Parthian Empire (AD 162–226)
 - 2. Extension of Iranian power under the Sāsānian Empire
 - a. Foundation of the empire: the rise of Ardashir I in the early 3rd century AD, the wars of Shāpūr I (AD 241–272), organization of the empire

- b. Religious developments: Zoroastrianism, Christianity, Manichaeism; art and literature
 - c. Foreign policy: conflicts with the Romans, Byzantines, and Turks under Khosrow I (AD 531–579) and Khosrow II (AD 590/591–628); subsequent decline and extinction of the empire with the Arab conquest (AD 636/637–651)
3. Armenia: client status under the Iranian empires of Rome in the period dominated by the Arsacids
- I. The Nilotic Sudan, South Arabia, and Ethiopia until c. AD 600; North Africa until the Roman conquest (from 146 BC)
- 1. Emergence of civilization in the Nilotic Sudan (Nubia): the origins of Nubian culture
 - 2. Egyptianization and the Kingdom of Kush (c. 1786–751 BC), conquest of Egypt (c. 730 BC) and later expulsion by the Assyrians (by 654 BC), conquest by Aksum (AD 350)
 - 3. Pre-Islāmic South Arabia: the kingdoms of Ma'in, Saba', Qatabān, Ḥaḍramawt, and the tribes of central and northern Arabia; economic activities; religion; foreign relations
 - 4. Ethiopia to c. AD 650
 - a. Remotest antiquity: the land of Punt, the Sabaeen period
 - b. The Aksumite Empire (2nd century AD): the Abyssinian peoples, maritime trade, Ezana's rule (4th century AD), reign of Ella-Asbeha (6th century AD) and relations with Persia
 - 5. North Africa until the Roman conquest
 - a. Emergence of civilization in North Africa: the Early Neolithic culture in the Maghrib and Libya, the Berbers, the influence of Egypt, the advent of the mercantile Phoenicians and their foundation of Carthage c. 814 BC (Utica, 1101 BC?), the Greeks in Cyrenaica from c. 630 BC
 - b. Emergence of Carthage as the leading western Mediterranean power: conflicts with the Greeks in the western Mediterranean, extension of Carthaginian power into Spain and the clash with Rome in the Punic Wars resulting in the destruction of Carthage (146 BC)
 - c. Roman penetration into North Africa: the native kingdoms of Numidia and Mauretania and their eventual incorporation into the Roman Empire

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with early peoples and civilizations of Southwest Asia and Egypt, the Aegean, and North Africa

Afghanistan	Israel	North Africa	Transcaucasia
Arabia	Jordan	Palestine	Turkey and
Egypt	Lebanon	Prehistoric Peoples	Ancient Anatolia
Greek and Roman	Mesopotamia,	and Cultures	
Civilizations,	The History of	Syria	
Ancient	Ancient		
Iran			

MICROPAEDIA: Selected entries of reference information

General subjects

<i>Anatolia, Cyprus, and the Aegean:</i>	Harran	Paphlagonia	Himyar
Aegean civilizations	Hittite	Perga	Kindah
Ahhiyawa	Karatepe	Phocaea	Nabataean
Alaca Hüyük	Kaska	Phrygia	Saba'
Ališar Hüyük	Kizzuwadna	Pisidia	Şaliḥ
Amathus	Knossos	Sakcagöz	Tanukh
Anatolia	Kültepe	Salamis	Thamud
Arzawa	Luwian	Sardis	<i>Egypt:</i>
Aspendus	Lycaonia	Soli	Abū Jirāb
Bithynia	Lycia	Tarsus	Abū Ruwaysh
Boğazköy	Lydia	Troas	Abu Simbel
Çatalhöyük	Milid	Troy	Amarna, Tell el-
Chalcedon	Minoan	Xanthus	Amratian culture
Cilicia	civilization	Yazılıkaya	Badarian culture
Citium	Muşaşir	Zincirli Höyük	Beni Hasan
Gordium	Mysia	<i>Arabia:</i>	Canopus
	Pamphylia	Arabia Felix	

Dahshūr	Babylon	Parthia	Dibon
Dayr al-Baḥrī	Babylonia	Pasargadae	Ebla
Dayr al-Madīnah	Bīrāk, Tall	Persepolis	Edom
Elephantine	Borsippa	Persis	Far'ah, Tall al-
Gerzean culture	Calah	Satrap	Fāri'ah, Tall al-
Giza, Pyramids of	Chaldea	Shahr-e Sokhta	Galilee
Hermopolis Magna	Ctesiphon	Shuruppak	Gath
Hierakonpolis	Cunaxa, Battle of	Sippar	Gezer
Hyksos	Dur Sharrukin	Sumer	Ghassulian culture
Kadesh, Battle of	Elam	Susa	Gibeon
Kahun	Erech	Teishebaini	Gilead
Karnak	Eridu	Ten Thousand	Ḥalaf, Tall
Kawa	Eshnunna	Immortals	Hasi, Tel
Kings, Valley	Fertile Crescent	Tepe Gawra	Hebrew
of the	Gaugamela,	Tepe Yahya	Hierapolis
Lāhūn, al-	Battle of	Toprakkale	Jericho
Luxor	Granicus, Battle	'Ubayd, Tall al-	Jezreel
Ma'ādī, al-	of the	Ur	Judaea
Madīnat Habu	Guti	Urartu	Judah
Maydūm	Hammurabi,	<i>North Africa:</i>	Kadesh
Memphis	Code of	Capsian industry	Kadesh, Battle of
Naukratis	Hasanlu	Carthage	Karkar
nome	Hassuna	Cyrenaica	Katna
Oxyrhynchus	Hatra	Fezzan	Kiriath-sepher
Palermo Stone	Ḥīrah, al-	Gaetulia	Mari
Pelusium	Hurrian	Hadrumetum	Megiddo
Per Ramessu	Isin	Hippo	Nora
pharaoh	Jazirah, al-	Lambessa	Palestine
Ramesseum	Kassite	Leptis	Palmyra
Sais	Khwarezm	Mauretania	Philistine
Ṣaqqārah	Kish	Numidia	Phoenicia
Sarapeum	kudurru	Ptolemais	Samaria
Tanis	Lagash	Sabratha	Shubat Enlil
Tasian culture	Larsa	Thugga	Ugarit
Thebes	Lullubi	Tripolitania	<i>other:</i>
Turin Papyrus	Mannai	Utica	Aksum
<i>Mesopotamia and</i>	Media	Volubilis	Meroe
<i>Iran:</i>	Mesene	<i>Palestine and Syria:</i>	Mycenae
Adab	Mesopotamia	Ai	Napata
Akh lame	Mitanni	'Ajjul, Tall al-	Nubia
Akkad	Nineveh	Alalakh	Ophir
Amorite	Nippur	Aleppo	Pelasgi
Anbar	Nisa	Bashan	Punt
Anshan	Nuzu	Beth Yerah	Sea People
Ashur	Osroëne	Canaan	tell
Assyria	Parni	Carchemish	

Biographies

<i>Egypt:</i>	Snefru	Ashurnarsipal II	Cambyses II
Akhenaton	Thutmose I	Esarhaddon	Cyrus II
Amenhotep III	Thutmose III	Hammurabi	Darius II
Ankhesenamun	Thutmose IV	Merodach-Baladan II	Khosrow I
Hatshepsut	Tutankhamen	Nebuchadrezzar II	Khosrow II
Mentuhotep II	<i>Israel:</i>	Sargon	Sāsānian dynasty
Merneptah	Abraham	Sargon II	Shāpūr II
Ramses II	David	Sennacherib	Xerxes I
Ramses III	Moses	Tiglath-pileser III	<i>other:</i>
Ramses IV	Solomon	<i>Persia (Iran):</i>	Hannibal
Saite dynasty	<i>Mesopotamia</i>	Achaemenian	Suppiluliumas I
Sesostris I	<i>(Akkad, Assyria,</i>	dynasty	Tigranes II the
Sesostris III	<i>Babylonia):</i>	Arsacid dynasty	Great
Seti I	Ashurbanipal	Artaxerxes II	

Section 912. Peoples of Ancient Europe and the Classical Civilizations of the Ancient Mediterranean World to AD 395

A. Non-Classical ancient Europe

1. The geography and ethnography of Europe, archaeological and documentary historical sources, historiographic problems
2. Europe before the Iron Age
 - a. Spread of Neolithic farming communities throughout all of Europe by *c.* 2000 BC
 - b. Spread of Bronze Age industry throughout Europe by *c.* 1500 BC: population movements into southeastern Europe and southwestern Asia in the 2nd millennium BC, the Indo-Europeans
3. Non-Classical Europe in the Iron Age (*c.* 650 BC–*c.* AD 100)
 - a. The Etruscans and other Italic peoples, the non-Greek peoples of the Balkan Peninsula
 - i. Conjectured Etruscan origins; Etruscan language and writing; cities; government and society; art and religion; maritime expansion; foreign relations with the Greeks, Carthaginians, and other Italic peoples; decline after *c.* 500 BC and eventual Roman conquest in the mid-3rd century
 - ii. Other Italic peoples: the Umbro-Sabellians, Oscans, Apulians, Latins, Siculi, Ligurians, Veneti, and Piceni; their cultures; their relations with the Greeks, Etruscans, and Carthaginians; eventual absorption by Rome
 - iii. Non-Greek peoples of the Balkan Peninsula; *e.g.*, Illyrians, Thracians: their culture and relationship to Classical civilizations
 - b. Trans-Alpine Europe and the Iberian Peninsula
 - i. The Celts: the Hallstatt Period (7th–6th centuries BC); Celtic occupation of Europe from the Danube to the Iberian Peninsula and the British Isles by *c.* 500 BC; Celtic penetration of Italy, the Balkan Peninsula, and Anatolia during the La Tène period (after *c.* 500 BC); subjugation in Gaul by Rome by 50 BC and later by the Germans by the 5th century AD; Celtic art, religion, and social and political organization
 - ii. The Germans: their acquisition of Iron Age culture, migration into the Elbe–Rhine region by *c.* 500 BC, pressure on the Celts and Rome, inundation of the western half of the Roman Empire by the 5th century AD, Germanic social and political organization, religion and mythology
 - c. Ancient peoples of the European steppe
 - i. The Cimmerians: conjectured origins; southward migration, under Scythian pressure, from north of the Caucasus into Southwest Asia in the 8th and 7th centuries BC
 - ii. The Scythians (Sakas): westward migration from the 8th century BC and eventual establishment in India and southern Russia after *c.* 600 BC; the Kingdom of the Royal Scyths in southern Russia from *c.* 600 BC to *c.* AD 100; relations with the Greeks and with Achaemenid Persia; government, society, and military tactics; art and religion
 - iii. The Sarmatian migration into southern Russia in the 4th century BC and gradual displacement of the Scythians by *c.* AD 100; conflict with Rome; conquest by the Goths and Huns in the 3rd and 4th centuries AD; society, art, and religion

B. Archaic Greece and the development of Classical Greek civilization (*c.* 1200–323 BC)

1. The Early Archaic and Archaic periods (*c.* 1200–*c.* 500 BC)
 - a. The Dorian invasions, the Greek migrations to Anatolia, and their results (Proto-Geometric Period, *c.* 1100–*c.* 900 BC)
 - b. The Geometric Period (*c.* 900–*c.* 750 BC): the world of Homer and Hesiod, the beginning of writing and of the *polis*, mythology and religious developments, the panhellenic centres (*e.g.*, Olympia, Delphi), social and political organization
 - c. The Archaic Period (*c.* 750–*c.* 500 BC)
 - i. General trends in the *poleis*: displacement of monarchy by aristocracy, development of a money economy, socioeconomic crises and the rise and fall of tyranny, the colonization movement, relations among the *poleis* (*e.g.*, leagues, wars)

- ii. The *poleis* of mainland Greece: the emergence of Spartan dominance over the Peloponnese and of a military-oriented polity and repression; aristocracy and tyranny at Athens, the reforms of Solon, and the institution of democracy under Cleisthenes; tyranny, aristocracy, and economic expansion at Corinth; the other *poleis* of the Peloponnese, the Isthmus, Euboea, and Boeotia
- iii. The Greeks in Asia Minor (Anatolia): Dorian and Aeolian cities; Miletus, Ephesus, and other Ionian cities; their commercial and cultural efflorescence
- iv. The Greek islands: the Cyclades, Sporades, Crete, Cyprus, and the Ionian Islands
- v. The Greek colonies and emporia in the West and Africa: southern Italy and Sicily (*e.g.*, Cumae, Syracuse), Gaul and the Iberian Peninsula (*e.g.*, Massilia), Cyrene and Naukratis
- vi. The Greeks in the North: Chalcidice, Thrace, Propontis (*e.g.*, Byzantium, Abydos, Lampsacus), and Pontus (*e.g.*, Black Sea region, Sinope, and Trapezus)
- vii. The arts in the Archaic Period: rationalism and irrationalism and the beginnings of philosophy and science, Orphism and the cult of Dionysus
- viii. The Greco-Persian Wars: the Persian (Achaemenid) conquest of Asia Minor and Thrace and the Ionian revolt (499 BC), Darius' (490 BC) and Xerxes' (480 BC) invasions of Greece and eventual Greek victory, the Greek offensive (479 BC), results of the wars, Herodotus' account of the conflict

2. The Classical period (c. 500–323 BC)

- a. Athens in the age of Pericles
 - i. The Delian League and the Athenian Empire
 - ii. Temporary retardation and final development of the democracy, society and economy
 - iii. Cultural efflorescence; *e.g.*, the rebuilding of the Acropolis, drama, the pre-Socratic philosophers
- b. The Peloponnesian League and the other Greek states in the 5th century BC: relations among the Greek states from 479 to 431 BC
- c. The Peloponnesian War (431–404 BC): the war to the Peace of Nicias (421), renewal of the war and the defeat of Athens, intellectual and political changes at Athens (*e.g.*, oligarchic revolution, the Sophists and Socrates), Thucydides' account of the war
- d. The era of the Spartan and Theban hegemonies in Greece: Spartan policies toward the Greek states, relations with Persia, Athens and Thebes against Sparta, the Second Athenian League and the restoration of democracy, Theban expansion and containment, peace and the balance of power in Greece
- e. The northern kingdoms: Epirus, the rise of Macedonia and the conquest of Greece under Philip II
- f. The western Greeks: conflict with Carthage, the rise of Syracuse under Dionysius the Elder
- g. Greek culture in the 4th century BC: developments in philosophy and the arts
- h. The empire of Alexander III the Great: relations with the Greeks; the conquest of the Persian Empire (334–330 BC), Bactria, and the Indus Valley (330–323 BC); the ideals and governing practices of Alexander and the diversity of his empire

C. The Hellenistic Age (323–27 BC)

- 1. Establishment of the Hellenistic kingdoms and monarchies
 - a. The regency and warfare among rival generals after Alexander's death (323–276 BC)
 - b. Macedonian and Ptolemaic Egypt (323–30 BC)
 - i. The Ptolemaic dynasty: dynastic strife and the end of the dynasty with the death of Cleopatra (30 BC)
 - ii. Government and civilization of Hellenistic Egypt
 - c. The Seleucid Kingdom in Asia: the dynasty, government, society, culture, and economy in its diverse regions; Jewish resistance; territorial losses in the 3rd century
 - d. Greek rule in Bactria and India
 - e. The Attalid kingdom of Pergamum and the native states in Asia Minor: Bithynia, Pontus, Cappadocia, Galatia, and Rhodes
 - f. The Antigonid kingdom of Macedonia: government and foreign policy

- g. Greece: social and political changes in the *polis*, the Achaean and Aetolian leagues, Athens and the other Greek states
 - h. The western Greeks, Epirus, Sicily under Agathocles (317–289 BC) and Hieron II (c. 270–216/215 BC) until its absorption by Rome
2. Relations among the Hellenistic states and other peoples from c. 275 to 27 BC
 - a. Expansionist policies of the Ptolemies in the Aegean and Asia Minor and Syria and their conflicts with the Seleucids
 - b. Conflicts between the Greek leagues and the Antigonids in the 3rd century BC
 - c. The Celtic migrations: expansion into the Iberian Peninsula, the British Isles, and Rome and southern Italy; later expansion into central Europe, the Carpathians, and the Balkans
 - d. The vigorous policies of Antiochus III and Philip V; the breakup of the Seleucid Empire; the entrance of Rome into the affairs of the Hellenistic states, resulting in their eventual incorporation into the Roman Empire
 3. Hellenistic political, social, economic, and cultural institutions
 - a. Hellenistic monarchy and royal administration
 - b. Cultural developments: developments in philosophy, science, the arts, education, and religion
- D. The rise of Rome
1. The character and achievements of the Romans, the archaeological and documentary historical sources (e.g., Pompeii and Herculaneum), historiographic problems
 2. Early (regal) Rome to the 6th century BC
 - a. Myths of origins and the early monarchy
 - b. The Etruscan hegemony and formative influence over Rome
 - c. Development of Roman social, religious, political, and military institutions; Roman virtues
 3. The early Roman Republic (6th century–264 BC)
 - a. Overthrow of the monarchy and establishment of the republic and its institutions: the magistracies, judicial institutions, the Senate, plebeian institutions
 - b. Expansion of Rome in Italy: Rome and its Latin neighbours, the Gallic invasion and further conquests, Roman mastery of Italy
 4. The middle republic: the emergence of Rome as the leading Mediterranean power (264–133 BC)
 - a. The First and Second Punic Wars
 - i. The First Punic War (264–241 BC) and its aftermath: the emergence of Roman naval power and acquisition of Sicily (241 BC), later annexation of Corsica and Sardinia (238 BC)
 - ii. Roman expansion into Cisalpine Gaul and entry into Greek affairs
 - iii. The Second Punic War (218–201 BC): Hannibal's invasion of Italy, his initial victories, and the war of attrition in Italy; Roman defeat of the Carthaginians at the Battle of the Metaurus (207 BC); the First Macedonian War (214–205 BC) and the conflict in Spain; Roman counteroffensive and victory in Africa (202 BC); Roman pacification of conquered territories
 - b. Establishment of Roman hegemony in the Hellenistic world
 - i. Establishment of a Roman protectorate over Greece after the Second Macedonian War (200–196 BC), the conquest of Macedonia and Illyricum (168 BC), the reduction of Rhodes, Roman exclusion of Seleucid power from the Aegean
 - ii. The Third Punic War (149–146 BC): the destruction of Carthage, subjugation of Macedonia and Greece
 - iii. Beginning of Roman provincial administration, abuses, Romanization of the empire
 - c. Roman government and economy in the middle republic: consuls, the Senate, and popular assemblies; development of large business interests, grazing estates, and urban immigration
 - d. Roman culture in the middle republic: Hellenizing influences
 5. The late Roman Republic (133–31 BC)
 - a. Social and economic ills in Italy and the reform movement of the Gracchi (133–121 BC) and its results: the rise of middle-class equites

- b. Roman wars against the Celts and the conquest of Gallia Narbonensis (121 BC), wars against Jugurtha of Numidia (112–105 BC) and the Germans (105–101 BC), Marius' career and military reforms
 - c. Events in Asia and the first war with Mithradates VI Eupator (88–85 BC): Italian allies (*socii*) against Rome in the Social War (90–89 BC) and their subsequent enfranchisement, the dictatorship and constitution of Sulla (82–80 BC)
 - d. The Roman state in the two decades after Sulla
 - i. Pompey's early career, revolts against Roman rule, Pompey's alliance with Crassus and repeal of the Sullan system, his extraordinary commands
 - ii. Growing political suspicion and the outbreak of violence in the mid-1st century BC: the conspiracies of Catiline, Cicero's decline, the rise of Caesar and Pompey
 - e. The alliance of Caesar, Pompey, and Crassus (59–44 BC): Caesar's conquest of Gaul; political maneuvers and the outbreak of the Civil War; Caesar's triumph, dictatorship, and assassination
 - f. The initial cooperation of Octavian and Mark Antony in the Triumvirate and Octavian's achievement of sole power (43–31 BC): the annexation of Egypt and its administration
 - g. Roman law during the late republic: the development of new procedures, the role of magistrates, the law of succession
 - h. Culture in the late republic: oratory and philosophy, the arts
- E. The Roman Empire (31 BC–AD 395)
- 1. Consolidation of the empire under the Julio-Claudians (31 BC–AD 68)
 - a. Augustus' establishment of the principate (27 BC–AD 14): the role of the *princeps*; the imperial administration, fiscal and military reforms, and the founding of new colonies; social and religious legislation; economic growth
 - b. The Roman Empire at the time of Augustus: provincial administration, the imperial frontiers, the western provinces, the eastern provinces, the economic unification of the Mediterranean
 - c. Foreign policy: Roman relations with Parthia and the other states in the East; the southern, western, and northern frontiers
 - d. The culture of the Augustan Age: contributions of Livy, Virgil, Horace, and Ovid; religion; the visual arts
 - e. The empire under Tiberius (AD 14–37), Caligula (AD 37–41), Claudius I (AD 41–54), and Nero (AD 54–68): internal and frontier policies, the annexation of Britain, Tacitus' accounts, civil war and revolt in "the year of the four Emperors" (AD 69)
 - 2. Growth of the empire under the Flavians and Antonines (AD 69–192)
 - a. The Flavian emperors (AD 69–96): Vespasian's fiscal and provincial reorganization, military and frontier policies, Titus and the suppression of the Jewish revolt, Domitian's despotism, military development and frontiers
 - b. The Antonine emperors (AD 96–192): the reigns of Nerva, Trajan, Hadrian, Antoninus Pius, Marcus Aurelius, and Commodus; the beginning of imperial decline after AD 180
 - 3. The zenith of the Roman Empire in the late 1st and 2nd centuries AD
 - a. The city of Rome and the empire: methods of Roman imperialism; the cities, culture, society, politics, and economy of the western and eastern provinces; the legions and frontier defenses
 - b. Greco-Roman culture of the late 1st and 2nd centuries AD: developments in philosophy, religion, technology, and the arts
 - 4. Changes and crises in the Roman Empire in the 3rd and 4th centuries AD
 - a. Civil wars, conflict with Parthia, the growth of bureaucracy, and militarization of government under the Severan dynasty (AD 193–235)
 - b. Religious and cultural life: the public religions under the empire, the rise and spread of Christianity and other Eastern religions, official persecution of Christianity
 - c. The transformation of Greco-Roman culture in late antiquity (3rd and 4th centuries AD), Greek revival and growth of Christian theology
 - d. Military anarchy and disintegration of the Roman Empire (AD 235–270): the Gordians, the beginning of Germanic invasions, loss of eastern provinces, economic and social crisis

- e. The recovery of the Roman Empire and the establishment of the dominate (AD 270–337): the recovery measures of Aurelian and his immediate successors
- i. Diocletian's (284–305) fundamental political and economic measures: persecution of Christians, struggle for power
 - ii. Constantine the Great (307–337) and his conversion to Christianity, administration, and founding of Constantinople
- f. The Roman Empire under the 4th-century successors of Constantine to Theodosius I (AD 379–395)
- i. The rule of Constantine's sons (337–361): renewed wars with Sasanid Persia and increased penetration of the empire by the Germans
 - ii. Julian's reign (361–363): the attempt to restore the old empire
 - iii. Establishment of Christianity as the sole state religion; social, economic, and urban decline; remnants of pagan culture
- g. The provinces under the later empire and the eclipse of the empire in the West: Germanic hegemony and the invasions by other peoples

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and biographies dealing with peoples of ancient Europe and the Classical civilizations of the ancient Mediterranean world to AD 395

Alexander the Great	Caesar	France	Greek and Roman Civilizations, Ancient
Athens	Constantine the Great	Germany	Italy
Augustus	European History and Culture	Greece	Rome
Balkan States			

MICROPAEDIA: Selected entries of reference information

General subjects

<i>ancient Europe—</i>	Arevaci	Lavinium	Galatia
<i>Balkans:</i>	Boii	Ligurian	Hierapolis
Dacia	Carnuntum	Lucania	Isauria
Getae	Chatti	Mamertini	Pontus
Illyria	Cimbri	Marsi	Sarmatian
Paeonia	Gepidae	Paeligni	Scythian
Triballi	Hallstatt	Piceni	Side
<i>ancient Europe—</i>	Heuneburg	Populonia	Steppe, The
<i>Britain:</i>	Lingones	Praeneste	<i>Greece—Archaic period:</i>
Caledonia	Marcomanni	Sabine	Acarnania
Creswell Crags	Reinheim	Samnite	Achaean
Kent's Cavern	<i>ancient Europe—</i>	Segesta	Aetolia
Pict	<i>Iberia:</i>	Siculi	agora
Silures	Arevaci	Stabiae	amphictyony
Skara Brae	Celtiberia	Umbri	Amphipolis
<i>ancient Europe—</i>	Iberian	Veii	Apamea Cibotus
<i>Gaul:</i>	Lusitani	Veneti	apella
Aedui	Numantia	Villanovan culture	Archaic period
Arausio,	<i>ancient Europe—</i>	Volsci	archon
Battle of	<i>Italy:</i>	Volsinii	Areopagus
Belgae	Alba Fucens	Vulci	Assus
Gaul	Ardea	<i>ancient western Asia:</i>	Boeotian League
Helvetii	Ateste	Alani	Bosporus, kingdom of the
La Tène	Aurunci	Anazarbus	boule
Morini	Boii	Antioch	Calydon
Senones	Caere	Bactria	Caulonia
Sequani	Este	Cappadocia	Chersonese, Tauric
Veneti	Etruscan	Caria	Chersonese, Thracian
<i>ancient Europe—</i>	Felsina	Cimmerian	Clazomenae
<i>Germany:</i>	Hernici	Commagene	
Agri Decumates	Hirpini	Dura-Europus	
Alemanni	Latium		

Cnidus	Theseum	Five Good	delator
Colchis	Thespiæ	Emperors	dictator
Colophon	Tiryns	foedus	eques
Corinth	Trojan War	Hadrian's Wall	fasti
Cumæ	trophy	Herculeum	gladiator
Cyrene	tyrant	indiction	imperium
Cyzicus	<i>Greece—Classical</i>	itinerarium	interrex
deme	<i>period:</i>	labarum	Italy
Dorian	Anabasis	Monumentum	latifundium
Ecclesia	Aornos, Siege of	Ancyranum	Latin League
Eleusis	Artemis,	Mursa, Battle of	legate
Elis	Temple of	Notitia Dignitatum	lictor
ephebus	Chalcidian League	Ostia	limes
Ephesus	cleruchy	Pompeii	Macedonian
ephor	Corinth, League of	princeps	Wars
Eretria	Delian League	procurator	Munda, Battle of
Erythrae	Gaugamela,	Thugga	municipium
eupatrid	Battle of	tribune	Optimates and
geōmoroi	Granicus, Battle	Tusculum	Populares
Gortyn	of the	<i>Roman provinces:</i>	pater patriæ
Greco-Persian	Hydaspes, Battle	Africa	patrician
Wars	of the	Alps	Pharsalus, Battle of
Halicarnassus	Leuctra, Battle of	Arabia	plebeian
helot	Macedonia	Asia	Pollentia
Himera	paideia	Belgica	praetor
hoplite	Peloponnesian	Dacia	Praetorian Guard
Ionia	War	Gallia Comata	prefect
Lampsacus	Philippi	Illyria	proconsul
Lelantine War	tetrarch	Lugdunensis	proscription
Leontini	<i>Hellenistic Age:</i>	Mauretania	province
Magna Graecia	Achaean League	Moesia	publican
Magnesia ad	Aetolian League	Narbonensis	Punic War, First
Maeandrum	Antioch	Numidia	Punic War, Second
Mantineia	Bastarnæ	Pannonia	Punic War, Third
Marathon,	Cynoscephalæ	Paphlagonia	Pydna, Battle of
Battle of	Hellenistic Age	Raetia	quaestor
metic	Ipsus, Battle of	Transalpine Gaul	Roman Republic
Miletus	Issus, Battle of	<i>Roman Republic:</i>	and Empire
Olynthus	Lamian War	Acta	Rubicon
Orchomenus	Macedonia	Actium, Battle of	Secular Games
Paestum	Petra	aedile	Senate
Parian Chronicle	Seleucia on the	aerarium	Social War
Parthenon	Tigris	angaria	Thapsus, Battle of
Pella	Seleucid kingdom	Cagliari	tribe
Pergamum	Syrian Wars	Cannæ, Battle of	triumph
Phaestus	<i>Roman Empire:</i>	Capua	triumvirate
phyle	Adrianople,	censor	<i>other:</i>
Plataea	Battle of	civitas	Beaker folk
polis	Aelia Capitolina	clientship	Celt
Priene	Antinoöpolis	colony	Lake Dwellings
prytaneum	Antonine Wall	comitia	shell mound
Selinus	Capernaum	consul	Urnfield culture
Sicyon	Carrhae, Battle of	curia	
sortition	dominus	Decapolis	
strategus	emperor	decemviri	
Tegea	fascēs	decurio	
Thermopylae	fiscus		

Biographies*Greece and**Macedonia:*

Agesilaus II

Alcibiades

Argead dynasty

Cimon

Cleisthenes of

Athens

Demosthenes

Dionysius the Elder

Epaminondas

Lycurgus

Miltiades the

Younger

Peisistratus

Pericles

Philip II

Philip V

Pyrrhus

Solon

Themistocles	Ptolemy V	Claudius	Pilate, Pontius
Theramenes	Epiphanes	Claudius Caecus,	Pompey the Great
<i>Hellenistic states:</i>	Ptolemy VI	Appius	Romulus and
Antigonus I	Philometor	Constantine I	Remus
Monophthalmus	Ptolemy IX	Dioctletian	Seneca, Lucius
Antigonus II	Soter II	Domitian	Annaeus
Gonatas	Ptolemy XII	Gallienus, Publius	Severus, Septimius
Antiochus I Soter	Auletes	Licinius Egnatius	Severus Alexander
Antiochus III	Ptolemy XIII	Germanicus Caesar	Scipio Africanus
Antiochus IV	Theos Philopator	Gracchus, Gaius	the Elder
Epiphanes	Seleucus I Nicator	Sempronius	Scipio Africanus
Arsinoe II	<i>Rome:</i>	Gracchus, Tiberius	the Younger
Cleopatra VII	Agrippa, Marcus	Sempronius	Sulla, Lucius
Thea Philopator	Vipsanius	Hadrian	Cornelius
Mithradates VI	Antony, Mark	Herod	Theodosius I
Eupator	Aurelian	Herod Agrippa I	Tiberius
Ptolemy I Soter	Caesar, Julius	Herod Antipas	Trajan
Ptolemy II	Caligula	Julian	Valentinian I
Philadelphus	Caracalla	Maecenas, Gaius	Vespasian
Ptolemy III	Cato, Marcus	Marcus Aurelius	
Euergetes	Porcius	Marius, Gaius	
Ptolemy IV	Cicero, Marcus	Nero	
Philopator	Tullius		

INDEX: See entries under all of the terms above

Division II. Peoples and Civilizations of Medieval Europe, North Africa, and Southwest Asia

[For Part Nine headnote see page 343.]

The outlines in the four sections of Division II deal with the civilizations directly descendant from those of the ancient Near East and of Classical antiquity, which are treated in the two sections of Division I. The general period covered in Division II is the Middle Ages, beginning with the death of Theodosius I in AD 395, conventionally taken as marking the permanent division of the Roman Empire into East and West, and extending to *c.* 1500, conventionally taken as the starting point of modern history.

The sectional organization of this division and the outlines in its four sections reflect significant cultural and political interaction between the Eastern Christian, Western Christian, and Islāmic spheres, and also involve some breaking points in the history of each sphere.

Section 921. Western Europe, the Byzantine (Eastern Roman) Empire, and Eastern Europe from AD 395 to *c.* 1050 356

922. The Formative Period in Islāmic History, from AD 622 to *c.* 1055 361

923. Western Christendom in the High and Later Middle Ages (*c.* 1050–*c.* 1500) 363

924. The Crusading Movement, the Islāmic States of Southwest Asia, North Africa, and Europe, and the States of Eastern Christendom from *c.* 1050 to *c.* 1480 372

Section 921. Western Europe, the Byzantine (Eastern Roman) Empire, and Eastern Europe from AD 395 to *c.* 1050

- A. The study of medieval and Byzantine history: the historical sources, historiographic problems, chronological outline
- B. The eclipse of the Roman Empire in the West and the development and Christianization of Germanic successor states (AD 395–*c.* 750)
 1. The end of the Western Roman Empire and the Germanic Völkerwanderung (AD 395–*c.* 500)
 - a. The general decline of government, economy, society, and culture
 - b. Establishment of the Germanic hegemony: the invasions of Vandals; the invasions of Angles, Saxons, and Jutes (Britain); the Visigothic invasions in the 5th century and settlement in Provence and Spain; the Frankish conquest of Gaul (*c.* 481/482–511) and the Burgundian flight to the south; the Huns; abolition of the Western Empire and Ostrogothic rule in Italy (493–553); other Germanic tribes—the issue of Arianism versus Catholic Christianity; Germanic law and society

2. The Germanic successor states and the remnants of the Roman Empire in the West from c. 500 to 750; the origins of early feudalism
 - a. Byzantine conquests and later diminution of Byzantium's western possessions (540–751), the Exarchate of Ravenna, Lombard conquests in Italy, beginning of the political role of the Roman papacy
 - b. Early development of the Germanic kingdoms
 - i. The Visigothic kingdom to 711
 - ii. The Anglo-Saxon kingdoms in England and the Celtic kingdoms in Ireland
 - iii. The Franks under the Merovingians and early Carolingians: the successors of Clovis, rise and establishment of the Carolingians under Charles Martel and Pepin III the Short (714–768), Carolingian relations with the papacy and entry into Italian affairs; origins of the Papal States
 - c. Effects of the rise of Islām on western Europe
 3. Religion, the arts, and society in the early Middle Ages: the amalgamation of late Classical and Germanic cultures and Christianity
 - a. Conversion of the Celts, the Picts, and the Germans to Catholic Christianity: religious and cultural functions of monasticism and the Western Church
 - b. The arts, intellectual life, and education in the early Middle Ages
 - c. Social and economic life in the early Middle Ages
- C. The early Byzantine Empire (AD 395–717)
1. Origins of Byzantium in the late Roman Empire: the reforms of Diocletian and Constantine
 2. Persistence of Greco-Roman society in the East in the 5th century: the empire from the death of Theodosius I to the accession of Heraclius (610)
 - a. Economic and social policies: agriculture, coinage, relations with the barbarians (*e.g.*, Huns, Goths, Isaurians, Avars, Slavs)
 - b. Ecclesiastical controversies, Syrian and Egyptian disaffection, and the beginning of conflict with the Western Church
 - c. The empire at the end of the 5th century: internal tensions, political and economic policies under Anastasius I
 - d. The reigns of Justin I (518–527) and Justinian I (527–565): realignment with the Roman Church, Code of Justinian, military campaigns in the West, effects of the plague, later campaigns
 - e. Early Byzantine culture: Christianity, the arts, and intellectual life
 - f. Justinian's successors (565–610): relations with the barbarians and with the Persians, revolt of the army
 3. Rehabilitation of the empire under the dynasty of Heraclius (610–711)
 - a. Heraclius' reorganization of the empire along military lines: wars with Persia; the loss of Syria, Palestine, Armenia, and Egypt to the Arabs and continued Arab pressures; recognition of Byzantine overlordship in the Balkans
 - b. Decline of the dynasty (685–711): renewed wars with the Slavs; settlement with the Arabs; fiscal, agricultural, and defensive policies; military anarchy (711–717)
- D. Western Christendom and Scandinavia from the Carolingian era to the general European revival (c. 750–c. 1050)
1. The Carolingian Empire and its later dissolution (c. 750–887), France in the 10th century
 - a. The reign of Charlemagne (king, 768–814; emperor from 800): further military expansion of the Frankish kingdom; legislation, administration, and defense; ecclesiastical policies; patronage of arts and learning
 - b. Decline and dissolution of the Carolingian Empire under the successors of Charlemagne: the society, government, and culture of the Frankish world
 - i. Louis the Pious; partitioning of the empire by the Treaty of Verdun (843) between Louis's sons (Lothair, Charles the Bald, and Louis the German); Muslim, Norman, and Magyar invasions and the debilitation of central authority
 - ii. The Frankish world: society, institutions, economic life, the church (triumph and reform of Benedictine monasticism, birth of the Cluniac order), literature (Carolingian renaissance) and the arts

- c. The East Frankish kingdom (Germany): the last Carolingians (to 911), the emergence of the four stem duchies (Saxony, Franconia, Swabia, and Bavaria)
 - d. The West Frankish kingdom (France): dynastic rivalry between Carolingians and Robertians (to 987) and the ascendancy of the feudal magnates
 - e. The Middle Frankish kingdom (Lotharingia): Burgundy, Provence, and Italy
2. The British Isles and Scandinavia (c. 800–1066)
 - a. England: the decline of Mercia and the rise of Wessex; the 9th-century Danish invasions; King Alfred's legal, administrative, and ecclesiastical policies and patronage of the arts; Anglo-Saxon political unification and monastic revival in the 10th century; the conquest of the Danes and their rule over the Anglo-Danish state; the reign of Edward the Confessor and the Norman Conquest
 - b. Development of the Kingdom of Scotland, the Welsh, Ireland during the Norse invasions
 - i. Roman penetration in Scotland: Christianity, Norse influence
 - ii. Early Christianity in Wales: relations with the Anglo-Saxons, Welsh society
 - iii. Ireland: conversion to Christianity, monasticism, the Norse invasions
 - c. The Viking Age in Scandinavia: the Vikings and Varangians, widespread raids and conquests (c. 800–c. 1050), social and political organization, arts, paganism and conversion to Christianity from c. 850
 3. Germany, Burgundy, and Italy: development of the Holy Roman (German) Empire (911–1056)
 - a. Revival of central authority in Germany and intervention in Italy by the Saxon dynasty: Conrad (911–918), rise of the nobility, early opposition from Arnulf of Bavaria, drive against Magyars and Slavs, Germanic kingship
 - b. Promotion of the German church under Otto I (936–973): his conquest of Italy and establishment of the Holy Roman Empire (962), early Salian kings (1024–56)
 - c. Development of medieval Italy: political, economic, and social developments on the peninsula and in Sicily
 - i. Growth in power of the papacy; early years of the commercial cities of Venice in the north and Gaeta, Naples, Sorrento, and Amalfi in Campania; the Arabs in Sicily
 - ii. Cities and countryside: persistence of an urban tradition despite the exodus to rural areas, the role of bishops in urban life, economy and society
 4. The Kingdom of France under the early Capetians (987–1180): the relative weakness of the monarchy vis-à-vis the great feudatories, establishment of an Anglo-French domination in western France under the Plantagenets (Normandy, Anjou, Aquitaine), Capetian attempts to expand the royal domain
 5. Growth of the Christian states in northern Spain (Asturias–Leon–Castile, Navarre, Aragon–Catalonia): their relations with one another and with the Muslims in Spain, the first phase of the Reconquista to the fall of Toledo (1085)
 6. The sociopolitical and economic structure of early medieval Europe: origins, development, and spread of feudalism; its elements and structure; the manorial economy and mainly localized commerce to c. 1050
- E. Peoples and states of eastern Europe to c. 1050: early empires and later development of Christianized states
 1. The Slavic peoples: origins, early society and culture, movement into Pannonia and south Russia, plundering expeditions and eventual settlement in the Balkans
 2. The eastern European states and peoples within the Byzantine orbit
 - a. The Bulgarian domains to 1018: origins, migration into the Balkans (c. AD 650) and mixture with the local Slavic populations, early contacts and wars with Byzantium, adoption of Christianity (870), the First Bulgarian Empire (893–1014) and subsequent conquest by Byzantium
 - b. The Balkans: the migration of the Croats and Serbs into the Balkans and their subsequent relations with the Bulgars and Byzantium to c. 1050
 - c. Exploration and the rise of the Rus raids on Constantinople, development of trade routes, Khazar state north of the Black Sea
 - d. The princes of Novgorod (end of the 9th century)
 - e. The state of Kievan Rus (c. 980–1054): Slavic-Varangian (Scandinavian) origins, economic decline, social and political institutions
 3. Eastern European states within the orbit of Western Christendom

- a. Developments in Moravia and Bohemia to 1055: the Celtic and Germanic tribes supplanted by Slavic peoples in the 6th century, Czech dominance in the 8th century, unification under the Přemysl rulers
 - i. Unification of Greater Moravia under Mojmir (814): religious conflicts with Frankish clergy and temporary adherence to the Eastern rite, political expansion
 - ii. The early Přemysl rulers of Bohemia: capital at Prague, ties with Bavaria and the Saxon dynasty, Boleslav I (929–967), Boleslav II (967–999), annexation of Moravia under Břetislav (1034–55)
- b. The Avar Empire and the early Magyar (Hungarian) kingdom to c. 1050: alliance with the Carolingian ruler Arnulf, establishment of the Árpád dynasty, settlement of the central plain, conversion to Christianity, reign of Stephen I (997–1038)
- c. Development of the Kingdom of Poland in the 10th century and Polish conversion to Western Christianity under the dynasty of the Piasts, civil strife and later restoration under Casimir I (1039–58)

F. The zenith and incipient decline of the Byzantine Empire (717–1081), the growth of Venice

1. The age of Iconoclasm (717–867): the reforms of Leo III the Isaurian, repulse of the Arabs, Bulgar incursions and continued religious dissension under Leo's successors
2. The Macedonian era (867–1025): territorial expansion, foreign relations, continued strength and prosperity under its rulers until 1025
 - a. Military revival, relations with Slavs and Bulgars, estrangement from the West
 - b. Culture and administration: legal reforms under Basil I and Leo VI
 - c. Social and economic change: reforms of Basil II
3. Byzantine decline and subjection to Western influences: 11th-century weakness, arrival of new enemies, the schism with Rome (1054)
4. Venice: the development of its institutions, commerce, and naval power in the early Middle Ages

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and a biography dealing with Western Europe, the Byzantine (Eastern Roman) Empire, and eastern Europe from AD 395 to c. 1050

Austria	France	Ireland	Steppe, The
Balkan States	Germany	Istanbul	History of the
Baltic States	Greek and Roman	Italy	Eurasian
Belarus	Civilizations,	Kiev	Transcaucasia
Byzantine Empire,	Ancient	Poland	Ukraine
The History of the	Holy Roman	Rome	United Kingdom
Charlemagne	Empire, The	Russia	Venice
European History	History of the	Spain	
and Culture	Hungary		

MICROPAEDIA: Selected entries of reference information

General subjects

<i>barbarian invaders and successor kingdoms:</i>	Suebi	Justinian, Code of	<i>early medieval society and culture:</i>
Alani	Vandal	logothete	feudal land tenure
Alemanni	Visigoth	Manzikert,	feudalism
Angle	<i>Byzantine and Western Roman empires:</i>	Battle of	fief
Antae	Byzantine Empire	Mardaite	Germanic law
Avar	Carthage,	Mons Lactarius,	homage and fealty
Frank	Exarchate of	Battle of	knight
Goth	Ecloga	Myra	knight service
Hun	Epanagoge	Nicaea, empire of	liege
Jute	eparch	pronoia system	manorialism
Lombard	Farmer's Law	Ravenna	Middle Ages
Ostrogoth	Ghassan	Rhodian Sea Law	serfdom
Pecheneg	Iconoclastic	Taginae, Battle of	serjeanty
Saxon	Controversy	theme	vassal

wardship and marriage	Connaught	<i>eastern European states:</i>	Holy Roman Empire
<i>Merovingian and Carolingian era:</i>	Cornwall	boyar	Papal States
Aquitaine	Dalriada	druzhdina	Provence
Austrasia	Danegeld	Khazar	Saxony
Frank	Danelaw	Lusatia	Swabia
Gévaudan	Deira	Mazovia	Thuringia
Lorraine	East Anglia	Moravia	<i>national development—</i>
missi dominici	Essex	Piast dynasty	<i>Iberia:</i>
Neustria	frankpledge	Pomerania	Aragon
Pepin, Donation of	Hadrian's Wall	Rus	Asturias
Poitiers, Battle of	Kent	Ukraine	Castile
Septimania	Leinster	<i>national development—</i>	Catalonia
Toulouse	Lindsey	<i>France:</i>	Covadonga
Valois	Lothian	Anjou	Leon
Verdun, Treaty of	Mercia	Aquitaine	Liber Judiciorum
<i>national development—</i>	Middle Anglia	Brittany	Mozarab
<i>British Isles:</i>	Munster	Gascony	Navarre
Alba	Northumbria	Normandy	Reconquista
Angle	Ossory	<i>national development—</i>	<i>national development—</i>
Anglo-Saxon	Pict	<i>Germany, Burgundy, and Italy:</i>	<i>Scandinavia:</i>
Anglo-Saxon Chronicle	Scot	Bavaria	Birka
Anglo-Saxon law	Strathclyde	Burgundy	Danewirk
Bernicia	Sussex	Franconia	Hedeby
ceorl	Wessex		housecarl
	Whitby, Synod of		Norman
	witan		
	<i>national development—</i>		
Biographies			
<i>barbarian invaders and successor kingdoms:</i>	Baldwin I (Constantinople)	Marcian	Charles Martel
Aistulf	Baldwin II (Constantinople)	Maurice	Childerich I
Alaric	Basil I	Michael IV	Chilperic I
Alaric II	Basil II	Michael VIII Palaeologus	Chlotar I
Alboin	Belisarius	Nepos, Julius	Chlotar II
Amalasantha	Constans II	Nicephorus I	Clovis I
Árpád	Constantine VII Porphyrogenitus	Nicephorus II Phocas	Dagobert I
Ataulphus	Constantine IX Monomachus	Orestes	Eboin
Athanaric	Constantine IX Monomachus	Phocas	Fredegund
Attila	Eudocia	Romanus III	Germanus of Paris, Saint
Ermanaric	Macrembolitissa	Romulus Augustulus	Louis I (France)
Gaiseric	Henry (Constantinople)	Stilicho	Merovech
Krum	Heraclius	Theodora (d. 548)	Merovingian dynasty
Leovigild	Honorius	Theodora (d. 1056)	Pepin I (Aquitaine)
Liutprand	Irene (d. 803)	Theodore I (Nicaea)	Pepin II (Aquitaine)
Odoacer	Irene (d. 1120)	Theodosius I	Pepin I (Carolingian dynasty)
Ricimer	John I Comnenus	Theodosius II	Pepin II (Carolingian dynasty)
Rothari	John III Ducas	Tiberius II	Pepin III (Carolingian dynasty)
Simeon I	Vatatzes	Valentinian III	
Theodoric (Italy)	John V Palaeologus	Zeno	
Totila	Justin I	Zoe	
Ulfilas	Justin II	<i>Merovingian and Carolingian era:</i>	
Witigis	Justinian I	Alcuin	
<i>Byzantine and Western Roman empires:</i>	Justinian II	Arnulf of Metz, Saint	
Aetius, Flavius	Leo I	Brunhild	Pepin (Italy)
Alexius I Comnenus	Leo III	Carolingian dynasty	Sigebert I
Anastasius I	Leo VI	Charlemagne	Theodoric I (Merovingian dynasty)
Andronicus I Comnenus	Manuel I Comnenus		Wala, Saint

<i>national</i>	<i>national</i>	Robert I	Otto III
<i>development—</i>	<i>development—</i>	(Normandy)	(Germany/Holy
<i>British Isles:</i>	<i>eastern European</i>	Robert the Strong	Roman Empire)
Aethelberht I	<i>states:</i>	Rollo	Rudolf (Germany/ Holy Roman
(Kent)	Arpad	Rudolf (France)	Empire)
Agricola	Boleslav I	William I	Sylvester II (pope)
Alfred	Boleslav II	(Normandy)	
Athelstan	Bolesław I	<i>national</i>	<i>national</i>
Augustine of	Boris I (Bulgaria)	<i>development—</i>	<i>development—</i>
Canterbury, Saint	Bratislav I	<i>Germany,</i>	<i>Iberia:</i>
Bede the	Mieszko I	<i>Burgundy,</i>	'Abd ar-Raḥmān I
Venerable, Saint	Mieszko II	<i>and Italy:</i>	'Abd ar-Raḥmān II
Boudicca	Oleg	Arnulf	'Abd
Brian	Rurik	Arnulf I	ar-Raḥmān III
Canute	Rurik dynasty	Berengar	Alfonso I
Conn Cetchathach	Samuel (Bulgaria)	(Germany/Holy	(Asturias/Leon)
Dunstan of	Stephen I	Roman Empire)	Ferdinand I
Canterbury, Saint	(Bulgaria)	Berengar II (Italy)	(Castile)
Edgar	Stephen I	Boso	Maṣṣūr, Abū
Edmund I	(Hungary)	Charles III	'Amir al-
Edmund II	Svyatoslav I	(Germany/Holy	Pelayo
Edward (the	Vladimir I	Roman Empire)	Sancho III
Confessor)	Yaroslav I	Charles (Provence)	(Navarre)
Edward (the Elder)	<i>national</i>	Conrad I	Tāriq ibn Ziyād
Edward (the	<i>development—</i>	(Germany/Holy	<i>national</i>
Martyr)	<i>France:</i>	Roman Empire)	<i>development—</i>
Edwin	Adalbero of	Conrad II	<i>Scandinavia:</i>
Egbert	Ardennes	(Germany/Holy	Canute
Godwine	Charles II (France/ Holy Roman	Roman Empire)	Erik I (Norway)
Hardecanute	Empire)	Henry I	Erik the Red
Harold I	Charles III	(Germany/Holy	Haakon I
Harold II	(France)	Roman Empire)	Harald I
Kenneth I	Eudes	Henry II	(Denmark)
Kenneth II	Geoffrey II	(Germany/Holy	Harald I (Norway)
Kenneth III	(Anjou)	Roman Empire)	Harald II (Norway)
Macbeth	Henry I (France)	Henry III	Harald III
Malcolm II	Hugh Capet	(Germany/Holy	(Norway)
Malcolm III	Lothair (France)	Roman Empire)	Hardecanute
Offa	Louis III (France)	Leo IX (pope)	Leif Eriksson
Olaf Guthfrithson	Louis IV (France)	Louis III	Olaf I (Norway)
Olaf Sihtricson	Louis V (France)	(Germany/Holy	Olaf II (Norway)
Oswald, Saint	Richard I	Roman Empire)	Ragnar Lothbrok
Patrick, Saint	(Normandy)	Otto I (Germany/ Holy Roman	Rollo
Sweyn	Richard II	Empire)	Sweyn I
Theodore of	(Normandy)	Otto II (Germany/ Holy Roman	(Denmark)
Canterbury,	Robert I (France)	Empire)	Sweyn II
Saint	Robert II (France)		(Denmark)

INDEX: See entries under all of the terms above

Section 922. The Formative Period in Islāmic History, from AD 622 to c. 1055

- A. The study of Islāmic history: the historical sources, historiographic problems
- B. The rise and spread of Islām and the Arab Empire to the end of the Umayyad dynasty (AD 622–750)
 1. Islām and Arab expansion in the 7th century
 - a. Arabia before Muḥammad
 - b. The life and career of Muḥammad and the rise of Islām, the doctrine of the *jihād* (holy war)

- c. Muslim expansion outside Arabia under the four Patriarchal Caliphs (632–661)
 - i. Abū Bakr (632–634) and ‘Umar I (634–644): the tribe of Quraysh; divisions among the followers of Muḥammad; the conquest of Iraq and the Sāsānid (Persian) Empire and the Byzantine territories of Jordan, Palestine, Syria, and Egypt
 - ii. ‘Uthmān (644–656) and ‘Alī (656–661): expeditions into North Africa, Armenia, and Persia; social and religious grievances; civil unrest; the origins of Shi‘ism
2. The Umayyad caliphate (661–750)
 - a. The consolidation of the caliphate (661–684) under Mu‘āwiyah I and his successors: westward orientation of the caliphate and its capital at Damascus, growing opposition to the Umayyads
 - b. The zenith of Umayyad power with the advent of the Marwānids: ‘Abd al-Malik (685–705) and al-Walīd (705–715), suppression of revolts, new conquests
 - c. The later Umayyads (715–750): conciliation of state policies with religion, peace and prosperity under Hishām (724–743), disintegration of the empire under his successors and the ‘Abbāsīd revolt
 - d. Umayyad government and society
 - i. Administration of the Arab lands: utilization of local officials, the position and functions of the caliph, Islāmization and Arabization, social classes
 - ii. Cultural life under the Umayyads: spread of the Arabic language, literary revival, fragmentation into religious sects, accomplishment in the arts
- C. The ‘Abbāsīd Empire and its successor states (750–c. 1055)
 1. The ‘Abbāsīd caliphate from 750 to 945
 - a. Establishment of the new dynasty and its advance under Abū al-‘Abbās as-Saffāḥ (749–754), al-Manṣūr (754–775), and al-Mahdī (775–785); the ‘Abbāsīds at their zenith (786–861)
 - b. Decline of the caliphate after the death of al-Mutawakkil (861): growth of provincial autonomy
 - c. Economic and social life under the ‘Abbāsīds: manufactures and trade
 - d. Cultural life under the ‘Abbāsīd caliphate
 - i. Religion: theology and philosophy, Islāmīc mysticism
 - ii. The arts and sciences: Greek and Persian influences, the aniconic principle in the arts
 2. Eclipse of the ‘Abbāsīds and the growth of provincial dynasties from c. 755 to 1055
 - a. The Umayyad emirate and caliphate in Spain (756–1031) and its capital at Córdoba
 - i. Conquest of southern and central Spain by Ṭāriq ibn Ziyād (711); defeat of the Muslims near Poitiers by the Frank Charles Martel (732); foundation of the independent emirate by ‘Abd ar-Raḥmān I (756–788); political and cultural splendour in the reign of ‘Abd ar-Raḥmān II, defeat of the *muwallads*
 - ii. The Umayyad caliphate under ‘Abd ar-Raḥmān an-Nāṣir III: relations with Arabs, Berbers, and the Christian states in Spain; conquest of Morocco by his successors; the *ṭā’ifas* and internal disorders
 - iii. Social and economic life in Muslim Spain: the culture of Muslim Spain, developments in literature and the sciences
 - b. The Fāṭimīd state of North Africa and Syria from 909 to c. 1055: the foundation of the Fāṭimīd caliphate in Tunisia and Algeria, its conquest of Morocco (926) and Egypt (969), and expansion into Syria
 - c. Other dynasties in North Africa and Syria: the Shi‘ite Idrīsīds of Morocco (789–926); the Rustamīd kingdom in the central Maghrib (787–911); the Aghlabīd state in Tunisia, Algeria, and Sicily (800–909); minor dynasties
 - d. The Sāmānīd dynasty of Khorāsān (875–999) and its role in the Islāmization of the Turkīc peoples: patronage of art and learning
 - e. The Būyīd dynasty in Iran and Iraq (932–1055); Shi‘ism and the Iranian revival, Isfahan
 - f. Other eastern states: the Qarmatians in eastern Arabia (c. 900–1078), the Turkīsh Qarakhanīd dynasty of Mā Warā ‘an-Nahr (Transoxania) and eastern Turkīstan (922–c. 1050), the Turkīsh Ghaznavīds of Afghanistan and northwestern India (998–1050), minor states and dynasties

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the Empire of the Caliphate and its successor states to c. AD 1055

Arabia	Egypt	Islāmic	North Africa
Baghdad	Iran	World, The	Spain
Damascus	Iraq	Mecca and Medina	Syria

MICROPAEDIA: Selected entries of reference information

General subjects

caliph	hājib	Kūfah	Ṣaqālibah
Caliphate	Hāshimīyah	Mozarab	Shī'ite
Córdoba	Hegira	Nahāvand,	Ṣiffīn, Battle of
divan	iqṭā'	Battle of	Sunnite
emir	jizya	Poitiers, Battle of	taifa
fitnah	Karbalā', Battle of	(732)	Wāsiṭ
Fuṣṭāṭ, al-	kharāj	Rashidun	Zanj rebellion
ghanimah	Khorram-dīnān	riddah	

Biographies

'Abbāsīd dynasty	Būyid dynasty	Ma'mūn, al-	Sāmānid dynasty
'Abd al-Malik	Fāṭimid dynasty	Maṣṣūr, al-	Ṣimjūrīd dynasty
'Abd	Ghaznavīd dynasty	Mazyadīd dynasty	'Umar I
ar-Raḥmān III	Ḥamdānid dynasty	Mosāferīd dynasty	'Umar II
Abū Bakr	Hārūn ar-Rashīd	Mu'āwīyah I	Umayyad dynasty
Abū Muslim	Hūdīd dynasty	Mu'tamid, al-	'Uthmān ibn
'Alī	Kā'ūsīyeh dynasty	Najāḥīd dynasty	'Affān
Barmakīds	Maḥmūd	Ṣaffārīd dynasty	Zeyārīd dynasty

INDEX: See entries under all of the terms above

Section 923. Western Christendom in the High and Later Middle Ages (c. 1050–c. 1500)

A. The medieval western European revival and the economy, society, and culture of Western Christendom in the High Middle Ages

1. Society, economy, and culture

- a. Western European society in the High Middle Ages: the three social orders (priests and monks; warriors; peasants and labourers); the feudal nobility; the bourgeoisie; the status of women
- b. Growth of agricultural productivity and population: revival of a money economy, manufacturing, and the commercial effects of the Crusades; revival of towns and population movements
- c. Technological inventions and improvements
- d. The church in medieval society: growth of papal hegemony, reform movements (eremitism, Cistercians, mendicant orders), ecumenical councils, emergence of the laity, struggle against heretics (Inquisition from 1233), role of religion in medieval society
- e. The culture of the High Middle Ages
 - i. Establishment of schools and universities
 - ii. The intellectual revival of the 11th and 12th centuries, Scholasticism, developments in philosophy and theology
 - iii. The arts: Latin and vernacular literature, Romanesque and Gothic visual arts, music, theatre, the decorative arts
- f. The status of Jews in medieval society and their economic role, persecutions, and migrations
- g. Political institutions and ideas
 - i. The two major powers, the Empire and the papacy; the relations between temporal and spiritual power

- ii. Kingship as the ideal Christian form of government: its relationship to sacrality and to the growing bureaucracy; the three main forms of government inherited from antiquity: monarchy, oligarchy, tyranny
 - iii. The city-state (Italy)
 - 2. The Holy Roman Empire, the papacy, and Italy from *c.* 1050 to *c.* 1300
 - a. The empire, the papacy, and Italy in the era of the Investiture Controversy
 - i. Church reform in the 10th and 11th centuries and the clash between the papacy and the emperors over lay investiture (at its height between the emperor Henry IV and Pope Gregory VII): the resulting incipient decline of German monarchical authority under the Salian emperors
 - ii. The Norman conquest of southern Italy and Sicily and establishment of a strong monarchy: relations with the papacy, Venice, and the Byzantine Empire
 - iii. The growth of communes in northern Italy, the status of German imperial power, the political role of the papacy in Italy, the commercial expansion of Italian cities (*e.g.*, Genoa, Pisa), continued growth of Venetian maritime power
 - b. The empire under the Hohenstaufen dynasty and after its extinction to *c.* 1300, the papacy and Italy
 - i. Steady inroads of the German princes into German monarchical authority: colonization of Slavic territory, development of commercial centres (*e.g.*, Lübeck), the reign of Frederick I Barbarossa and Frederick II, extinction of the Hohenstaufen dynasty and the Great Interregnum (1250–73), the election and reign of Rudolf of Habsburg
 - ii. The Kingdom of Sicily: centralized government, ethnic mixture, Palermo, control by the Hohenstaufens (1194–1266), the Angevin conquest and expulsion (1282), the advent of Aragonese control
 - iii. The decline of German imperial control in northern Italy and the continued development of the communes (*e.g.*, Milan, Pisa, Florence, Siena): their internal and external conflicts
 - iv. Continued commercial expansion of Italian cities: Venetian expansion in the Levant and aid to the Normans in the conquest of Byzantium (1204), commercial inroads into the Levantine trade by Genoa and Pisa
 - 3. The growth of the Kingdom of France under the later Capetian dynasty (1180–1328), the Low Countries
 - a. Growth of the power of the French kings and extension of the territory under their control
 - i. Philip II Augustus (1180–1223): acquisition of territory and consolidation of the realm, royal administration, feudal policies
 - ii. Louis VIII (1223–26) and Louis IX (1226–70): institution of the granting of appanages to younger sons of kings, the Albigensian Crusade, rise of bureaucracy, attitudes toward the clergy and the lay nobility; Louis's efforts for peace, justice, and morality; his canonization in 1297
 - iii. The later Capetians: Philip IV the Fair (1285–1314), claims of the monarchy, beginnings of the States General, conflict with Boniface VIII, suppression of the Templars
 - iv. Foreign relations: conflict with the Holy Roman Empire under Philip II, the religious crusades of Louis IX, the wars of Philip IV
 - v. Economy, society, and culture in the 13th century: increase in population, growth of towns and urban prosperity, rural life, religion, culture and learning
 - b. The Low Countries: development of the territorial principalities and the rise of towns; *e.g.*, Ghent, Bruges
 - i. Secular and spiritual principalities
 - ii. Struggle for independence, French and British influence
 - iii. Social and economic structure
 - 4. The Spanish Christian kingdoms of Castile and Leon, Aragon (including Barcelona and Catalonia), Portugal, and Navarre (1035–*c.* 1260): their expansion into Muslim territory, their mutual rivalries, their ethnic-cultural mixtures, and their internal political development; the role of the church

- a. The medieval empire (1035–1157): the division of the kingdoms and the emergence of Portugal as an independent state
 - b. The rise of Castile and Aragon and the expulsion of the Muslims, led especially by the rulers of Aragon (James I, 1213–76) and Castile (Ferdinand III, 1217–52)
 - c. Society, economy, and culture: administration of the Spanish kingdoms; development of feudalism, growth of towns, and appearance of trade and industry; establishment of the Cortes; foundation of the universities of Valencia and Salamanca
5. The Kingdom of England and its continental dependencies from the Norman Conquest to the death of Edward I; Scotland, Wales, and Ireland (1066–1307)
 - a. The Norman Conquest: introduction of feudalism and the development of royal administration under William I the Conqueror (1066–87) and his immediate successors
 - i. Church–state relations and the place of the clergy in the feudal structure, the Domesday survey
 - ii. Strengthening of central government under William’s successors: relations with the church in their reigns
 - iii. The period of the Anarchy (1135–54): Matilda and Stephen, civil war
 - b. The early Plantagenets
 - i. The reign of Henry II (1154–89): military and administrative reforms, Henry’s conflict with the church and the struggle with Becket, the rebellions of Henry’s sons
 - ii. Richard I (1189–99): administration in Richard’s absence, the Saladin Tithe, attempts to establish a standing army
 - iii. The reign of John (1199–1216): loss of French possessions, John’s conflict with Innocent III, the revolt of the barons and Magna Carta
 - iv. Henry III (1216–72) and Edward I (1272–1307): Simon de Montfort and the Barons’ War; Edward’s restoration of royal power and his legal, administrative, and military policies; the growth of Parliament, development of Oxford and Cambridge universities
 - c. Scotland, Wales, and Ireland: relations between the Kingdom of Scotland and the English crown, the extent of English control in Wales and Ireland
 - i. The unification of Scotland and the development of the monarchy
 - ii. Norman infiltration in Wales, the three kingdoms, internal conflicts and the Edwardian settlement
 - iii. Ireland: the Anglo-Norman invasion and its effects, establishment of the Irish Parliament
 6. Scandinavia (c. 1050–c. 1300): establishment of the kingdoms of Denmark, Norway, and Sweden
 - a. The trend toward unity and strong monarchy: political developments in the three kingdoms
 - b. Expansion into Finland, Iceland, and Greenland: introduction of feudalism, economic developments and influence of the Hanseatic League, society
 7. The Slavic and Magyar states of Western Christendom (c. 1050–c. 1300)
 - a. Poland: the reigns of Boleslaw II (1058–79) and Boleslaw III (1102–38), the division of Poland between Boleslaw III’s sons, the seniority system, territorial losses, the early role of the Teutonic Order in eastern Europe, internal developments
 - b. Bohemia under the later Přemysl rulers (1055–1306): struggles within the ruling family, privileges secured from the Holy Roman emperor, territorial expansion, losses to Rudolf of Habsburg
 - i. German interference in Bohemia: attacks upon the position of the Prague princes by Frederick I Barbarossa, the Golden Bull of Sicily (1212)
 - ii. Political and economic growth: German immigration, founding of urban communities, expansion under Otakar II (1253–78) into Austria, silver mining and coinage
 - c. Hungary: the early kings, expansion into Transylvania and Dalmatia, the nobility, Golden Bull (1222), Mongol invasion (1241), extinction of the Árpád dynasty in 1301
- B. The decline of medieval European political institutions, economy, and culture and the incipient transition to the modern age (c. 1300–c. 1500)
 1. The culture of the late Middle Ages in western Europe

- a. The early Renaissance in Italy: historiographic problems, the contribution of the city-states, developments in literature and the fine arts
 - i. Revival of Greek studies and the formation of Classical libraries in Italy: Humanism, relationship of Humanism to Christianity
 - ii. New concepts and techniques in painting, sculpture, and architecture: patronage of the arts by the papacy
 - b. The late Gothic style in northern Europe
 - c. Late medieval intellectual developments: political theory, law, and the decline of ideals of imperial unity and papal supremacy; the rising power of national monarchies; decline of Scholasticism; science; witchcraft
2. Late medieval society and economy
 - a. The exaggeration of chivalry and declining importance of the feudal nobility in the face of changing military technology and organization: growing influence of the bourgeoisie, growth of royal government
 - b. Gradual inflation and continued development of capitalism: peasant revolts; economic, social, and political effects of the Black Death (1347–50) and subsequent epidemics of the plague; development of a great maritime trade between the North Sea and the Mediterranean; progress of enclosures; recovery of the population and economy after the middle of the 15th century
 3. The church in the later Middle Ages: papal monarchy and taxation, the Avignon papacy (1309–77) and the Great Schism (1378–1417), the conciliar movement and other reform movements with regard to the church, mysticism
 4. Germany, Bohemia, and the Swiss Confederation (*c.* 1300–*c.* 1500)
 - a. Limitations on the imperial office and the continued ascendancy of the princes in Germany: internal strife between the cities and the princes, the Habsburg and Luxemburg emperors, the division of the Habsburg lands and the enhancement of Habsburg power and influence in Europe by 1500
 - i. Development of the individual states
 - ii. Society, economy, and culture in the 14th and 15th centuries
 - b. Bohemia in the later Middle Ages: political and religious developments
 - i. The Luxemburg dynasty (1310–1437): territorial expansion under Charles I, growth of the city of Prague, Wenceslas IV
 - ii. Beginning of the religious reform movement (*c.* 1360): the Chapel Bethlehem's preachers, the activities of Jan Hus and his execution at the Council of Constance (1415)
 - iii. The struggle between Sigismund and the Hussites: the Four Articles of Prague, Žižka's leadership of the Hussites, the Hussite preponderance (1437–71), George of Poděbrady
 - iv. The Jagiellon kings (1471–1526): the decline of royal authority, growth of power of the first two estates
 - c. Early Swiss history, development of the Swiss Confederation after 1291, struggle against the Habsburgs, the French invasion and the Peace of Constance (1446)
 5. Italy in the late Middle Ages and the Renaissance
 - a. Social and political developments in the period 1300–1400: withdrawal of imperial and papal authority, Italian society, the crises of the 14th century (*e.g.*, the Black Death, economic decline, urban unrest)
 - b. The Italian states in the 14th century: forms of rule, use of mercenaries, cultural developments
 - i. Milan: the Visconti family, rule at home, expansion in northern Italy, Visconti attitudes toward the state
 - ii. Florence: republicanism, the cloth industry, banking, movement into the city from the countryside, plots against the republic
 - iii. Venice: republican institutions, economic prosperity and commercial empire
 - iv. The Papal States: their locations and proprietors, breakdown of papal control during the Avignon papacy and the Great Schism (1378–1417)
 - v. Naples, Sicily, and the other Italian states (*e.g.*, Angevin rule in Naples until its union with Sicily in 1442 under Alfonso V of Aragon); Savoy; Genoa; Verona

- c. The Italian states in the 15th century: expansion of the major Italian powers, Italy as a political system, cultural developments
 - i. The crisis of Florentine republicanism: the threat from Gian Galeazzo Visconti of Milan and his successors, Florentine historiography, rule by the Medici
 - ii. The Papal States: papal policy to strengthen its position, reliance of the popes on their relatives to control the domains
 - iii. Despotisms: Alfonso I (Alfonso V of Aragon) in Naples and Sicily and division of the territory on his death in 1458, the Sforza in Milan
 - iv. Venice: the stability of Venetian life, increased interests in activities on the Italian peninsula
6. France and the Low Countries (c. 1300–c. 1500)
 - a. The period of the Hundred Years' War: the stages of the war, the role of the French kings in the conflict, the war's significance
 - i. Remote and proximate causes of the war: the problem of English lands in France, the problem of the French succession, the Flemish revolt
 - ii. From the outbreak of the war (1337) to the Treaty of Brétigny (1360): the reign of Philip VI (1328–50), the Crécy campaign and its aftermath (1346–54), negotiations during John II the Good's captivity (1356–60), burgeoning power of the estates and revolt of the peasants; the Parisian revolt and the bourgeois leader Etienne Marcel (1358)
 - iii. From the Treaty of Brétigny (1360) to the accession of Henry V of England (1413): Charles V (1364–80), the dispute over Flanders, temporary peace, Charles VI (1380–1422), struggle between Burgundians and Armagnacs
 - iv. From the accession of Henry V (1413) to the siege of Orléans (1428–29): Charles VII (1422–61); France divided between the dauphin Charles, Philip the Good of Burgundy, and Henry V of England
 - v. Recovery and reunification (1429–83) and the expulsion of the English: Joan of Arc and the stirring of French national feeling, reconquest of Maine and Normandy, conquest of Guyenne (1453), final settlement at Picquigny (1475)
 - b. Administrative and military reforms and the strengthening of royal power vis-à-vis the nobility and towns under Charles VII (1422–61) and Louis XI (1461–83): foreign, fiscal, and ecclesiastical policies; social and cultural developments: the States General (1484) and the failure of representative monarchy
 - c. The Low Countries: continued growth of towns, industry, and commerce, with attendant class conflicts and interference by the French monarchy; unification under the House of Burgundy; Burgundian administration
7. England, Wales, Scotland, and Ireland (c. 1307–c. 1500)
 - a. Royal decline under the later Plantagenets and the struggle for the crown between the Lancastrians and Yorkists
 - i. Royal decline under Edward II (1307–27) and its restoration under Edward III (1327–77): the Hundred Years' War, domestic achievements, the crises of Edward III's later reign
 - ii. Richard II (1377–99): the Peasants' Revolt (1381), the influence of John Wycliffe, later political struggles and Richard's deposition
 - iii. Henry IV (1399–1413), Henry V (1413–22), and Henry VI (1422–61 and 1470–71): rebellions under Henry IV and his relations with Parliament, domestic rivalries and the loss of France under Henry VI, Cade's rebellion and the Wars of the Roses
 - iv. The reigns of Edward IV (1461–70 and 1471–83) and Richard III (1483–85): England in the late Middle Ages
 - b. Scotland: the wars of independence, relations with the English crown, Bruces and Stewarts, Scotland in the 15th century
 - c. Establishment of English suzerainty over Wales, fluctuating English influence in Ireland and the rise to power of the earls of Kildare
8. Spain and Portugal (c. 1300–c. 1500)
 - a. Castile and Leon: continued pressure on the Muslims under Alfonso XI (1312–50), increasing power of the Cortes, development of the woolen industry, literary achievements

- b. The Aragon Confederation (Aragon, Catalonia, and Valencia): acquisition of Sicily (1282) and growth of Aragon as a Mediterranean power: the Cortes, law, and administration: acquisition of the Kingdom of Naples (1442) under Alfonso V (1416–58)
- c. Creation of a united Spain and expansion of Spanish dominance in the early Age of Discovery
 - i. The union of Aragon and Castile–Leon under Ferdinand and Isabella: strengthening of their positions vis-à-vis the nobility, the Inquisition and the treatment of Jews, conquest of Granada (1492) and acquisition of Naples (1503)
 - ii. Spanish explorations and territorial acquisitions: colonial policy in the New World, the Atlantic trade
- d. Portugal: development of the monarchy under the House of Avis (1383–1580); alliance with England; consolidation of the monarchy and establishment of its overseas empire under John I (1385–1433), Prince Henry the Navigator, and Manuel I (1495–1521)
- 9. The Scandinavian kingdoms (c. 1300–c. 1500)
 - a. Developments in the 14th century leading to the formation of the Kalmar Union (1397–1523), Scandinavia under the union
 - b. Developments in Denmark, Norway, and Sweden during the union: decline of Norway and rise of Sweden
- 10. Hungary, Poland–Lithuania, and the Teutonic Order
 - a. Hungary under foreign kings: foreign affairs, economy, and society under the Angevins and Sigismund: the reign of Matthias Corvinus (1458–90)
 - b. Poland–Lithuania, the Teutonic Order, and the Baltic peoples
 - i. The Mongol invasions (1241–42) and reestablishment of the Kingdom of Poland (1253–1382): Władysław I and the struggle with the Teutonic Order; Casimir III and Louis I of Hungary; social classes, the church, and policies toward the Jews
 - ii. The Jagiellon dynasty (1382–1492): the union of Poland and Lithuania (1385–86), extension of the empire, growth of parliamentarianism dominated by the nobility

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with western Christendom in the High and later Middle Ages (c. 1050–c. 1500)

Amsterdam	Finland	Ireland	Poland
Antwerp	Florence	Italy	Portugal
Austria	France	Lisbon	Prague
Baltic States	Germany	London	Rome
Belgium	Habsburg, The	Luxembourg	Spain
Crusades, The	House of	Madrid	Sweden
Czech and Slovak Republics	Holy Roman Empire, The	Milan	Switzerland
Denmark	History of the	Naples	United Kingdom
European History and Culture	Hungary	Netherlands, The	Venice
	Iceland	Norway	Vienna
		Paris	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>European politics and polity:</i>	Hundred Years' War	Teutonic Order	Barnet, Battle of
Agincourt, Battle of	Inquisition	Western Schism	Barons' War
Avignon papacy	Investiture	Worms, Concordat of	Bosworth Field, Battle of
Bouvines, Battle of	Controversy	<i>national affairs—</i>	Clarendon, Assize of
Castillon, Battle of	Norman	<i>Britain and Angevin empire:</i>	Clarendon, Constitutions of
Crécy, Battle of	Orléans, Siege of	Angevin empire	Domesday Book
crusade	Poitiers, Battle of	Bannockburn, Battle of	
Holy Roman Empire	Templar		

- Dupplin Moor,
 Battle of
 Hastings, Battle of
 Lollard
 Magna Carta
 Norman Conquest
 Northampton,
 Assize of
 Ordainer
 Oxford,
 Provisions of
 Paston Letters
 Peasants' Revolt
 Roses, Wars of the
 tanistry
 Tewkesbury,
 Battle of
 Towton, Battle of
 Westminster,
 Statutes of
 (1275-90)
*national affairs—east
 central Europe:*
 Cuman
 Golden Bull of
 1222
 Koszyce, Pact of
 Mazovia
 Moravia
*national affairs—
 France:*
 Albigenses
 Aquitaine
 Brittany
 Burgundy
 Hundred
 Years' War
 Jacquerie
- Normandy
 Praguerie
 Provence
*national affairs—
 Germany and Low
 Countries:*
 Bavaria
 Brabant
 Brandenburg
 Burgundy
 elector
 Flanders
 Golden Bull
 of Emperor
 Charles IV
 Hainaut
 Hanseatic League
 Holland
 Holy Roman
 Empire
 imperial city
 Limburg
 Namur
 Saxony
 Swabia
*national affairs—
 Iberian peninsula:*
 Alarcos, Battle of
 Almohads
 Almoravids
 Andalusia
 Aragon
 Castile
 Catalonia
 converso
 Granada
 Leon
- Medina del
 Campo, Treaty of
 Morisco
 Mudejar
 Navarre
 Navas de Tolosa,
 Battle of Las
 Reconquista
 Tordesillas,
 Treaty of
 Valencia
*national affairs—
 Italy:*
 Ciompi, Revolt
 of the
 Eight Saints, War
 of the
 Guelf and
 Ghibelline
 Lodi, Peace of
 Lombard League
 Naples,
 kingdom of
 papacy
 Papal States
 Sicilian Vespers
 Two Sicilies,
 Kingdom of the
 Venetia
*national affairs—
 Scandinavia and
 Baltic states:*
 Birka
 Birkarlar
 Brothers of the
 Sword, Order
 of the
 Courland
- Danewirk
 Kalmar Union
 Lithuania, grand
 duchy of
 Livonia
 Norman
*national affairs—
 Switzerland:*
 Everlasting
 League
 Morat, Battle of
 Morgarten,
 Battle of
 Näfels, Battle of
 Sempach,
 Battle of
 Stans, Diet of
 Toggenburg
 Succession
*society and
 commerce:*
 Black Death
 commune
 craft guild
 feudal land
 tenure
 feudalism
 Hanseatic League
 knight
 manorial court
 manorialism
 merchant guild
 Middle Ages
 Renaissance
 serfdom
 vassal
- Biographies**
- British Isles and
 Angevin Empire:*
 Alexander I
 (Scotland)
 Alexander II
 (Scotland)
 Alexander III
 (Scotland)
 Beaufort, Henry
 Becket, Saint
 Thomas
 Bruce family
 Clarence, George
 Plantagenet,
 duke of
 David I (Scotland)
 David II (Scotland)
 David ap Llywelyn
 Despenser,
 Hugh Le; and
 Despenser,
 Hugh Le
- Edward (the
 Confessor;
 England)
 Edward I
 (England)
 Edward II
 (England)
 Edward III
 (England)
 Edward IV
 (England)
 Edward V
 (England)
 Edward the Black
 Prince
 Eleanor of
 Aquitaine
 Fortescue, Sir John
 Gaveston, Piers
 Glendower, Owen
- Gloucester
 Plantagenet,
 Humphrey,
 Duke of
 Gloucester,
 Thomas of
 Woodstock,
 Duke of
 Henry I (England)
 Henry II (England)
 Henry III
 (England)
 Henry IV
 (England)
 Henry V (England)
 Henry VI
 (England)
 Henry VII
 (England)
 Henry the Young
 King
 Hubert Walter
 James I (Scotland)
- James II (Scotland)
 James III
 (Scotland)
 James IV
 (Scotland)
 John (England)
 John (Scotland)
 John of Gaunt
 Lancaster,
 House of
 Lanfranc
 Langton, Stephen
 Llywelyn ap
 Gruffudd
 Llywelyn ap
 Iowerth
 Malcolm III
 Canmore
 Margaret
 (Scotland)
 Margaret
 of Anjou
 Matilda

Meath, Hugh de	Árpád dynasty	Charles (Burgundy)	Artevelde,
Lacy, 1st Lord of	Béla III (Hungary)	Charles IV	Jacob van
Montfort	Béla IV (Hungary)	(France)	Charles IV
family	Bolesław II	Charles V (France)	(emperor)
Montfort,	(Poland)	Charles VI	Conrad III
Simon de	Bolesław III	(France)	(German king)
Normandy,	(Poland)	Charles VII	Conrad IV
House of	Břetislav I	(France)	(German king)
Northumberland,	(Bohemia)	Charles VIII	Frederick I
Henry Percy, 1st	Casimir I (Poland)	(France)	(Brandenburg)
Earl of	Casimir II (Poland)	Coeur, Jacques	Frederick I
Oldcastle,	Casimir III	Gondi family	(emperor)
Sir John	(Poland)	Guesclin,	Frederick II
Owain Gwynedd	Casimir IV	Bertrand du	(emperor)
Pembroke,	(Poland)	Henry I (France)	Guy (Flanders)
Richard	Charles I	Joan of Arc, Saint	Habsburg,
FitzGilbert	(Hungary)	John (IV)	House of
2nd Earl of	Daniel	(Brittany)	Henry II
Pembroke,	Romanovich	John IV (or V)	Jasomirgott
William Marshal,	George (Bohemia)	(Brittany)	(Austria)
1st Earl of	Hunyadi, János	John (Burgundy)	Henry X
Percy family	Jadwiga	John II (France)	(Bavaria)
Percy, Sir Henry	Jagiellon dynasty	La Trémoille,	Henry III
Plantagenet,	John (Bohemia)	Georges de	(emperor)
House of	John I Albert	Louis VII (France)	Henry IV
Richard I	(Poland)	Louis VIII	(emperor)
(England)	Ladislav I	(France)	Henry V (emperor)
Richard II	(Hungary)	Louis IX (France)	Henry VI
(England)	Ladislav IV	Louis X (France)	(emperor)
Richard III	(Hungary)	Louis XI (France)	Henry VII
(England)	Ladislav V	Lusignan family	(emperor)
Robert II	(Hungary)	Marcel, Étienne	Henry (VII)
(Normandy)	Louis I (Hungary)	Montfort family	(German king)
Robert I (Scotland)	Matthias I	Philip II	Henry III
Robert II	(Hungary)	(Burgundy)	(Saxony)
(Scotland)	Oleśnicki,	Philip III	Henry Raspe
Robert III	Zbigniew	(Burgundy)	Hermann von
(Scotland)	Otakar I	Philip I (France)	Salza
Roderic O'Connor	(Bohemia)	Philip II (France)	Hohenstaufen
Stephen	Otakar II	Philip III (France)	dynasty
Tudor, House of	(Bohemia)	Philip IV (France)	Jacoba of Bavaria
Tyler, Wat	Piast dynasty	Philip V (France)	Lothair II (or III)
Wallace, Sir	Stanislaus of	Philip VI (France)	(emperor)
William	Kraków, Saint	Rais, Gilles de	Louis II
Warwick, Richard	Stephen V	René I (Anjou)	(Flanders)
Neville,	(Hungary)	Richemont,	Louis IV
1st Earl of	Vladislav II	Arthur,	(emperor)
William I	(Bohemia)	Constable de	Otto IV
(England)	Wenceslas I	Suger	(emperor)
William II	(Bohemia)	Valois dynasty	Philip (German
(England)	Władysław I	<i>Germany and the</i>	king)
William I	(Poland)	<i>Low Countries:</i>	Rudolf I
(Scotland)	Władysław II	Adalbert (Bremen)	(German king)
William the	Jagiello (Poland)	Adolf (German	Rupert (German
Aetheling	Władysław III	king)	king)
Wycliffe, John	Warneńczyk	Albert I	Sigismund
York, House of	(Poland)	(Brandenburg)	(emperor)
York, Richard,	<i>France:</i>	Albert III Achilles	Welf dynasty
3rd duke of	Berry, Jean de	(Brandenburg)	Wenceslas
<i>east central Europe:</i>	France, duc de	Albert I (German	(German king)
Andrew II	Blanche of Castile	king)	Wettin dynasty
(Hungary)	Caboche, Simon	Albert II (German	Wittelsbach,
	Capetian dynasty	king)	House of

Iberian peninsula:

Afonso I
(Portugal)
Afonso II
(Portugal)
Afonso V
(Portugal)
Alfonso I
(Aragon)
Alfonso II
(Aragon)
Alfonso III
(Aragon)
Alfonso IV
(Aragon)
Alfonso V
(Aragon)
Alfonso VI
(Castile/Leon)
Alfonso VII
(Castile/Leon)
Alfonso IX
(Castile/Leon)
Alfonso X
(Castile/Leon)
Alfonso XI
(Castile/Leon)
Charles II
(Navarre)
Cid, the
Edward (Portugal)
Ferdinand II
(Aragon)
Ferdinand I
(Castile/Leon)
Ferdinand II
(Castile/Leon)
Ferdinand III
(Castile/Leon)
Ferdinand IV
(Castile/Leon)
García V (Navarre)
Henry II (Castile/
Leon)
Henry III (Castile/
Leon)
Henry IV (Castile/
Leon)
Isabella I
James I (Aragon)
James II (Aragon)
John I (Aragon)
John II (Aragon)
John II (Castile/
Leon)
John I (Portugal)
John II (Portugal)
Muḥammad XI
(Granada)
Peter II (Aragon)
Peter III (Aragon)
Peter IV (Aragon)

Peter I (Castile/
Leon)
Ramón
Berenguer I
Ramón
Berenguer II
Ramón
Berenguer III
Ramón
Berenguer IV
Sancho III Garcés
(Navarre)
Urraca

Italy and the papacy:

Adorno family
Alberti family
Alexander III
(pope)
Amadeus VI
(Savoy)
Amadeus VII
(Savoy)
Amadeus VIII
(Savoy)
Bardi family
Bentivoglio family
Boccanegra family
Bonacolsi family
Boniface VIII
(pope)
Borgia family
Carrara family
Castracani,
Castruccio
Charles I (Naples)
Charles II (Naples)
Charles III (Naples)
Charles I (Sicily)
Cola di Rienzo
Colonna family
Contarini family
Corsini family
Dandolo, Enrico
Dandolo,
Vincenzo
Dandolo family
della Scala family
Drogo de
Hauteville
Este, House of
Ezzelino III da
Romano
Fieschi family
Gherardesca family
Gonzaga dynasty
Gregory VII (pope)
Gregory IX (pope)
Gregory X (pope)
Grimaldi family
Innocent III (pope)
Joan I (Naples)
Joan II (Naples)

Ladislas (Naples)
Lauria,
Ruggiero di
Leo IX (pope)
Louis (Naples)
Malaspina family
Malatesta family
Martin I (Sicily)
Medici, Cosimo de'
Medici,
Lorenzo de'
Medici, Piero di
Cosimo de'
Medici, Piero di
Lorenzo de'
Medici family
Mocenigo family
Montefeltro family
Morosini family
Ordelaffi family
Orsini family
Paschal II (pope)
Pepoli family
Peruzzi family
Piccinino, Niccolò
Piccolomini family
Polenta family
Polo, Marco
Robert (Apulia)
Robert (Naples)
Roger (Apulia)
Roger I (Sicily)
Roger II (Sicily)
Sambuccio
d'Alando
Savonarola,
Girolamo
Sforza, Francesco
Sforza, Ludovico
Sforza family
Spinola family
Ugucione della
Fagginola
Urban II (pope)
Visconti family
Visconti, Gian
Galeazzo
Visconti, Matteo I
William I (Sicily)
William II (Sicily)
William de
Hauteville
*Scandinavia and the
Baltic States:*
Absalon
Algirdas
Canute VI
(Denmark)
Christian I
(Denmark)
Christopher I
(Denmark)

Christopher III
(Denmark)
Erik V
(Denmark)
Erik VI
(Denmark)
Erik VII
(Denmark)
Erik XIII
(Sweden)
Eskil
Gediminas
Haakon I
Haakon IV
Haakon V
Haakon VI
Inge I
John (Denmark)
Kestutis
Magnus I
(Norway)
Magnus III
(Norway)
Magnus IV
(Norway)
Magnus V
(Norway)
Magnus VI
(Norway)
Magnus I
(Sweden)
Magnus II
(Sweden)
Margaret I
(Denmark)
Mindaugas
Olaf II (Norway)
Olaf III (Norway)
Olaf (Sweden)
Sigurd I
Sverrir Sigurdsson
Sweyn II
(Denmark)
Valdemar II
(Denmark)
Valdemar IV
(Denmark)
Valdemar
(Sweden)
Vytautas
the Great
Władysław II
Jagiello
Switzerland:
Brun, Rudolf
Bubenberg,
Adrian von
Nicholas of Flüe,
Saint
Stüssi, Rudolf
Waldman, Hans

Section 924. The Crusading Movement, the Islāmic States of Southwest Asia, North Africa, and Europe, and the States of Eastern Christendom from c. 1050 to c. 1480

- A. The expansion of western Europe in the crusading movement and the Muslim response, the states of Eastern Christendom and the crusader states from c. 1050 to c. 1480
 1. The crusading era and the states of Eastern Christendom (c. 1050–c. 1480)
 - a. The First Crusade (1096–99) and the establishment of the Latin states
 - i. Background of the First Crusade: overcrowding in Christian Latin Europe and the wish of the church to divert the violence between Christians to an attack on the infidels, religious renewal in Europe, disruption of the pilgrimage routes by the Muslims, role of papal leadership at the Council of Clermont (1095), preparations for the Crusade and its participants
 - ii. The sieges of Antioch (1097–98) and Jerusalem (1099): establishment of the crusader states
 - b. The Second (1147–48) and Third (1188–92) crusades: Christian colonization in the East and export of feudalism, the crusader states to 1187, the institutions of the First Kingdom, the magnates of the Third Crusade
 - c. The Byzantine Empire from 1081 to 1204, policies aimed at revival implemented by Comnenus dynasty
 - i. Alexius I Comnenus and the First Crusade: pressures from the Seljuqs and Pechenegs
 - ii. The later Comneni and fluctuating relations with the Venetians, Normans, and crusaders
 - iii. The Fourth Crusade (1202–04) and the establishment of the Latin empire
 - d. The later crusades: decline of the crusading movement and of the Latin enclaves, results of the crusades
 - i. The Latin East after the Third Crusade: the Fifth (1218–21) and Sixth (1227–29) crusades; oriental politics of Emperor Frederick II
 - ii. The crusades of Louis IX of France (1248–50, 1270), final loss of the crusader states, Kingdom of Cyprus; survival of the spirit of the crusades among Latin Christians
 - e. Russia (1054–1300): the lands of Rus and the rise of new centres (e.g., Novgorod, Vladimir, Galicia), the Mongol invasion (1223) and Tatar rule
 - f. The Second Bulgarian Empire under the Asenid dynasty from c. 1185, decline after 1241
 2. The Slavic states of Eastern Christendom from c. 1300 to c. 1500
 - a. Russia: the rise of the Muscovite state under the suzerainty of the Golden Horde and its later successful revolt (1380), expansion and establishment of Moscow as the leading Russian power under Tsar Ivan III (1462–1505), foreign policy
 - b. The Balkans: growing strength of Serbia vis-à-vis the Byzantine and Bulgarian empires; subjugation of Albania, Macedonia, and Bulgaria under Stefan Dušan in the 14th century; Romania: subjection to the Ottoman Turks by 1453
 3. Restoration of the Byzantine Empire under the Palaeologus dynasty (1261), efforts to restore Byzantine power in the Balkans, foreign relations, cultural life
 - a. Michael VIII (1261–82) and attempts to revive the empire, threats from the West, relations with the papacy
 - b. The successors of Michael VIII: cultural revival, civil wars
 - c. Turkish expansion, limited recovery by the Byzantine Empire before the final Turkish assault, the fall of Constantinople (1453)
- B. The Islāmic states of Southwest Asia, North Africa, and Europe (c. 1050–c. 1480): Turkish and Kurdish dynasties, the Mongol invasions, and the rise of the Ottoman Empire
 1. Southwest Asia before the Mongol invasions
 - a. The Great Seljuq Empire in Syria, Iraq, and Iran (c. 1050–c. 1190)

- i. Origins and conversion of the Seljuqs to Islām and their establishment in Khorāsān (c. 1000) under Maḥmūd of Ghazna, the foundation of the Seljuq state under Toghrīl Beg (1038–63), his conquest of Iran and Iraq and establishment of a protectorate over the ‘Abbāsīd caliphate
- ii. Extension of Seljuq hegemony into Syria and Palestine and victory over the Byzantines, partition and partial breakup of the empire after 1092, Seljuq restoration of Sunnī supremacy and patronage of the Iranian cultural revival
- b. Great Seljuq successor states (c. 1100–c. 1250): the Zangīd *atabegs* in Syria and northern Iraq, the Ismā‘īlī Assassins in Iran and Syria (c. 1090–c. 1250), the Khwārezm shahs of Iran and Central Asia (1097–1234), other dynasties
- c. The foundation of the independent sultanate of Rum from territory conquered from Byzantium in Anatolia (from 1071), commercial prosperity and territorial expansion in the 13th century, the Turkish Dānishmendīd state in northern Anatolia (c. 1071–1177) and its absorption by the Seljuqs
2. The Mongolian invasions of eastern Europe and Southwest Asia in the 13th century
3. Southwest Asia and eastern Europe after the Mongolian invasions
 - a. Mongol successor states (c. 1250–c. 1480)
 - i. The Mongolian Il Khans in Iraq and Iran (c. 1250–1353): trade, administration, and eventual conversion to Islām; the Timurids and other Il Khan successor states
 - ii. The khanate of the Golden Horde in eastern Europe (from 1240): adoption of Islām, gradual absorption of the Mongols into the Turkish *ulus* to form the Tatar people, the zenith of the empire in the early 14th century, Timur’s invasion (1395) and its later partition
 - b. Turkish Anatolia and the rise of the Ottoman Empire to 1481
 - i. Origins and expansion of the Ottoman state (c. 1300–1402): its expansion in Anatolia and conquest of Serbia and Bulgaria in the 14th century, defeat by Timur (1402), restoration of the empire and beginning of the Ottoman challenge to the European states by the invasion of Hungary (1434), conquest of Constantinople (1453) and conquest of Anatolia
 - ii. Development of Ottoman administrative and military institutions
4. North Africa and Muslim Spain (c. 1050–c. 1490)
 - a. The decline of the Fāṭimīds (c. 1050–1171) in the face of Seljuq and crusader invasions
 - b. The Ayyūbīds and Mamlūks in Egypt and Syria (1171–c. 1500)
 - i. Establishment of the Ayyūbīd dynasty in Egypt and expansion of its control over Muslim Syria under Salādīn (1171–93): conflict with the crusader states, pacific policies of his successors
 - ii. Displacement of the Ayyūbīds by the Turkish Mamlūks in 1250, the Bahri Mamlūks’ resistance to the Mongols and extension of European power in Syria under Quṭuz and Baybars I (1260–77), their displacement by the Burjī Mamlūks in 1382, Mamlūk administration and military institutions, the continued maintenance of Sunnī orthodoxy
 - c. The Berber Almoravid and Almohad empires in northwest Africa and Spain (1056–1269)
 - i. Almoravid origins as a religious reform federation in the western Sudan, conquest of Morocco and western Algeria under Abū Bakr and Yūsuf ibn Tāshufīn (1062–92), the latter’s intervention in Spain against the expanding Christian states, Almoravid conquest of Muslim Spain (1090–91), weakness and decline in the face of the renewal of the Reconquista and the Almohad revolt in North Africa (c. 1123)
 - ii. The Almohad religious reform movement under the Berber Muḥammad ibn Tūmart (d. 1130) and the extension of Almohad control over Muslim Spain (capital at Seville) and the Maghrib (1145–72), initial containment of the Reconquista and later disintegration of the empire in Spain after 1212, subsequent eclipse in the Maghrib, Almohad patronage of philosophy and the arts
 - d. The east medieval dynasties of North Africa (13th–15th century): political and cultural developments
 - i. The Ḥafṣīds in Tunisia, the ‘Abd al-Wāḍīd kingdom of Tīlīmāsān, the Marinīds in eastern Morocco and their problems with the Arabs, political life, the Naṣrīd kingdom of Granada
 - ii. Religious, intellectual, and artistic life: Ṣūfīsm, literary and artistic influences from Muslim Spain

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the crusading movement, the Islāmic states of Southwest Asia, North Africa, and Europe, and the states of Eastern Christendom from c. 1050 to c. 1480

Balkan States	Crusades, The	Jerusalem	Syria
Byzantine Empire,	Egypt	North Africa	Transcaucasia
The History	Islāmic	Russia	Turkey and
of the	World, The	Spain	Ancient Anatolia

MICROPAEDIA: Selected entries of reference information

General subjects

<i>Balkans:</i>	Kipchak	Moor	<i>Middle East—other:</i>
Bogomil	Kulikovo, Battle of	Morisco	Ak Koyunlu
Epirus,	Moscow, Grand	Mozarab	Anatolia
Despotate of	Principality of	Navas de Tolosa,	Ankara, Battle of
Kosovo, Battle of	Neva, Battle of the	Battle of Las	Assassin
(1389)	Novgorod,	Reconquista	bashi-bazouk
Kosovo, Battle of	Treaty of	Valencia	Jalāyirid
(1448)	Pechenegs	<i>Middle East—</i>	Kara Koyunlu
Maritsa River,	Rus	<i>Crusades:</i>	Little Armenia
Battle of the	Ryazan	Antioch	Mamlūk
Moldavia	Suzdal	Arsūf, Battle of	Myriocephalon,
Morea,	Tver	Children's	Battle of
Despotate of	Ugra, Battle of the	Crusade	Nicaea, empire of
Serbia	veche	crusade	Seljuq
Thrace	Volhynia	Ḥaṭṭīn, Battle of	<i>other:</i>
Vlach	<i>Iberia and</i>	Holy Lance	Bari, Siege of
Walachia	<i>northwestern Africa:</i>	Jerusalem,	pronoia system
Zara, Siege of	Almohads	Assizes of	
<i>eastern Europe:</i>	Almoravids	Jerusalem,	
Crimea, khanate	Barghawāṭah	Kingdom of	
of the	Granada	Nicopolis, Battle of	
Golden Horde		Saracen	

Biographies

<i>Christians—Balkans</i>	Manuel I	<i>Muslims—Iberia and</i>	Mehmed II
<i>and Russia:</i>	Comnenus	<i>northwestern Africa:</i>	Murad I
Alexander Nevsky,	Manuel II	'Abd al-Mu'min	Murad II
Saint	Palaeologus	Ḥaḥṣid dynasty	Nizām al-Mulk
Ivan III	Metochites,	Ḥammūdīd	Saladin
Ivan Asen I	Theodore	dynasty	Salghurid dynasty
Ivan Asen II	Michael VIII	Hūdid dynasty	Sanjar
Kotromanić	Palaeologus	Zirid dynasty	Toghri'l Beg
dynasty	<i>Christians—Crusader</i>	<i>Muslims—Middle</i>	Zangid dynasty
Rurik dynasty	<i>states:</i>	<i>East:</i>	
Stefan Dušan	Bohemond I	Alp-Arslan	
Vasily I	John	Artuqid dynasty	
<i>Christians—</i>	(Constantinople)	Baybars I	
<i>Byzantine Empire:</i>	Lusignan family	Dānishmend	
Alexius I	Mézières,	dynasty	
Comnenus	Philippe de	Eldegūzid dynasty	
Isaac II Angelus	Raymond	Ghāzān, Maḥmūd	
John III Ducas	(Antioch)	Khwārezm-Shāh	
Vatatzes	Reginald of	dynasty	
	Châtillon		

INDEX: See entries under all of the terms above

Division III. Peoples and Traditional Civilizations of East, Central, South, and Southeast Asia

[For Part Nine headnote see page 343.]

For each nation or group of peoples covered in this division, the outline treats first of the geography and ethnography and then moves into the chronology of the respective civilization: Sections 931 and 932 outline the Chinese dynasties from the Ch'in through the late Ch'ing (mid-19th century).

Section 933 deals with the peoples of inner Asia and the steppe and covers the early histories of Manchuria, Turkistan, and Afghanistan; of the Mongol Empire and its successor states; and of Tibet and Nepal.

Section 934 outlines the character and achievements of the Japanese and Korean civilizations from their beginnings until the Meiji Restoration of 1868 and the Japanese annexation of Korea in 1910.

Sections 935 and 936 treat of the civilizations of the Indian subcontinent, of the early political units of India and Ceylon, the period of Muslim hegemony, the Mughal and Marāthā empires, and, for Ceylon, the arrival of the Portuguese in 1505.

Section 937 deals with the peoples and civilizations of Southeast Asia, including the histories of Burma, Siam, Cambodia, Vietnam, and Malaya, as well as the islands of the Indonesian Archipelago, until *c.* 1600.

Section 931. China to the Beginning of the Late T'ang (AD 755) 375

932. China from the Late T'ang (AD 755) to the Late Ch'ing (*c.* 1839) 377

933. Inner (Central and Northeast) Asia to *c.* 1750 379

934. Japan to the Meiji Restoration (1868), and Korea to 1910 381

935. The Indian Subcontinent and Ceylon to *c.* AD 1200 383

936. The Indian Subcontinent from *c.* 1200 to 1761, and Ceylon from *c.* 1200 to 1505 385

937. The Peoples and Civilizations of Southeast Asia to *c.* 1600 387

Section 931. China to the Beginning of the Late T'ang (AD 755)

- A. The character and achievements of Chinese civilization, the geography and ethnography of China, archaeological and documentary historical sources, historiographic problems
- B. The emergence of traditional Chinese civilization
 1. The prehistoric period
 - a. The Paleolithic and Mesolithic stages in North China: industries in the Ordos region, microlithic tools
 - b. The Neolithic stage: pebble tools and domesticated animals, "Mongolian Neolithic"
 - c. The Yang-shao Painted Pottery culture
 - i. Stratigraphy: villages of Hsi-yin-ts'un and Yang-shao-ts'un, pottery styles
 - ii. Painted pottery styles, sites in Kansu, ornamental designs, stone implements
 - d. The Lung-shan Black Pottery complex and western limits of Black Pottery culture, the Late Neolithic Period in South China and the Early Bronze Age in North China, bronze objects in the Ordos region
 2. The beginnings of the Chinese civilization: the early dynasties
 - a. Origins of the Chinese people and culture: legends and cultural centres, the Hsia dynasty (*c.* 2205–*c.* 1766 BC)
 - b. The Shang, or Yin, period (*c.* 1766–*c.* 1122 BC): Chengchow site as early capital and cultural centre at Anyang, social system, early calendar, warfare, industry and commerce, script
 - c. The Western (early) Chou (1122–771 BC): the conquest of Shang under Wen Wang and Wu Wang (1111 BC), Chou feudal system
 - d. The Eastern (later) Chou (771–481 BC), also called the Chun Ch'iu period; internal chaos; period of the Warring States (481–221 BC)
 - i. Breakdown of the Chou feudal system: capital at Loyang, rivalry among Chou states, various Chou successor states in the Warring States period (481–221 BC)
 - ii. Social, political, and cultural changes: decline of feudalism, urbanization and assimilation, rise of monarchy under Wen Kung, economic development
 - e. The Classical period of Chinese literature and philosophy: Chinese religion and cosmology, Confucianism and Taoism, the "hundred schools" (the Naturalists, the Dialecticians, Mo-tzu, Meng-tzu [Mencius], Chuang-tzu, the Legalists)

C. The unification of China under the Ch'in and Han dynasties (221 BC–AD 220)

1. Establishment of the Ch'in empire (221–206 BC): development of central government, fall of the dynasty after death of Shih Huang Ti
 - a. Early successes of the Ch'in under Mu Kung, reforms of Hsiao Kung and Shang Yang
 - b. Ch'in strategy, unification of China by the Ch'in (221 BC), abolition of feudal system, highway building and construction of the Great Wall in the reign of Shih Huang Ti, the minister Li Ssu, political repression
2. The Han dynasty
 - a. Western (Former or Earlier) Han (206 BC–AD 8) and the Wang Mang usurpation (AD 9–23)
 - i. Establishment of the dynasty by Liu Pang (Han Kao Tsu): the capital at Ch'ang-an, reign of Liu Heng (Han Wen Ti) from 179 to 157 BC, consolidation of Imperial power
 - ii. Expansion under Han Wu Ti (140–87 BC) into southern China and Central Asia, dynastic crisis (91–87 BC), ascendancy of the Wang family and Wang Mang's usurpation of throne (AD 9–23)
 - b. The Eastern (Later) Han: restoration of the dynasty by Liu Hsiu (Han Kuang Wu Ti) (AD 25–57), capital at Loyang, domestic and foreign policy, decline of government after AD 125
 - c. Political developments, foreign relations, and cultural attainments in the Han period
 - i. The Han political system: the structure and the practice of government
 - ii. Relations with other peoples: the Hsiung-nu of Central Asia, Pan Ch'ao's campaigns in Central Asia
 - iii. Han cultural life: educational developments, invention of paper, prose writing, developments in music and the visual arts, introduction of Buddhism

D. The breakdown and revival of the empire

1. The Six Dynasties period (AD 220–589)
 - a. The division of the empire into the Three Kingdoms of Wei (North China), Shu Han (Szechwan), and Wu (South China): era of barbarian invasions and rule, the period of the Sixteen Kingdoms (304–589)
 - b. Intellectual and religious trends: decline in Confucianism, Taoist resurgence, spread of Buddhism
2. The reunification of China under the Sui and early T'ang dynasties
 - a. The Sui (581–618): Sui founder Yang Chien (Sui Wen Ti), institutional reforms
 - b. The reign of Yang Ti (605–618): integration of the South, foreign affairs, military reverses and collapse of the dynasty
 - c. The early T'ang (618–624) and the period of T'ang power (626–755)
 - i. Li Yüan's (618–626) establishment of the dynasty: resistance to T'ang conquest, administration of the state, fiscal and legal system
 - ii. The era of good government in the reign of T'ai Tsung (626–649): educational and administrative reforms, conquest of eastern Turks, Kao Tsung (649–683) and influence of Empress Wu, conquest of Oxus Valley and later military reverses
 - iii. Prosperity and progress in the reign of Hsüan Tsung (712–756): internal reforms, military reorganization

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with China to the beginning of the late T'ang (AD 755)

Asia
China
Nanking

MICROPAEDIA: Selected entries of reference information

General subjects

<i>ancient cultures and historic sites:</i>	Ch'in tomb	Hsiung-nu	Sha-ch'ing
Ch'i-chia culture	Great Wall of China	Lung-shan culture	<i>dynastic capitals:</i>
		Pan-p'o-ts'un	An-yang

Hsien-yang	Chou dynasty	Spring and	Chinese civil
Lo-yang	Ch'u	Autumn Period	service
Nanking	Han dynasty	Sui dynasty	equal-field system
Sian	Hsia dynasty	T'ang dynasty	Five Pecks of Rice
Ta-t'ung	Lu	Three Kingdoms	fu-ping
Yang-chou	Nangnang	Warring States	Hanlin Academy
<i>dynasties, periods,</i>	Shang dynasty	Wei dynasty	well-field system
<i>and states:</i>	Six Dynasties	<i>government and</i>	
Ch'i	Southern	<i>society:</i>	
Chin dynasty	Dynasties	Bamboo Annals	
Ch'in dynasty		ensor	

Biographies

<i>officials and military</i>	Shang Yang	<i>rulers:</i>	T'ai-tsung (T'ang)
<i>leaders:</i>	Ts'ao Ts'ao	Hsiao-wen ti	Wang Mang
Chao Kao	<i>philosophers:</i>	Hsüan Tsung	Wen-ti (Sui)
Hsiang Yü	Chuang-tzu	(T'ang)	Wu Hou
Li Ssu	Confucius	Kao-tsu (Han)	Wu-ti (Chin)
Lü Pu-wei	Lao-tzu	Kao-tsu (T'ang)	Wu-ti (Han)
Pan Ch'ao	Mencius	Kuang-wu ti	Yang Ti
	Mo-tzu	Shih huang-ti	

INDEX: See entries under all of the terms above

Section 932. China from the Late T'ang (AD 755) to the Late Ch'ing (c. 1839)**A. The late T'ang dynasty, the Ten Kingdoms, the Five Dynasties, and the Sung dynasty****1. The late T'ang and the Northern Sung**

- a. The late T'ang (755-907): the rebellion of An Lu-shan (755-757) and its effects, provincial separatism, attempts to restore central authority, growth in power of provincial warlords
- b. T'ang cultural life: the growing influences of Buddhism, developments in music and the visual arts
- c. Social and economic developments: the decline of the aristocracy and social mobility, agricultural advances and expansion of trade
- d. The period of the Five Dynasties and the Ten Kingdoms (907-960)
 - i. The short-lived Five Dynasties in North China: the Liang dynasty, advance of talented bureaucrats in government posts
 - ii. The more permanent Ten Kingdoms: the Tanguts; the Khitan, or Liao, empire; the kingdoms of Wu, the Southern T'ang, the Southern P'ing, the Ch'u, the Earlier and Later Shu, the Min, the Southern Han, and the Wu-yüeh
- e. The Northern Sung (960-1126): foundation of the dynasty and its expansion under T'ai-tsu and T'ai-tsung and their successors
 - i. Unification and centralization of the empire: development of the Imperial civil service in T'ai-tsu's reign (960-976), further consolidation under Chen Tsung (998-1022)
 - ii. Reforms in the reign of Shen Tsung (1068-85): leadership of Wang An-shih, criticism of the reforms leading to the decline and fall of the dynasty

2. The Southern Sung (1127-1279): survival and consolidation, defeat by the Juchens and removal of the Sung to South China under Kao-tsung**3. Sung cultural and economic developments; e.g., resurgence of Neo-Confucianism, visual arts and music, scholarship, historiography, invention of printing, manufacturing advances****B. Mongol-Chinese rule under the Yüan dynasty (1279-1368)****1. The Mongol conquest of China: imposition of Mongol government and policies**

- a. Genghis Khan's conquest of the Chin (1211-34), invasion of the Sung and the establishment of the Yüan dynasty under Kublai Khan
- b. Mongol government and administration: transfer of the capital to Ta-tu (Peking), nonassimilation with the Chinese, expansion of trade

2. Religious and intellectual life, relations with the West, decline of Mongol rule
 - a. Religious toleration and patronage of Buddhism, the status of the Confucian scholar, developments in the arts
 - b. Yüan China and the West: commercial and cultural contacts, arrival of Catholic missionaries
- C. The Ming and Ch'ing dynasties to *c.* 1839: the tribute system, relative stability, ethnocentrism, and emphasis on cultural unity
 1. The Ming dynasty (1368–1644)
 - a. Foundation of the Ming and its political and social structure
 - i. Peasant uprisings and the foundation of the dynasty (1368) by Chu Yüan-chang (Hung-wu): pattern of dynastic succession, gradual degeneration of Ming government
 - ii. Government and administration: local and central government, later innovations to coordinate central government and regional administration
 - b. Developments in foreign relations and economic policy
 - c. Cultural life in the Ming period: philosophy and religion, developments in the visual arts, music, literature, and scholarship
 2. The Ch'ing (Manchu) dynasty to *c.* 1839
 - a. The Manchu rise to power (1644): preservation of the Ming administration under joint Manchu–Chinese supervision
 - i. Manchu entrance in Peking and territorial conquest ending with the seizure of Taiwan (1683): early Ch'ing institutions
 - ii. Early foreign relations in Asia, contacts with the West
 - b. Mid-Ch'ing social and economic developments: the role of religious associations, expansion of industry, social unrest, intellectual and cultural advances
 - i. Advances in agriculture through increased rice cultivation and introduction of new crops, expansion of crafts and industries, commerce and finance
 - ii. Population growth and immigration, religious associations, the White Lotus Rebellion (1796–1804)
 - iii. Cultural developments; *e.g.*, government interference in scholarship; introduction of Western sciences; advances in music, literature, and the visual arts
 - c. Dynastic degeneration and widespread governmental corruption beginning in the 1760s; economic decline, famine, and social unrest in the early 1800s

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and a biography dealing with China from the late T'ang (AD 755) to the late Ch'ing (*c.* 1839)

Asia	Genghis Khan
Canton	Nanking
China	Peking
Chungking	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>capital cities:</i>	Yang-chou	Sung dynasty	kowtow
Canton	<i>dynasties, kingdoms,</i>	T'ang dynasty	pao-chia
Ch'ang-sha	<i>and states:</i>	Ten Kingdoms	Tung-lin
Ch'eng-tu	Chin dynasty	Yüan dynasty	<i>other:</i>
Chungking	(Juchen)	<i>government and</i>	Cathay
Hang-chou	Ch'ing dynasty	<i>society:</i>	Hakka
Lo-yang	Five Dynasties	Banner system	Nerchinsk,
Nanking	Hsi Hsia	Canton System	Treaty of
Peking	Liao dynasty	Chinese civil	White Lotus
Sian	Ming dynasty	service	Rebellion

Biographies

<i>emperors:</i>	T'ai-tsu (Sung)	Cheng	Wu San-kuei
Cheng-te	T'ai-tsung (Sung)	Ch'eng-kung	Yüeh Fei
Chia-ch'ing	Yung-cheng	Cheng Ho	<i>Westerners:</i>
Ch'ien-lung	(Ch'ing)	Dorgon	Polo, Marco
(Ch'ing)	Yung-lo (Ming)	Hsü Kuang-ch'i	Ricci, Matteo
Hung-wu	<i>statesmen and</i>	Huang Tsung-hsi	
K'ang-hsi (Ch'ing)	<i>military leaders:</i>	Nurhachi	
Kublai Khan	An Lu-shan	Ou-yang Hsiu	
Shen Tsung (Sung)		Wang An-shih	

INDEX: See entries under all of the terms above

Section 933. Inner (Central and Northeast) Asia to c. 1750

- A. The peoples of the steppes, their cultures, and their interactions with neighbouring civilizations; the geography and ethnography of Inner Asia; archaeological and documentary historical sources; historiographic problems
- B. The peoples and states of Inner Asia to c. AD 1200
1. The Hsiung-nu tribal confederation dominating Mongolia, southern Siberia, and eastern Turkistan from c. 400 BC to c. AD 50; pressure on it and its destruction by Han China
 2. The Manchurian tribes: attempts at unification, fluctuating relations with the Chinese until the advent of the Mongols
 - a. The Tung-hu tribes and Chinese presence in Manchuria to the 3rd century BC, ascendancy of the Hsien-pei and establishment of the Yin kingdom by Mu-jung Hui (AD 352), the Parhae (P'o-hai) kingdom (AD 712)
 - b. The Khitan and Juchen empires: penetration into China, Korea, and Mongolia; Juchen conquest of Chinese Sung territory; capital at Yen-ching (Peking); conquest by Mongols in 1234
 3. Development of West and East Turkistan to c. 1750
 - a. West Turkistan: the early empires, Muslim rule, the Chagatai khans and Timurids, the Uzbek and Kazakh khanates
 - b. East Turkistan (Kashgaria): Kyrgyz, Uighur tribes, Qarakhanid rule in the 10th century, Mongol conquest and rule in the 13th century, conquest by Manchus (1758–59)
 4. The Mongolian and Tungusic states from the 10th to the 13th century: the Liao (Khitan) empire and the later Chin (Juchen) state in North China and Manchuria (947–1125), the Western Liao (Kara khitai) of Turkistan (1124–1211)
 5. The development of Afghanistan to c. 1700: rule by Achaemenians and Greeks to c. 1st century AD, various nomadic rulers, advent of Muslim control in the 7th century, Mongol conquest (1221), later rule by Timurids and Mughals
- C. The Mongol Empire and its successor states
1. The establishment of a united Mongol Empire in Central, eastern, and western Asia by Genghis Khan and his successors (1206–60)
 - a. The rise of Genghis Khan and his military and political organization, tactics, and conquests
 - b. The division of his empire among his sons: further expansion under Ögödei Khan, Mangu (Möngke) Khan's friendly relations with Western Christendom
 2. The Mongol successor states
 - a. The completion of the conquest of China (1260–79) and the foundation of the Yüan dynasty by Kublai Khan
 - b. The Chagatai khanate (*ulus*) of Turkistan in the 13th and 14th centuries
 - c. Timur's (Tamerlane's) establishment of the Timurid dynasty (1370–1506): his capital at Samarkand; his conquests; Turkistan, Afghanistan, and Transoxania under his successors
 - d. The Iranian Il Khans (1258–1335): the Golden Horde (later Kipchak empire) in eastern Europe and its successor states (1240–1783)

- e. Mongolia from the 13th to the 18th century: internecine strife, the revival of Buddhism, subjection to Yüan China and later autonomy and disunity until the ascendancy of the Manchus (Ch'ing China) in the 18th century
- D. Tibet and Nepal to c. 1750
1. Tibet to c. 1750
 - a. The legendary origins of the Tibetan people, consolidation of Tibet under Gnam-ri srong-btsan (c. AD 570–619), later rulers to the 9th century, introduction of Buddhism, cultural developments
 - b. Tibetan disunity from the 9th to the 14th century: eclipse and resurgence of Buddhism, conquest by Mongols, developments in literature and the visual arts
 - c. Rule by the Dge-lugs-pa (Yellow Hat) monastic order, unification of Tibet (1642), Tibet under Chinese overlordship (1720)
 2. Nepal to c. 1750: rule by Indian princely families, influence of Hinduism, relations with China and Tibet
- E. The waning of nomad power from the 16th to the 18th century: the Manchu conquest of China and parts of Inner Asia, the Afghans as the last nomad power in Inner Asia, Russian expansion into Siberia and western Turkistan

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and a biography dealing with inner (Central and Northeast) Asia to c. 1750

Asia
 Central Asia
 China
 Genghis Khan
 Mongolia
 Nepal
 Steppe, The History of the Eurasian

MICROPAEDIA: Selected entries of reference information

General subjects

<i>dynasties and empires:</i>	Uzbek dynasty	Oyrat	Samarkand
Chin dynasty (Juchen)	Yüan dynasty	Yüeh-chih	Sogdiana
Golden Horde	<i>peoples:</i>	<i>other:</i>	Turkistan
Gtsang dynasty	Chahar	Karakorum	
Liao dynasty	Hsiung-nu	Parhae	
	Juan-juan	Qarluq	
	Mongol	confederation	

Biographies

Abahai	Möngke	Phag-mo-gru	Timur
Batu	Mozaffarid dynasty	family	Timurid dynasty
Il-Khanid dynasty	Nurhachi	Qarakhanid	Willem van
Kublai Khan	Ögödei	dynasty	Ruysbroeck

INDEX: See entries under all of the terms above

Section 934. Japan to the Meiji Restoration (1868), and Korea to 1910

- A. Introduction: the character and achievements of Japanese and Korean civilizations, the geography and ethnography of Japan and Korea, archaeological and documentary historical sources, historiographic problems
- B. Early Japan
1. Prehistoric cultures: nonceramic cultures in the Paleolithic Period, Jōmon (5th or 4th millennium to c. 250 BC) and Yayoi (c. 250 BC–AD 250) Neolithic pottery cultures, agriculture and the influx of Chinese culture
 2. The ancient period: unification of Japan under the Yamato court and subsequent governments (c. 250–710)
 - a. The rise and fall of the Yamato court: relations with Korea, internal power struggles, introduction of Buddhism
 - b. The governmental reforms of Shōtoku Taishi of the Soga family: theories of ideal government, the 12 court rank and the “Seventeen Article Constitution,” relations with China, spread of Buddhism
 - c. The Taika reforms (645), elimination of the Soga family, land reform, intervention in Korea, the *ritsu-ryō* system of social and land reform
 3. The Imperial state from 710 to 1185
 - a. Government-directed religious and cultural developments in the Nara period (710–784): flowering of Buddhism; Chinese and Indian influences on literature, music, and the visual arts
 - b. The Heian period (794–1185): changes in the *ritsu-ryō* system, ascendancy of the Fujiwara family and growing importance of the aristocracy
 - i. Failure of Taika land reforms, power struggles among the nobility, growth of Fujiwara control over government, rise of Japanese literature and rejection of Chinese culture
 - ii. Government by “cloistered” emperors: decline of Fujiwara power and rise of the samurai class, the Hōgen (1156) and Heiji (1159) uprisings, introduction of feudalism
- C. Feudal Japan
1. The Kamakura period (1192–1333)
 - a. Minamoto Yoritomo and the founding of the *bakufu* (shogunate) at Kamakura (1192), the samurai *shugo* as feudal lords
 - b. The rise of the Hōjō family from 1199: the Jōkyū Disturbance (1221), Hōjō Yasutoki’s (1224–42) administrative reforms, the Jōei law code
 - c. Resistance to the Mongol invasions of Japan (1274 and 1281), the Kamakura *bakufu* and feudal administration of farming regions
 - d. Buddhist culture during the Kamakura period (e.g., growth of Zen) and Neo-Confucianism: literature, philosophy, and the visual arts
 - e. Decline of Kamakura society: economic problems leading to the rise of daimyo (domain lord) class and decline of *bakufu*
 2. The second feudal era: the Muromachi, or Ashikaga, period (1338–1573)
 - a. The Kemmu Restoration (1333) and return to direct Imperial rule: the emperor Go-Daigo, the Kemmu legal code, Ashikaga Takauji and the dual dynasties (1336–92)
 - b. Yoshimitsu’s establishment of the Muromachi *bakufu* (1378) and unification of the dual dynasties (1392): taxation and strong military governors, feudal warfare after 1428
 - c. Increased trade with China: piracy, the Ōnin War (1467–77), provincial self-government and growing influence of farmers
 3. The period of the “warring country” and the beginning of unification under the Oda regime
 - a. Unification under *sengoku* (civil war) daimyo league leaders: development of commerce and guilds
 - b. Arrival of the Portuguese (1543) and Spanish (1549): opening of trade, Catholic Jesuit missionary activity (1549)

- c. Cultural development in the 15th and 16th centuries: the influence of Zen Buddhism on philosophy, drama, literature, and the visual arts
 - d. The Azuchi-Momoyama period (1574–1600): unification under Oda Nobunaga (1549–82) and Toyotomi Hideyoshi (1582–98)
4. The Tokugawa period (1603–1867): military–bureaucratic rule
- a. Establishment (1603) and consolidation of the Tokugawa (Edo) shogunate by Tokugawa Ieyasu: Japanese policy of national seclusion (1630s) from Christian missionaries and most European traders
 - b. The Tokugawa postfeudal military–bureaucratic system: class structure and *bakuhau* system
 - c. Industrial and commercial developments, advances in literature and the visual arts
 - d. The weakening of the *bakuhau* system and its eventual collapse
 - i. Economic crises: impoverishment of small farmers and commercial problems, political reform, opening of Japan to Western influences (1840s)
 - ii. Cultural developments in the 18th and 19th centuries: Confucianism and the Shintō revival, Buddhism, literature and the visual arts
 - iii. The Tempō reforms and downfall of the *bakuhau*: economic and administrative measures, pressure from Europe and the U.S.
- D. Korea to 1910
- 1. The prehistoric origins of the Korean people, the use of ironware and emergence of tribal states in the Bronze Age
 - 2. The Three Kingdoms of Korea (Koguryō, Paekche, and Silla) and their interactions (c. 57 BC–AD 668), introduction of Buddhism, literature and the visual arts
 - 3. The unification of Korea under Silla control (668–935): adoption of Chinese governmental organization and land tenure system, emergence of provincial magnates, cultural developments
 - 4. The Koryō dynasty (935–1392): social and cultural developments, military rule, land reform and social change after the Mongol invasions (1231–c. 1261)
 - 5. The Yi (Chosōn) dynasty (1392–1910)
 - a. The establishment of a Confucian state: royal bureaucratic government, decline of Buddhism and emergence of Confucian culture, introduction of printing
 - b. Invasions by Japan (1592–98) and the Manchu (c. 1619–1636): Korea as a Ch'ing (Manchu) vassal, Silhak scholarship and cultural development, introduction of Roman Catholicism
 - c. Relations with foreign countries: growth of Japanese influence, the Tonghak Revolt (1894) and government reform, Japanese supremacy in Korea (1910)

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with Japan to the Meiji Restoration (1868), and Korea to 1910

Asia
 Japan
 Korea
 Kyōto
 Ōsaka-Kōbe Metropolitan Area
 Tokyo-Yokohama Metropolitan Area

MICROPAEDIA: Selected entries of reference information

General subjects

<i>Japan—government and society:</i>	han	shugo	Hōgen Disturbance
be	kabane	tennō	Jinshin-no-ran
Bushidō	kampaku	uji	Ōnin War
chōnin	Kebiishi	wakō	Sekigahara,
daimyo	rangaku	za	Battle of
Dajōkan	rōnin	<i>Japan—historic events:</i>	Shimabara
equal-field system	samurai	Gempei War	Rebellion
	shogunate		

<i>Japan—historic periods:</i>	Nara period	Taihō code	yangban
Asuka period	Tokugawa period	Taika era reforms	Yi dynasty
Azuchi-Momoyama period	Tumulus period	<i>Korea—government and society:</i>	<i>Korea—states:</i>
Bunka-Bunsei period	Yayoi culture	Hwarangdo	Kaya
Genroku period	<i>Japan—laws and treaties:</i>	kol'um	Koguryō
Heian period	Harris Treaty	Koryō dynasty	Nangnang
Jōmon culture	Kanagawa, Treaty of	Silhak	Paekche
Kamakura period	Kansei reforms	Sōhak	Parhae
Muromachi period	Seventeen Article Constitution	sōwōn	Silla
		Unified Silla dynasty	

Biographies

<i>Japan—emperors:</i>	Tokugawa	Ii Naosuke	<i>Japan—other:</i>
Antoku	Hidetada	Kusunoki	Dōkyō
Daigo, Go-	Tokugawa Iemitsu	Masashige	Honda Toshiaki
Himiko	Tokugawa Ieyasu	Maeda family	Nichiren
Kammu	Tokugawa Yoshimune	Matsudaira	Tokugawa Mitsukuni
Sanjo, Go-	<i>Japan—warriors and statesmen:</i>	Sadanobu	Yamaga Sokō
Shirakawa	Abe Masahiro	Minamoto Yoshitsune	<i>Korea:</i>
Shirakawa, Go-Shōmu	Arai Hakuseki	Mōri family	Chajang Yulsa
Tenji	Fujiwara family	Nitta Yoshisada	Ch'oe Che-u
Toba, Go-	Fujiwara	Oda Nobunaga	Ch'oe Si-hyōng
Uda	Kamatari	Sakuma Zōzan	Han Yong-an
<i>Japan—shoguns:</i>	Fujiwara	Shimazu family	Kojong
Ashikaga Tadayoshi	Michinaga	Shimazu Nariaki	Sejong
Ashikaga Takauji	Fujiwara Tokihira	Shōtoku, Taishi	Son Pyōng-hi
Ashikaga Yoshimasa	Hayashi Shihei	Soga Umaku	<i>other:</i>
Ashikaga Yoshimitsu	Hōjō family	Taira family	Harris, Townsend
Minamoto Yoritomo	Hōjō Tokimasa	Taira Kiyomori	Perry, Matthew C.
	Hōjō Tokimune	Takasugi Shinsaku	Valignano, Alessandro
	Hōjō Yasutoki	Tanuma Okitsugu	Xavier, Saint Francis
	Hōjō Yoshitoki	Toyotomi Hideyoshi	

INDEX: See entries under all of the terms above

Section 935. The Indian Subcontinent and Ceylon to c. AD 1200

- A. The character and achievements of traditional Indian civilizations and their influence on Ceylonese and Southeast Asian civilizations, the geography and ethnography of the Indian subcontinent and Ceylon, archaeological and documentary historical sources, historiographic problems
- B. India from the prehistoric period to AD 300: the emergence of civilization in the Indus River Valley, the growth of kingdoms and the great empires
 1. Late Stone Age hunters and Neolithic settlement in Baluchistān and the Indus Valley, first settlements east of the Indus
 2. Indus civilization (c. 2300–c. 1750 BC): social, economic, and cultural developments
 - a. Development of urban centres; e.g., Mohenjo-daro, Harappā, Kalibangan, Lothal
 - b. Developments in agriculture, animal husbandry, metalwork and pottery, transportation, and trade
 - c. Developments in languages, religion, and the visual arts
 3. The development of the Indo-Aryan states (c. 1500–600 BC): urbanization at Kāśī (Vārānasi) and elsewhere in the Ganges Valley, other cultures in the Indian subcontinent
 - a. Early Ganges cultures to c. 1200 BC: social organization and religious development
 - b. Later Ganges cultures to c. 600 BC: development of the caste system and emergence of Brahman, Kṣatriya, Vaiśya, and Śūdra castes

4. Pre-Mauryan states (c. 600–150 BC): development of political and economic systems, Taxila as a cultural centre
 - a. The early development of Buddhism and Jainism, beginning of Magadha ascendancy
 - b. Invasion by Alexander the Great (327 BC) and establishment of Greek settlements
 5. Development of the Mauryan empire (c. 321–185 BC): the capital at Pāṭaliputra (Patna)
 - a. Establishment of the empire by Candra Gupta (c. 321–c. 297 BC) and consolidation by Aśoka (c. 265–238 BC)
 - b. Mauryan economic, social, and administrative developments, evolution of the concept of the state
 6. The rise of small kingdoms in the north (150 BC–AD 300): Indo-Greek and Asian rulers, various local republics and kingdoms (Śuṅga, Kāliṅga)
 7. South Indian civilizations to AD 300
 - a. Development of guilds, banking systems, and extensive maritime trade with the West
 - b. Cultural and religious development; e.g., patronage of religious art and literature, growth of sects in Hinduism and Jainism, assimilation of foreigners into caste society
- C. North India, the Deccan, and South India (AD 300–750)
1. The Guptas of North India (AD 320–540): expansion and administration of territory, invasions by the Hūṅas (c. mid-5th century), successor states to the Guptas
 2. Various kingdoms of the Deccan: the Vākāṭaka dynasty, the Cālukyas, and the Rāṣṭrakūṭas
 3. The Pallavas in South India: developments in religious art and architecture, literature, and science
- D. North India (750–1200), the Deccan, and South India (750–c. 1330): new dynasties and centres of power
1. The tripartite struggle in North India, the Rājput kingdoms, Turkish control in Ghazna from 998
 2. The decline of the Cālukyas in the Deccan and the rise of the Cōḷas in the 10th century, later Hoysaḷas and Pāṇḍyas control, relations with the south
 3. Social, economic, and cultural developments; e.g., feudalism and economic decentralization, partial social mobility, growth of Tantrism, literature and the visual arts
- E. Ceylon from the prehistoric period to the end of the Classical Age (AD 1200)
1. Prehistoric settlements in Ceylon, colonization by Indo-Aryan tribes in the 5th century BC, conversion to Buddhism (c. 3rd century BC)
 2. Ceylon in the Classical Age (c. 200 BC–AD 1200): the Polonnaruva dynasties, growth of Sinhalese political institutions, social and agricultural developments

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the Indian subcontinent and Ceylon to c. AD 1200

Asia
India
Nepal
Sri Lanka

MICROPAEDIA: Selected entries of reference information

General subjects

<i>historic regions and sites:</i>	Gedrosia	Patna	<i>kingdoms and states:</i>
Bhārhut	Halebīd	Śrāvastī	Anurādhapura
Brahmaṛṣi-deśa	Kalibangan	Taxila	Avanti
Gandhāra	Kaliṅga	Vaiśālī	Kosala
Gauḍa	Mālwa	Valabhī	Magadha
	Nālanda	Vārānasi	Mauryan empire

<i>peoples and society:</i>	Indus	Rājput	<i>other:</i>
Brahman	civilization	Sūdra	Dīpavamsa
Chandelā	Kulinism	Vaiśya	Rājatarāṅgiṇī
Hepthalite	Licchavi	Varṇa	Serendib
	Mallas	Yavana	Tarāori, Battles of

Biographies

Aśoka	Gaṅga dynasty	Mahendra	Śaiśunāga dynasty
Buddha	Gurjara-Pratihāra	Maitraka dynasty	Śaka satrap
Cālukya dynasty	dynasty	Menader	Samudra Gupta
Candra Gupta	Harṣa	Nanda dynasty	Sātavāhana
Candra Gupta I	Hoysala dynasty	Pāla dynasty	dynasty
Candra Gupta II	Īśanavarman	Pallava dynasty	Sena dynasty
Cōla dynasty	Kalacuri dynasty	Pāṇḍya dynasty	Śuṅga dynasty
Duṭṭhagāmaṇī	Kaniška	Parākramabāhu I	Vākāṭaka dynasty
Gāhaḍavāla	Kauṭilya	Rāṣṭrakūṭa	Yādava dynasty
dynasty	Kushān	dynasty	

INDEX: See entries under all of the terms above

Section 936. The Indian Subcontinent from c. 1200 to 1761, and Ceylon from c. 1200 to 1505
A. North India under Muslim hegemony (c. 1200–1526)

1. The completion of the Ghūrid conquest; the Delhi sultanate (1206–1526): the military and administrative policies of the five dynasties
 - a. The consolidation of the conquest of North India by the Slave dynasty (1206–90)
 - b. The revival of efficient administration by the Khaljī dynasty (1290–1320)
 - c. The Tughluq dynasty (1320–1413): administrative reforms by Muḥammad ibn Tughluq (1325–51), Mughal invasion (1398) and decline of Tughluq control
 - d. Tenuous control by the Sayyid dynasty (1414–51), expansion and decline of Lodī dynasty (1451–1526)
 - e. Cultural and religious developments during the Delhi sultanate; *e.g.*, Islāmic and Hindu movements and education
2. The 14th-century rise of regional kingdoms in the north: Bengal, Mālwa, Gujarāt, Jaunpur, and Kashmir

B. The Deccan (c. 1320–1627) and South India (1336–1646)

1. The Deccan (c. 1320–1627): the Bahmanī dynasty and the five Deccan sultanates
 - a. The Bahmanī dynasty (1347–c. 1527): introduction of Muslims into the Deccan and their relations with the Hindus
 - b. The rise (c. 1500) of the five sultanates of Ahmadnagar, Berār, Bīdar, Bijāpur, and Golconda; Muslim–Hindu relations; Mughal conquests in the Deccan in the 16th century
2. The Hindu Vijayanagar empire (1336–1646) in South India
 - a. Foundation of the state (1336) and its expansion in South India: conflicts with Muslim dynasties in the Deccan, decentralization and decline of state
 - b. Administrative and social organization of the empire, cultural and religious development

C. The beginning of the political and administrative unification of the subcontinent under the Mughal Empire (1526–1761)

1. The origins of the Mughals: the conquest of North India under Bābur, the Mughals' use of firearms
2. Extension and consolidation of empire by Akbar (1556–1605)
 - a. Subjection of neighbouring territories: the conquest and annexation of Bihār, Bengal, Afghanistan, and Kashmir
 - b. Akbar's administrative, fiscal, military, judicial, and religious policies

3. The empire under Jahāngīr (1605–27), Shāh Jahān (1628–58), and Aurangzeb (1659–1707): developments in the arts and agriculture
 4. Mughal decline in the 18th century: dynastic disputes and weakness after 1707 culminating in foreign invasions (1731–61)
- D. The emergence of the Marāṭhā empire in Mahārāshtra: rise to power and decline after 1761
1. The foundation (1674–80) of the dynasty by Śivājī: his challenge to Mughal authority in the Deccan, the Marāṭhā war of independence
 2. The Marāṭhās as the major power in India in the early 18th century: the contribution of the peshwas (chief ministers) to Marāṭhā success, struggle with the Portuguese, establishment of the Marāṭhā confederacy
- E. Ceylon from c. 1200 to the arrival of the Portuguese (1505)
1. Political and economic changes in the Sinhalese state: collapse of central authority, foreign invasions, growth of foreign trade
 2. Developments in culture and the Buddhist religion

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the Indian subcontinent from c. 1200 to 1761, and Ceylon from c. 1200 to 1505

Asia
India
Nepal
Sri Lanka

MICROPAEDIA: Selected entries of reference information

General subjects

<i>government and society:</i>	<i>historic events:</i>	Bharatpur	<i>kingdoms and states:</i>
Ashta Pradhan	Barāri Ghāt,	Bijāpur	Bahmanī
Cūlavamṣa	Battle of	Chandragiri	sultanate
Faṣlī era	Gogūnda, Battle of	Golconda	Bundelā
Ḥabshī	Jājau, Battle of	Gulbarga	Delhi sultanate
jāgirdār	Karnāl, Battle of	Kāmarūpa	Hyderābād
Mahāvamṣa	Pānīpat, Battles of	Karnāṭaka	Jaffna
manṣabdār	Tālikota, Battle of	Mahāvihāra	Kotte
peshwa	<i>historic regions and sites:</i>	Mālwa	Marāṭhā
Pindari	Asīgarh	Serendib	confederacy
rājākariya	Bengal	Vijayanagar	
Rājāvaliya			

Biographies

<i>Mughal emperors:</i>	Gaṅga dynasty	Hyder Ali	Prithvi Nārāyaṇ
Akbar	Hoysaḷa dynasty	Iltutmish	Shah
Aurangzeb	Khaljī dynasty	Muḥammad ibn	Shēr Shāh of Sūr
Bābur	Lodī dynasty	Tughluq	Sīrāj-ud-Dawlah
Humāyūn	Mughal dynasty	Mu'izz-ud-Dīn	Śivājī
Jahāngīr	Slave dynasty	Muḥammad ibn	
Shāh Jahān	<i>others:</i>	Sām	
<i>ruling families:</i>	Gobind Singh	Quṭb-ud-Dīn	
'Ādil Shāhī dynasty	Ḥusayan Shāh	Aybak	
Āravīḍu dynasty	'Ala' ad-Dīn		

INDEX: See entries under all of the terms above

Section 937. The Peoples and Civilizations of Southeast Asia to c. 1600

- A. The character and achievements of traditional Southeast Asian civilizations, South and East Asian influences, the geography and ethnography of Southeast Asia, archaeological and documentary historical sources, historiographic problems
- B. Mainland Southeast Asia to c. 1600
1. Myanmar (Burma) from the Anyathian culture (c. 5000 BC–AD 1600)
 - a. Origins of civilization in Myanmar: the Anyathian Stone Age culture, the Mons of southern Myanmar (c. 3rd century BC–11th century AD), Indian trade and cultural influences
 - b. The Tibeto-Burmese invasions of the Upper Irrawaddy Valley and the establishment of the Pyu state of northern Myanmar (c. 100 BC–AD 800)
 - c. The city kingdom of Pagan (849–1287): the influence of Theravāda Buddhism, Pagan as a cultural centre, destruction by the Mongols (1287)
 - d. Myanmar from c. 1300 to c. 1600: reunification and expansion
 2. The Tai people and the kingdom of Siam to c. 1500
 - a. The origins and settlement of the Tais: the kingdom of Nanchao in Yunnan (8th century AD)
 - b. Establishment of Tai power at Sukhothai (c. 1220): social and cultural developments
 - c. Establishment of the Tai state of Ayutthaya (1350): organization of administrative, social, and legal systems; wars with Lan Na during the reign of King Trailok (1448–88)
 - d. Laos to c. 1600: the Lao as a branch of the Tai people, establishment of the Lan Xang kingdom by Fa Ngum (1353–73), later rulers to 1571, successful Burmese invasion (1574)
 3. Cambodia from the prehistoric period to c. 1500
 - a. Prehistoric peoples in Cambodia, mythological origins of kingdom of Funan (c. AD 100) and the influence of Indian culture
 - b. Emergence of the state of Chenla and the decline of Funan in the 6th century
 - c. Establishment of the Khmer state of Angkor (c. 800), religion and the concept of kingship, social and administrative structures, the reign of Suryavarman II (1113–c. 1150), period of instability
 - d. Jayavarman VII (1181–c. 1218) and the reestablishment and extension of Khmer authority
 - e. Decline of the Angkor kingdom after 1220, introduction of Theravāda Buddhism, Tai invasions (1369 and 1389) and fall of city of Angkor (1431)
 4. Vietnam from the prehistoric period to c. 1516
 - a. The legendary and historical origins of the Vietnamese people, the influence of Chinese rule (from 111 BC) on Vietnamese society
 - b. The states of Funan (c. 1st–6th century AD) and Champa (AD 192–1471) in southern Vietnam
 - c. Chinese political and cultural domination of Nam Viet from 111 BC to AD 939; independence under Ly, Tran, and Le dynasties; political unification of Nam Viet and Champa (1471); government and society in precolonial Vietnam
 5. Malaya to the 16th century AD
 - a. Rise of Indianized states and their role in the formation of Malaya: the advent of Islām and the rise of the sultanate of Malacca (c. 1400–1511)
 - b. Early European intrusions: the Portuguese conquest of Malacca (1511), social and political developments in the 16th century
- C. Islands of the Indonesian Archipelago to c. 1600
1. The settlement of the Indonesian Archipelago: the introduction of Hinduism by Indian Brahmins
 2. The Malay kingdom of Śrīvijaya in southeast Java: the influence of Buddhism, the importance of the maritime trade with China from the 7th to the 12th century
 3. Central Java in the 8th and 9th centuries: cultural, religious, and economic development during the Shailendra dynasty

4. Eastern Java and the rest of the archipelago from 1019 to 1292: political and cultural developments, the Singhasāri empire of Kertanagara and the royal cult
5. The Majapahit empire in eastern Java (1319–89): religious and cultural developments
6. The spread of Islām in Indonesia: the rise of Muslim states in Sumatra and Java (c. late 13th century), conflicts between Islām and older Indonesian cultures

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the peoples and civilizations of Southeast Asia to c. 1600
 Asia
 Indonesia
 Southeast Asia

MICROPAEDIA: Selected entries of reference information

General subjects

<i>Myanmar, Malaya, and Siam:</i>	Ngasaunggyan, Battle of	Dong Son culture Funan	Majapahit empire priyayi
Dvaravati	Nong Sa Rai, Battle of	Lovek	Singhasāri
Hlutdaw	Pagan	Nam Viet	Śrīvijaya empire
Mon kingdom	Sadki Na grades	Vyadhapura	Tarumanegara
Mrohaung, Arakanese	<i>Indochina:</i>	<i>Indonesian</i>	
Kingdom of	Angkor	<i>Archipelago:</i>	
Nanchao	Champa	Buginese	
		Kaḍiri	

Biographies

<i>Myanmar, Malaya, and Siam:</i>	Ramkhamhaeng	Ly Bon	<i>Indonesian</i>
Anwarahta	Toungoo dynasty	Ngo Quyen	<i>Archipelago:</i>
Bayinnaung	Trailok	Nguyen dynasty	Erlangga
Mahmud Shah	<i>Indochina:</i>	Setthathirat I	Gajah Mada
Malacca, sultanate of	Chan	Suryavarman I	Hayam Wuruk
Mangrai	Dinh Bo Lin	Suryavarman II	Kertanagara
Narameikhla	Fa Ngum	Tran dynasty	Shailendra dynasty
Naresuan	Jayavarman VII	Tran Hung Dao	
Ramathibodi I	Later Ly dynasty	Trung Sisters	
	Le Loi		
	Le Thanh Tong		

INDEX: See entries under all of the terms above

Division IV. Peoples and Civilizations of Sub-Saharan Africa to 1885

[For Part Nine headnote see page 343.]

The history of North Africa, because of its early involvement with Europe and Islām, is dealt with up to c. 1480 in Sections 911 and 924; and it is carried to the 19th century in Section 962. The history of Nilotic Sudan to c. AD 550 and of Ethiopia to c. AD 650 is dealt with in Section 911.

With those exceptions, the five sections of Division IV deal first with the geography and ethnology and then with the histories of the peoples and civilizations of the African continent to c. 1885.

Section 941. West Africa to c. 1885 389

942. The Nilotic Sudan and Ethiopia from c. AD 550 to 1885 390

943. East Africa and Madagascar to c. 1885 391

944. Central Africa to c. 1885 392

945. Southern Africa to c. 1885 392

Section 941. West Africa to c. 1885

- A. The geography and ethnography of West Africa, definition of the region, the archaeological and documentary historical sources and historiographic problems, the character and achievements of civilizations in West Africa
- B. West Africa until the advent of the Europeans (c. AD 1500)
1. Development of the West African monarchies of Ghana and Kanem to c. AD 1000
 2. Development of the western Sudan empires
 - a. Emergence of the Keita dynasty of the Mali empire (c. 1235): Timbuktu as the cultural and commercial centre of Mali, fall of the Mali empire (c. late 15th century) and rise of the Songhai empire of Gao
 - b. The migrations of the Fulani people, migrations and military conquests of the Mande-speaking peoples, development of trade routes by the Dyula
- C. The precolonial period of European activity (c. 1400–c. 1885): exploration, development of the slave trade, and eventual collapse of indigenous states
1. Portuguese trade with the Guinea states from c. 1460
 2. The rise and expansion of the Atlantic slave trade (c. 1600–c. 1860): the pattern and development of European slave trade routes, the African slave merchant class
 3. The Islāmic revolutions in the western Sudan: spiritual and military leadership of Sidi Mukhtār (d. 1811) and Usman dan Fodio (d. 1817), the Fulani and Hausa *jihāds* (holy wars) and conquests
 4. West Africa from 1800 to c. 1885
 - a. The Guinea coastlands and the European antislavery movements
 - b. British colonial settlements from c. 1800: the colonies of Sierra Leone, the Gold Coast, Lagos, and Ashanti
 - c. 19th-century British and French exploration of the West African interior, establishment of colonies, and exploitation of trade

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with West Africa to c. 1885

Africa
Western Africa

MICROPAEDIA: Selected entries of reference information

General subjects

Akan states	British West Africa	Hausa states	Songhai empire
Akwamu	Dahomey	Kanem-Bornu	Tukulor empire
Ashanti empire	Djénné	Kumbi	Wolof empire
Audaghost	Fanti confederacy	Mali	
Bambara states	French West Africa	Mossi states	
Benin	Fulani empire	Oyo empire	
Bono			

Biographies

Agaja	Mūsā	Sonni 'Alī
Beecroft, John	Osei Tutu	Sumanguru
Faidherbe, Louis	Park, Mungo	Sundiata
Muhammad I	Rābiḥ az-Zubayr	'Umar Tal
Askia	Samory	Usman dan Fodio

INDEX: See entries under all of the terms above

Section 942. The Nilotic Sudan and Ethiopia from c. AD 550 to 1885**A. The Nilotic Sudan from c. 550 to 1885**

1. The medieval Christian kingdoms of Nobatia, Maqurrah, and 'Alwah; the Beja people
2. The spread of Muslim domination from c. 639: Mamlūk attacks in the 13th and 14th centuries, invasion of nomadic Arabs in the 15th century and intermarriage with Nubians, kingdom of 'Alwah as the last Christian barrier until its conquest (c. 1500)
3. The rise of the Funj (c. 1500), the spread of Islām
4. The Egyptian occupation from 1820 to 1885: the administration of Muḥammad 'Alī and his successors, Ismā'il Pasha and the growth of British influence

B. Ethiopia and Eritrea from c. AD 650 to 1855

1. The decline of the Christian Aksum empire (c. 600–c. 976): cordial relations with Islāmic states to the 8th century, conflicts with neighbouring peoples in the 9th century
2. The Zagwe dynasty (c. 12th–13th century), the Solomonid restoration (1270), the influence of the Coptic Church on culture and religion
3. Contacts with the Portuguese (1520–c. 1632), Muslim invasion under Aḥmad Grāñ (1531–43) and establishment of Turkish garrisons in the 16th century, brief conciliation with the Roman Catholic Church (early 17th century)
4. Gonder Ethiopia (1632–1855): alliance with Egyptian Coptic Church, friendly relations with Muslims, rivalry between the Oromo and Tigrayans

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the Nilotic Sudan and Ethiopia from c. AD 550 to c. 1885

Africa
Eastern Africa
Sudan, The

MICROPAEDIA: Selected entries of reference information

General subjects

Adal	Ethiopia	Kordofan
Aksum	Funj dynasty	Sudan, The
Darfur	Ifat	Zagwe dynasty

Biographies

Aḥmad Grāñ	Ewostatewos	Mahdī, al-	Sahle Selassie
Amda Tseyon	Gordon, Charles	Mikael Sehul	Yohannes IV
Covilhã, Pêro da	George		

INDEX: See entries under all of the terms above

Section 943. East Africa and Madagascar to c. 1885

- A. The geography and ethnography of East Africa and Madagascar: definition of the region, the archaeological and documentary historical sources and historiographic problems, the character and achievements of civilizations in East Africa
- B. East Africa to c. 1856 and Madagascar to c. 1810
1. The development of the coastal regions and of Madagascar and other offshore islands
 - a. Medieval commercial contacts of Azania with Arabia, India, and the Mediterranean: the development of coastal trading cities
 - b. The Shirazi dynasty (c. late 12th–15th century): the spread of Islām and growth of towns
 - c. The Portuguese invasions and occupation from 1502: gradual expulsion of the Portuguese (1631–98), the Omani influence (c. 1700–1856)
 - d. Madagascar from c. AD 1000 to 1810: early Indonesian settlement, later Muslim and African influx, kingdoms of Sakalava and Merina (1500–1810)
 2. The peoples and states of the East African interior to c. 1800
 - a. The Stone Age origins of the East African interior peoples in the Rift Valley (now Kenya, Tanzania, and Uganda)
 - b. The Iron Age settlements in the Rift Valley, the Bantu migrations and the Chwezi peoples
 - c. The Somali and Galla invasions (c. 10th–15th century), migrations of Nilotic and Kushitic peoples (c. 16th–18th century)
- C. East Africa from 1856 to c. 1900 and Madagascar from 1810 to 1896
1. Internal developments in East Africa
 - a. Development of political institutions and military kingships as defenses against Ngoni raids and Masai raiders: expansion of Rwanda and Buganda
 - b. The rise of Zanzibar as the leading East African coastal power: the slave trade
 - c. European exploratory and missionary activities
 2. Formation of the Kingdom of Madagascar (1810–61), English and French influences in the late 19th century

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with East Africa and Madagascar to c. 1885

Africa
Eastern Africa

MICROPAEDIA: Selected entries of reference information

General subjects

Boina	Bunyoro	Merina	Somaliland
Buganda	Menabé	Sakalava	Zanzibar

Biographies

Barghash	Livingstone, David	Mutesa I	Zwangendaba
Kirk, Sir John	Mirambo	Sa'īd ibn Sulṭān	

INDEX: See entries under all of the terms above

Section 944. Central Africa to c. 1885

- A. The geography and ethnography of Central Africa, definition of the region, the archaeological and documentary historical sources and historiographic problems, the character and achievements of civilizations in Central Africa
- B. Central Africa to c. 1885
1. The origins of Central African cultures in the Stone Age, emergence and expansion of the Bantu-speaking peoples
 2. The development of the Bantu states from c. AD 1400: the Kongo kingdom, the Luba and Lunda kingdoms, the Mongo people
 3. Development of Portuguese hegemony over Central Africa from the 1470s: trade and missionary activity, military support of the Kongo kingdom, control of the slave trade, influence on Central African unity

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with Central Africa to c. 1885

Africa
Central Africa

MICROPAEDIA: Selected entries of reference information

General subjects

Anziku, Kingdom of	Berlin West Africa	Kongo kingdom	Luba-Lunda states
Association	Conference	Kuba	Lunda empire
Internationale	Congo Free State	Loango,	Ngoy
Africaine	Kakongo	Kingdom of	Wadai
Bagirmi,	Kazembe		
Kingdom of			

Biographies

Afonso I	Livingstone, David
Brazza, Pierre-	Msiri
Paul-François-	Stanley, Sir Henry
Camille	Morton
Savorgnan de	Tippu Tib

INDEX: See entries under all of the terms above

Section 945. Southern Africa to c. 1885

- A. The geography and ethnography of southern Africa: definition of the region, the archaeological and documentary historical sources and historiographic problems, the character and achievements of civilizations in southern Africa
- B. Southern Africa before c. 1500
1. Origins of mankind and development of culture in the Stone Age and Iron Age, the migrations of Bantu-speaking peoples in southern Africa from c. AD 200–400
 2. The southeast coast trade in the Late Iron Age and interior trade routes to Mapungubwe (northeastern South Africa), Great Zimbabwe (southeastern Zimbabwe), and Ingombe Ilede (Zambia)
- C. Southern Africa from c. 1500 to c. 1885
1. Portuguese expansion (1530s) into the Zambezi valley and defeat of the Mwene Mutapa's empire in 1629: Portuguese defeats (1690s) by the Rozwi empire
 2. The Portuguese in west central Africa: conquests over the Kongo kingdom (1665) and the Ndongo kingdom (1671), control of the slave trade
 3. The Dutch settlement at the Cape of Good Hope from 1652: expansion toward the Orange River and subjugation of the Khoisans

4. Early 19th-century African migrations and rise of the Zulu Empire (1816) under Shaka, later black migrations into Rhodesia
5. The slave and ivory trade north of the Zambezi in the 19th century: decline of the slave trade in some areas and increased commerce in ivory, Yao migration into present-day Malawi, influence of missionaries
6. The Cape eastern frontier: Boer and Xhosa resistance to the British, the Boer Great Trek (1835–54) into the interior, continued friction with the British
 - a. Relations between Boers and the black population in the Transvaal
 - b. Establishment of the Orange Free State, the British colonies of Natal and Cape Colony
7. The era of mineral discoveries and confederation: diamonds and gold, Transvaal–Pedi and Zulu wars
8. Portuguese loss of control in Angola and Mozambique in the mid-19th century, Portuguese reemergence of control in the early 20th century, German annexation of South West Africa (1884)

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with Southern Africa to c. 1885

Africa
Southern Africa

MICROPAEDIA: Selected entries of reference information

General subjects

Afrikaner Bond	Gun War	Maravi	Rozwi
Blood River,	Imbangala	Confederacy	Sand River and
Battle of	Isandhlwana and	Matamba	Bloemfontein
Cape Frontier	Rorke's Drift,	Mfecane	conventions
Wars	Battles of	Mozambique	uitlanders
Gaza	Kaffraria	Conventions	Zimbabwe
Great Trek	Kasanje	Mwene Matapa	Zulu War
Griqua	Lunda empire	Ndongo	Zululand

Biographies

Brand, Sir	Gungunhana	Mswati	Rhodes, Cecil
Johannes	Joubert, Petrus	Mzilikazi	Robinson, Sir
Henricus	Jacobus	Philip, John	Hercules
Burgers, Thomas	Kruger, Paul	Potgieter, Hendrik	Sebetwane
François	Livingstone, David	Pretorius, Andries	Shaka
Cetshwayo	Lobengula	Pretorius,	Shepstone, Sir
D'Urban, Sir	Mackenzie, John	Marthinus Wessel	Theophilus
Benjamin	Mshweshwe	Retief, Piet	Sobhuza I

INDEX: See entries under all of the terms above

Division V. Peoples and Civilizations of Pre-Columbian America

[For Part Nine headnote see page 343.]

The subject in Section 951 is Andean civilization to *c.* 1540. The outline begins with the character and achievements of Andean civilization, with the ethnography and geography of the Andean region, and with archaeological and documentary historical sources. It goes on to the history of the pre-Inca cultures and states in the Andean region. It then deals with the empire of the Incas to the time of the Spanish conquest (1532–40).

The subject in Section 952 is Meso-American civilization to *c.* 1540. The outline begins with the geography and ethnography of Meso-America and with the character and achievements of Meso-American civilization. It goes on to the history of Meso-American civilizations until their conquest and destruction by the Spanish.

Section 951. Andean Civilization to *c.* AD 1540 394952. Meso-American Civilization to *c.* AD 1540 395**Section 951. Andean Civilization to *c.* AD 1540**

- A. The character and achievements of Andean civilization, the geography and ethnography of the Andean region, archaeological and documentary historical sources, historiographic problems
- B. Pre-Inca cultures and states
 1. Late Preceramic (*c.* 3500–*c.* 1800 BC) cultures: development of agriculture
 2. Initial (*c.* 1800–*c.* 1000 BC) and Early Horizon, or Chavín and Paracas (*c.* 1000–*c.* 200 BC), cultures in Peru: development of textiles, pottery, and ceremonial architecture
 3. Early Intermediate (Florescent, or Classic) Period (*c.* 200 BC–*c.* AD 600): metallurgy, pottery, and textile production in the Nazca and Moche cultures
 4. Middle Horizon Period (*c.* AD 600–*c.* 1000): the Huari and Tiahuanaco cultures, urban settlements, cultural decline after *c.* AD 800
 5. Late Intermediate Period (*c.* AD 1000–*c.* 1400): pottery and the introduction of bronze, the Chimu Empire (*c.* 1300–*c.* 1460) located at Chan Chan, spread of urban settlements
- C. The empire of the Incas (*c.* 1400–*c.* 1540)
 1. The origins and development of the Inca Empire
 - a. The autochthonic mythical origins of the Inca dynasty, establishment of the Cuzco Valley settlement (*c.* 1400)
 - b. The reigns of Capac Yupanqui, Inca Roca, Yahuar Huacac, and Viracocha Inca: Inca expansion into the Urubamba Valley and Titicaca Basin, the Chancas invasion (1438)
 - c. Inca victory over the Chancas (1438), Incan civil war between Cuzco and Calca factions, Cuzco victory and reign of Pachacuti Inca Yupanqui (1438–*c.* 1471), renewed battles with Chancas (*c.* 1445), further conquest of Titicaca Basin region, victory over Chimú Empire
 - d. Inca conquests during the reign of Topa Inca Yupanqui (*c.* 1471–*c.* 1493): annexation of highland Bolivia, northern Chile, northwestern Argentina, and southern Peru
 - e. Reign of Huayna Capac (*c.* 1493–*c.* 1525): conquest of northeastern Peru and northern Ecuador, Atahualpa's victory (1532) over Huascar in civil war
 - f. The Spanish conquest of the Incas (1532–40): Pizarro's execution of Atahualpa and support of Topa Huallpa (1533), later support of Manco Inca (1533–35); Manco's rebellion and defeat (1536), Spanish consolidation of power
 2. Incan government, society, and culture
 - a. Divine monarchy and the royal corporations, administrative hierarchy, taxation, the census and the quipu system of numerical records
 - b. The settlement of people loyal to the Incas in newly conquered territories, the spy system, religious practices, military policy and organization, technology, agriculture, transportation system, calendar, oral narratives

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with Andean civilization to *c.* AD 1540

Argentina	Latin America, The History of
Bolivia	Lima
Chile	Peru
Colombia	Pre-Columbian Civilizations
Ecuador	

MICROPAEDIA: Selected entries of reference information

General subjects

Andean civilization	Chavín	Inca	Pachacamac
Araucanian	Chimú	Machu Picchu	Paracas
Atacama	El Paraíso	Moche	Quechua
Chan Chan	Huari	Nazca	Tiahuanaco

Biographies

Almagro, Diego de	Huascar	Pizarro, Gonzalo
Atahualpa	Pizarro, Francisco	

INDEX: See entries under all of the terms above

Section 952. Meso-American Civilization to *c.* AD 1540

- A. The character and achievements of Meso-American civilization, the geography and ethnography of Meso-America, archaeological and documentary historical sources, historiographic problems
- B. Meso-America in the Pre-Classic and Classic periods
1. The development of Meso-American civilization in the Pre-Classic periods
 - a. Late Pleistocene and Early Hunter (*c.* 21,000–*c.* 6500 BC) peoples of Meso-America, development of agriculture (*c.* 6500–*c.* 1500 BC)
 - b. Early Formative Period (*c.* 1500–*c.* 900 BC): the Ocós and Caudros settlements, the Olmec civilization at San Lorenzo (*c.* 1150–*c.* 900 BC) and development of its stone monuments
 - c. Middle Formative Period (*c.* 900–*c.* 300 BC): the Olmecs at La Venta (*c.* 800–*c.* 400 BC); ceremonial architecture, pottery, and writing system; colonization and trade; pre-Maya villages in Guatemala
 - d. Late Formative Period (*c.* 300 BC–*c.* AD 100): regionalism and cultural integration, the Cuicuilco-Tilcomán cultures in the Valley of Mexico, the Zapotecs of Oaxaca, the Izapan civilization, Mayas of the Chicanel in northern Petén
 2. Maya and non-Maya Meso-America in the Classic Period (*c.* AD 100–*c.* 900)
 - a. Early Classic Period (*c.* AD 100–*c.* 600)
 - i. Teotihuacán cultural and urban development, ceremonial architecture and pottery, the Zapotecs at Monte Albán
 - ii. The Cotzumalhuapo culture in the Maya highlands, Tzakol and Tepeu cultures in lowland Maya civilization (*c.* AD 300–*c.* 900)
 - b. Late Classic non-Maya Meso-America (*c.* AD 600–*c.* 900): decline of Teotihuacán political and cultural influence, rise of Xochicalco culture, the Mixtecs of northern Oaxaca
 - c. Late Classic lowland Maya culture (*c.* AD 600–*c.* 900)
 - i. Urban settlements, temple-pyramids and palaces, Maya art, the calendar and writing system
 - ii. Maya religion, social and political life, the collapse of the Maya civilization (*c.* AD 900)
- C. Post-Classic Period in the Valley of Mexico and the Yucatán Peninsula (*c.* 900–*c.* 1519)
1. The rise and decline of the Toltec state in southern Mexico and the Yucatán Peninsula (*c.* 900–*c.* 1200): secular and religious institutions, art and architecture, the legend of Quetzalcóatl, Toltec–Maya culture of Tollan (Tula) and Chichén-Itzá

2. The development of the Aztec state and extension of Aztec rule over the Valley of Mexico (c. 1325–1519): military campaigns of Itzcoatl, Montezuma I, and Ahuizotl; administrative techniques under Montezuma II (1502–20)
 3. Aztec culture and society up to the time of the Spanish conquest; e.g., agriculture and technology, political organization, governmental structure, militarism, economy, religion, art and architecture
- D. The Spanish conquest of the Aztec state and the Yucatán Peninsula (1519–c. 1540): destruction of Aztec government and culture, imposition of Spanish colonial policies and religion

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with Meso-American civilization to c. AD 1540

Latin America, The History of
Mexico
Mexico City
Pre-Columbian Civilizations

MICROPAEDIA: Selected entries of reference information

General subjects

<i>cultural centres:</i>	Palenque	<i>peoples:</i>	Yucatec Maya
Chapultepec	Teotihuacán	Chichimec	Zapotec
Chichén Itzá	Texcoco	Chol	<i>other:</i>
Dos Pilas	Tikal	Lacandón	Aztec calendar
Kaminaljuyú	Tula	Maya	Mayan calendar
Mayapán	Uxmal	Olmec	Quetzalcóatl
Mitla	Xochicalco	Toltec	
Monte Albán			

Biographies

Alvarado, Pedro de	Cuauhtémoc
Cortés, Hernán, marqués del Valle de Oaxaca	Grijalba, Juan Marina Montezuma II

INDEX: See entries under all of the terms above

Division VI. The Modern World to 1920

[For Part Nine headnote see page 343.]

The theme of western expansion, imperialism, and colonialism pervades Division VI. The separation of the history of the modern world (c. 1500–c. 1920) into eleven sections reflects conventional regional analyses of modern history, and, within each of those sections, conventional judgments regarding turning-point dates of the regional histories.

Section 961. Western Europe from c. 1500 to c. 1789 397

962. Eastern Europe, Southwest Asia, and North Africa from c. 1480 to c. 1800 406

963. Europe from 1789 to c. 1920 408

964. European Colonies in the Americas from 1492 to c. 1790 420

965. Development of the United States and Canada from 1763 to 1920 422

966. Development of the Latin-American and Caribbean nations to c. 1920 428

967. Australia and Oceania to c. 1920 433

968. South Asia Under the Influence of European Imperialism from c. 1500 to c. 1920 434

969. Southeast Asia Under the Influence of European Imperialism to c. 1920 436

96/10. China from 1839 Until the Onset of Revolution (to c. 1911), and Japan from the Meiji Restoration to c. 1910 438

96/11. Southwest Asia and North Africa (c. 1800–1920), and Sub-Saharan Africa (1885–c. 1920) Under the Influence of European Imperialism: the Early Colonial Period 440

Section 961. Western Europe from c. 1500 to c. 1789

- A. The effects of religious and cultural change: the emergence of the nation-state system, the predominance and decline of Habsburg power centred in Spain (c. 1500–1648)
1. The later Renaissance in Italy and northern Europe
 - a. The influence of Italian statecraft and political theory: Machiavelli and the principle of *raison d'état*
 - b. Cultural and intellectual life in the later Renaissance
 2. The Scientific Revolution: the emergence of modern science and technology in the 16th and 17th centuries
 3. The emergence of a religiously divided Europe in the 16th century
 - a. The Protestant Reformation and its political and social consequences
 - b. The Catholic Reformation and Counter-Reformation
 4. International diplomacy and warfare (1494–1648)
 - a. The Italian Wars (1494–1516) and the concept of balance of power: French and Austro-Spanish expansionism in Italy
 - b. French and Austrian struggles for supremacy in Europe (1515–59): French anti-Habsburg alliances with England, German Lutheran princes, and the Turks
 - c. Conflicts between Catholic and Protestant powers after c. 1555: religious wars in France and the Low Countries, conflict with the Ottoman Empire
 - d. The Thirty Years' War (1618–48) and the Peace of Westphalia: the end of religious struggles and resecularization of international affairs
 5. National and dynastic states (c. 1500–1648)
 - a. Italy in the 16th and 17th centuries: political, economic, social, and cultural developments
 - i. The French invasion (1494) and conquests of Naples (1495) and Milan (1499), the influence of Savonarola, the anti-French League of Venice and the Spanish defeat of France (1525)
 - ii. Italy under Spanish domination: Catholic religious reforms; Spanish Habsburg rule in Naples, Sicily, Sardinia, and Milan
 - iii. Relations between Spain and the independent states of Italy: Savoy, Genoa, Tuscany, Venice, and the Papal States
 - b. Spain from 1516 to 1665
 - i. Establishment of the Habsburg dynasty (1516) by Charles I (Holy Roman Emperor Charles V), Spanish hegemony in Europe and the Americas, domestic and foreign policies of Philip II (1556–98), the Armada (1588), cultural developments in Spain's Golden Age
 - ii. Political and economic decline during the reigns of Philip III (1598–1621) and Philip IV (1621–65): expulsion of the Moriscos (1609), Olivares' administration, loss of Portugal (1640)
 - c. Portugal from c. 1500 to 1640: domination of East Indian trade, union with Spain (1580), independence under House of Bragança (1640)
 - d. The British Isles (c. 1485–1649)
 - i. Henry VII (1485–1509): dynastic unity in England after the Wars of the Roses; political, judicial, social, and economic developments
 - ii. Henry VIII (1509–47): foreign and domestic policies; the divorce question, the English Reformation, and the establishment of the Church of England; Edward VI (1547–53) and Mary I (1553–58)
 - iii. Elizabeth I (1558–1603): social and cultural developments; domestic policies; dynastic challenge of Mary, Queen of Scots; struggle with Spain
 - iv. James I (1603–25) of England (James VI of Scotland) and establishment of the Stuart dynasty: developments in religious doctrine, foreign relations, economic policy, and the arts; conflicts between crown and Parliament

- v. Charles I (1625–49) and the English Civil War (1642–51): economic and political disputes between crown and Parliament; royal personal rule (1629–40); persecution of Puritans; the Long Parliament, Oliver Cromwell, and the Civil War; execution of Charles I (1649)
 - vi. Scotland in the 16th and 17th centuries: reigns of James IV and James V; Mary, Queen of Scots (1542–67), and the Scottish Reformation; John Knox and Calvinism; James VI (1567–1625) of Scotland (James I of England, 1603–25) and personal union of the two crowns
 - vii. Ireland in the 16th and 17th centuries: subjugation of Ireland by Henry VIII and Elizabeth I, the Irish revolt of 1641, Cromwell's invasion and anti-Catholic policies during the Commonwealth
- e. France from 1483 to 1643
- i. Development of a standing army and a professional bureaucracy in the reigns of Charles VIII (1483–98), Louis XII (1498–1515), Francis I (1515–47), and Henry II (1547–59)
 - ii. The Protestant Reformation and the French Wars of Religion (1562–98): the reigns of Catherine de Médicis (1560–74) and Henry III (1574–89), religious compromise and restoration of strong monarchy under Henry IV of Bourbon (1589–1610)
 - iii. The reign of Louis XIII (1610–43) and Cardinal de Richelieu: suppression of the Huguenots and the nobles, French success in the Thirty Years' War
- f. Germany and the Holy Roman Empire from *c.* 1500 to 1648: the Reformation, Counter-Reformation, and Thirty Years' War
- i. Maximilian I (1493–1519), Martin Luther, and the origins of Lutheranism; Charles V and the Diet and Edict of Worms (1521); the Peasants' Revolt (1524–25); diets of Speyer (1526 and 1529) and Augsburg (1530); the Schmalkaldic League and ensuing wars; abdication of Charles V (1555) and Peace of Augsburg
 - ii. Ferdinand I (1556–64) and Maximilian II (1564–76), internal disunity under their successors, the Thirty Years' War (1618–48), political and religious settlements of the Peace of Westphalia (1648)
- g. The Swiss Confederation from 1474 to 1648
- i. Swiss victory over Charles the Bold in the Burgundian War (1474–77), military prestige of the confederation, victory over Maximilian I (1499), the Italian campaigns (1499–1516)
 - ii. The Swiss Reformation: Zwingli and Calvin, the Counter-Reformation and emergence of Catholic and Protestant cantons, neutrality in the Thirty Years' War (1618–48), European recognition by the Peace of Westphalia (1648)
- h. The Low Countries from 1494 to 1648
- i. Habsburg unification of the Low Countries (1494); further consolidation under the future emperor Charles V (1506–55); economic, cultural, and religious developments; revolt of the provinces (1567–79)
 - ii. Establishment of the United Provinces of the Netherlands (the Dutch Republic) in 1579: leadership of the House of Orange, continued war against Spanish Habsburg power
 - iii. Commercial supremacy of the Dutch Republic, intermittent wars with Spain (1621–48)
 - iv. Cultural, social, religious, and economic developments in the Dutch Republic
- i. Scandinavia from 1523 to 1648: separation of Sweden from Denmark–Norway (1523) and Dano-Swedish conflicts; Christian III of Denmark (1534–59), Gustav I Vasa (1523–60), and Gustavus II Adolphus (1611–32) of Sweden; participation in Thirty Years' War (1618–48)
- B. European overseas expansion and commercial development from *c.* 1400 to 1763
1. The beginning of European imperialism: rapid expansion of European trade with and control over the non-European world after *c.* 1450
 - a. Advances in geographical knowledge and technological improvements; *e.g.*, ship design, navigational instruments, cartography
 - b. Voyages of discovery and exploration: establishment of colonial empires
 - i. Discovery, exploration, and early settlement of the Americas

- ii. Discovery, exploration, and early settlement of the coastal regions of Africa, Australia, India, and the East Indies
 - 2. The decline of the feudal system and growth of commercial activity
 - a. The changing relationship between tenant and landlord, agricultural developments, evolving role of the guilds, decline of Hanseatic League, demographic movements
 - b. The decline in Mediterranean trade and growth of Antwerp and Amsterdam as international trade centres, the growth of a landed merchant class
 - 3. Technological advances and pre-Industrial Revolution manufacturing systems: development of “putting-out” system and decline of guild power
 - 4. The impact of colonial expansion on Europe
 - a. Economic effects
 - i. Development of new business organizations to direct colonial exploitation: joint-stock and chartered companies
 - ii. The “price revolution”: the relationship between the influx of precious metals from the Americas to Europe and the price rise in the 16th century
 - iii. Growth of mercantilism: theories and policies of economic nationalism developed by European powers, the concept of the balance of trade
 - iv. Increase in volume of world trade: the growth of the luxury trade (silks, spices, precious metals), the agricultural trade (tobacco, sugar, and coffee), the raw materials trade
 - v. Development and importance of the slave trade
 - b. Political effects: the relationship between Spain’s status as an international power and its colonial possessions in the 16th century, colonial rivalries among European powers in the 17th and 18th centuries
- C. France and Great Britain as the dominant powers in Europe, the emergence of Prussia and Austria as European powers
- 1. International wars and diplomacy (c. 1649–c. 1790)
 - a. The Age of Louis XIV (1661–1715): French successes in the War of Devolution (1667–68) and the Dutch War (1672–79), defeat in the War of the League of Augsburg (1689–97) and the War of the Spanish Succession (1701–14)
 - b. Development of the alliance system: the balance of power
 - i. The Quadruple Alliance: the emergence of Prussia and Austria as European powers, the War of the Austrian Succession (1740–48)
 - ii. The Seven Years’ War (1756–63) and France’s defeat and loss of colonial territory in the Americas
 - iii. French recovery and Franco-Spanish cooperation (1778–81) against Britain in the U.S. War of Independence, Russian-Prussian partition of Poland (1772)
 - 2. The European states (c. 1648–c. 1790)
 - a. Great Britain from 1649 to c. 1790
 - i. Oliver Cromwell, the Commonwealth, and the Protectorate (1649–60); the Stuart Restoration (1660) under Charles II (1660–85) and James II (1685–88); the Glorious Revolution of 1688 and end of crown rule without Parliament
 - ii. Limited monarchy under William III (1689–1702) and Mary II (1689–94) and Anne (1702–14); growth of Whig and Tory political parties (1689–1714); the Hanoverian succession and emergence of the cabinet system under George I and George II; Whig supremacy and political stability to 1760; ministries of Walpole, Pelham, and Pitt
 - iii. Early years of George III’s reign (1760–1820) to c. 1790: eclipse of Whig power and political instability (1760–70), failure of colonial policies and U.S. War of Independence, beginning of parliamentary and reform movements
 - iv. Economic, cultural, and social developments: agricultural innovations, population growth, origins of the Industrial Revolution and factory system, influence of Methodism
 - v. Formal union of England and Scotland (1707), Edinburgh’s status as an intellectual centre, Protestant Ascendancy in Ireland and growth of Irish patriotism among the Anglo-Irish, Wales in the 18th century
 - b. France from c. 1650 to c. 1790

- i. The Fronde, Louis XIV's minority (1643–61), and Mazarin's control of government to 1661
 - ii. The Age of Louis XIV (1661–1715): development of the central government, the Versailles court, military policies, mercantilist policies of Colbert
 - iii. Louis's religious and political policies: revocation (1685) of the Edict of Nantes and the Huguenot emigration, political influence of Jansenism, royal absolutism
 - iv. French cultural development in the 17th century
 - v. The *ancien régime* (1715–89): the close relationship between society and the state, the new urban class, the decline of the monarchy under Louis XV (1715–74) and Louis XVI (1774–92), power of the *parlements*, agricultural and industrial growth, domestic and colonial trade
 - vi. The reform movement: the influences of nationalism and individualism; attacks on political, social, and economic policies of the *ancien régime*; conflict between the nobility and bourgeoisie; the financial crisis and attempts at reform by Necker and Turgot; the States General and the beginning of the Revolution (1789)
- c. The lands ruled by the Austrian Habsburgs (1648–1790)
- i. Austrian consolidation and expansion under Leopold I (1658–1705), Joseph I (1705–11), and Charles VI (1711–40): conquest of Hungary and penetration of the Balkans in the Austro-Turkish wars (1683–99 and 1716–18), War of the Spanish Succession (1701–14) and acquisition of the Spanish Netherlands (1713)
 - ii. The Pragmatic Sanction and the accession of Maria Theresa (1740); War of the Austrian Succession (1740–48) and loss of Silesia to Prussia (1741); military, administrative, and educational reforms of Maria Theresa; acquisition of Polish Galicia (1772); failure of Joseph II's (1765–90) foreign policies and his enlightened domestic reforms (1780–90)
- d. Germany and the rise of Prussia (c. 1640–c. 1790)
- i. Frederick William, the Great Elector (1640–88): strengthening of Hohenzollern power in Brandenburg and Prussia, end of Polish suzerainty over Prussia, War of the Spanish Succession (1701–14), Austro-Prussian rivalry in the 18th century, Frederick I (1701–13) and Frederick William I (1713–40) of Prussia
 - ii. Frederick II the Great (1740–86): War of the Austrian Succession (1740–48), Seven Years' War (1756–63), partitions of Poland (1772–95), development of Idealism (Kant), enlightened reform and benevolent despotism
 - iii. The influence of Pietism, the German cultural revival in the second half of the 18th century
- e. Spain and Portugal
- i. Spain from 1665 to c. 1790: continued decline under Charles II (1665–1700); War of the Spanish Succession (1701–14) and establishment of the Bourbon dynasty; pro-French foreign policy under Philip V, Ferdinand VI, and Charles III; administrative and economic reforms of Charles III
 - ii. Portugal from 1640 to c. 1777: increasing economic and diplomatic ties to England under John IV (1640–56), Afonso VI (1656–83), Pedro II (1683–1706), and John V (1706–50); economic, religious, and administrative reforms under Pombal and Joseph I (1750–77)
- f. Italy in the 18th century
- i. Government reforms and the rule of Joseph II (1765–90) in Lombardy, reigns of Francis of Lorraine (1738–65) and Peter Leopold (1765–90) in Tuscany
 - ii. The viceroyalty of Naples and the kingdom of Sicily: economic and social unrest, rule of Charles VI in Sicily, transfer of Naples and Sicily to Charles III in 1734, the Bourbon regime
- g. The United Provinces of the Netherlands from 1648 to 1789; economic and political stagnation; the first (1650–72) and second (1702–47) stadholderless periods; the patriotic movement; social, religious, and cultural development
- h. Scandinavia from c. 1648 to c. 1792
- i. Swedish wars of conquest against Poland and Denmark–Norway under Charles X Gustav (1654–60) and Charles XI (1672–97), war with Russia under Charles XII (1697–1718) and displacement of Sweden by Russia as the chief Baltic power after the Great Northern War (1700–21)

- ii. Social and economic conditions in the Scandinavian countries
 - iii. Denmark–Norway losses in the First Northern War with Sweden (1655–60); economic stagnation (1720–66), “Enlightened” reforms under Christian VII (1766–1808), Struensee, and Bernstorff; revival of settlement in Greenland (1714)
 - iv. Growth of parliamentary government in Sweden: Frederick I (1720–51) and Adolf Frederick (1751–71), the “Hats” and “Nightcaps” political parties, absolutism reestablished by Gustav III (1771–92)
- i. The Swiss Confederation (c. 1650–1790); Villmergen wars (1656–1712), the influence of the Enlightenment
3. The age of the Enlightenment
- a. Origins in the 17th century: scientific achievements, developments in political and religious philosophies, developments in the arts
 - b. Expansion in the 18th century: the spread of religious, political, economic, and scientific theories in western Europe; cultural developments

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and biographies dealing with western Europe from c. 1500 to c. 1789

Amsterdam	Czech and Slovak Republics	Geneva	Madrid
Antwerp	Denmark	Germany	Malta
Arctic, The	Dublin	Greece	Manchester
Athens	Edinburgh	Habsburg, The House of	Marseille
Austria	Elizabeth I of England	Hamburg	Milan
Bacon, Francis	European History and Culture	Holy Roman Empire, The	Naples
Balkan States	European Overseas Exploration and Empires, The	History of the	Netherlands, The
Barcelona	Finland	Hungary	Norway
Belgium	Florence	Iceland	Paris
Berlin	France	Ireland	Portugal
Bourbon, The House of	Frederick the Great	Italy	Rome
Brussels		Lisbon	Spain
Cologne		London	Sweden
Columbus		Luther	Switzerland
Cromwell, Oliver		Luxembourg	United Kingdom
			Venice
			Vienna

MICROPAEDIA: Selected entries of reference information

General subjects

<i>cultural and economic:</i>	Bavarian Succession, War of the	Medina del Campo, Treaty of	Russo-Turkish Wars
Baroque period	Belgrade, Treaty of	Mohács, Battle of	Seven Years' War
bullionism	Blenheim, Battle of	Neva, Battle of the	Silesian Wars
Classicism and Neoclassicism	Breda, Treaty of	Nordlingen, Battle of	Spanish Succession, War of the
Enlightenment	Cambrai, League of	Northern War, First	Stolbovo, Treaty of
mercantilism	Carlowitz, Treaty of	Northern War, Second	Thirty Years' War
philosophie	Cateau-Cambresis, Peace of	Oudenaarde, Battle of	Utrecht, treaties of
physiocrat	Devolution, War of	Paris, Treaty of (1763)	Vienna, Siege of
Renaissance	Dutch War	Pavia, Battle of	Westphalia, Peace of
<i>international relations:</i>	Fontenoy, Battle of	Poland, Partition of	Wittstock, Battle of
Åbo, Treaty of	Grand Alliance, War of the	Pragmatic Sanction of Charles VI	<i>national affairs—</i>
Aix-la-Chapelle, Treaty of	Lepanto, Battle of	Pyrenees, Peace of the	<i>Britain:</i>
Altranstädt, treaties of	Lützen, Battle of	Ramillies, Battle of	Armada
Anglo-Dutch War	Madrid, Treaty of	Rocroi, Battle of	Bishops' Wars
Austrian Succession, War of the	Marignano, Battle of		Boyne, Battle of the
			cabal
			Clarendon Code

- Cloth of Gold.
Field of
Culloden,
Battle of
Darnel's case
Declaratory Act
Dover, Treaty of
English Civil
Wars
Fifth
Monarchy Men
Flodden,
Battle of
Glencoe,
Massacre of
Government,
Instrument of
Great Fire of
London
Great Plague of
London
Gunpowder Plot
High Commission,
Court of
Independent
Jacobite
Jenkins' Ear,
War of
Leveler
Long Parliament
Naseby, Battle of
Navigation Acts
New Model Army
Nonconformist
Nonjuror
Parliament,
Admonition to
Penal Laws
Pilgrimage of
Grace
Popish Plot
Protectorate
Puritanism
right, petition of
Rights, Bill of
(British)
Roundhead
Rye House Plot
Settlement, Act of
ship money
- Short Parliament
1688,
Revolution of
South Sea Bubble
Star Chamber,
Court of
test act
Toleration Act
Union, Act of
(England-Scotland)
Whig and Tory
national affairs—
France:
appanage
Armagnac
Camisard
capitation
Châtelet
coutume
Estates-General
Famille, Pacte de
Fronde, the
gabelle
généralité
Holy League
(France)
intendant
iron mask, the
man in the
Nantes, Edict of
noblesse de robe
Poisons, Affair
of the
Pyrenees, Peace
of the
Saint
Bartholomew's
Day, Massacre of
taille
Temple, Le
Three Henrys, War
of the
Unigenitus
national affairs—
Germany/Holy
Roman Empire:
Bayern (Bavaria)
Brandenburg
Catholic League
Diet
- Fürstenbund
Galicia
Holy Roman
Empire
Kreis
Palatinate
Prague,
Defenestration of
Protestant Union
Prussia
Saxony
Silesia
Wehlau, Treaty of
Worms, Diet of
Württemberg
national affairs—
Italy:
Holy League
(Papal Italy)
Naples,
kingdom of
Papal States
Tuscany
Two Sicilies,
Kingdom of the
national affairs—Low
Countries:
Austrian
Netherlands
Dutch Republic
Dutch War
Eighty Years' War
Ghent,
Pacification of
pensionary
Spanish
Netherlands
stadholder
States General
Troubles,
Council of
Tulip Mania
national affairs—
Scandinavia:
Anjala League
Count's War
Dacke War
Kalmar War
Stockholm
Bloodbath
- national affairs—*
Spain and Portugal:
Armada
audiencia
auto-da-fé
Inquisition
Tavoras,
Conspiracy
of the
Troubles,
Council of
national affairs—
Switzerland:
Kappel Wars
Stans, Diet of
Toggenberg
Succession
overseas exploration
and colonialism:
colonialism
Dutch East India
Company
Dutch West India
Company
East India
Company
exploration
French East India
Company
Hudson's Bay
Company
Indies, Casa
de las
Indies, Council
of the
Indies, Laws
of the
London
Company
mercantilism
Muscovy
Company
New Zealand
Company
Northwest
Passage
Plymouth
Company
- Biographies
Britain and Ireland:
Anne
Anne Boleyn
Argyll, Archibald
Campbell, 1st
marquess and 8th
earl of
Arlington, Henry
Bennet, 1st earl of
Babington,
Anthony
- Bacon, Francis,
viscount St.
Albans
Baring family
Blake, Robert
Bolingbroke,
Henry Saint
John, 1st viscount
Bothwell, James
Hepburn, 4th
earl of
- Breadalbane and
Holland, John
Campbell, 1st
earl of
Buckingham,
George Villiers,
1st Duke of
Buckingham,
George Villiers,
2nd Duke of
Cabot, John
- Catherine Howard
Catherine of
Aragon
Cecil, William, 1st
Baron Burghley
Charles I
Charles II
Clarendon,
Edward Hyde,
1st earl of

- Cleveland,
 Barbara Villiers,
 Duchess of
 Clive, Robert, 1st
 Baron Clive of
 Plassey
 Conway, Henry
 Seymour
 Cook, James
 Cotton, Sir
 Robert Bruce,
 1st Baronet
 Cranmer, Thomas
 Cromwell,
 Oliver
 Cromwell,
 Richard
 Cromwell,
 Thomas, earl
 of Essex
 Darnley,
 Henry Stewart,
 Lord
 Davison,
 William
 Digby,
 Sir Kenelm
 Drake,
 Sir Francis
 Edward VI
 Eliot, Sir John
 Elizabeth I
 Essex, Robert
 Devereux, 2nd
 earl of
 Fairfax of
 Cameron,
 Thomas Fairfax,
 3rd Baron
 Fawkes, Guy
 Fisher, Saint John
 Flood, Henry
 Fox, Charles James
 Gage, Thomas
 Gardiner, Stephen
 George I
 George II
 George III
 Gilbert, Sir
 Humphrey
 Godolphin, Sidney
 Godolphin,
 1st Earl of
 Gowrie, John
 Ruthven, 3rd
 earl of
 Grafton, Augustus
 Henry Fitzroy,
 3rd duke of
 Grattan, Henry
 Grenville, George
 Grey, Lady Jane
 Gwyn, Nell
 Hakluyt, Richard
 Hamilton, John
 Hamilton, 1st
 marquess of
 Hampden, John
 Hastings, Warren
 Hawkins, Sir John
 Henderson,
 Alexander
 Henrietta Maria
 Henry VII
 Henry VIII
 Howe, Richard
 Howe, Earl
 Hudson, Henry
 Huntly, George
 Gordon, 1st
 Marquess and 6th
 Earl of
 Hutchinson,
 Thomas
 James I (Britain)
 James II (Britain)
 James IV
 (Scotland)
 James V (Scotland)
 Jane Seymour
 Jeffreys (of Wem),
 George Jeffreys,
 1st Baron
 Knox, John
 Lambert, John
 Latimer, Hugh
 Laud, William
 Leeds, Thomas
 Osborne, 1st
 Duke of
 Leicester, Robert
 Dudley, earl of
 Leven, Alexander
 Leslie, 1st Earl of
 Lilburne, John
 Lovat, Simon
 Fraser, 11th Lord
 Maitland (of
 Lethington),
 William
 Marlborough, John
 Churchill, 1st
 Duke of
 Marlborough,
 Sarah Jennings,
 Duchess of
 Mary (Queen of
 Scots)
 Mary I
 Mary II
 Masham, Abigail,
 Baroness Masham
 of Otes
 Monck, George,
 1st Duke of
 Albemarle
 Monmouth, James
 Scott, Duke of
 Montagu, Ralph
 Montagu, 1st
 Duke of
 Moray, James
 Stewart, 1st
 Earl of
 More, Sir Thomas
 Morton, James
 Douglas, 4th
 Earl of
 Newcastle
 (-upon-Tyne),
 William
 Cavendish, 1st
 Duke of
 Norfolk, Thomas
 Howard, 3rd
 Duke of
 Norfolk, Thomas
 Howard, 4th
 Duke of
 Northampton,
 Henry Howard,
 Earl of
 Northumberland,
 John Dudley,
 Duke of
 Oates, Titus
 O'Donnell, Manus
 O'Neill, Owen Roe
 O'Neill, Shane
 Ormonde, James
 Butler, 12th earl
 and 1st duke of
 Oxford, Robert
 Harley, 1st
 Earl of
 Pitt, William, the
 Elder
 Pole, Reginald
 Pole, Richard de la
 Portsmouth,
 Louise-Renée
 de Kéroualle,
 Duchess of
 Prynne, William
 Pym, John
 Raleigh, Sir Walter
 Riccio, David
 Rupert, Prince
 Sackville (of
 Drayton), George
 Sackville-Germain,
 1st Viscount
 Saint John, Oliver
 Salisbury, Robert
 Cecil, 1st earl of
 Sandwich, Edward
 Montagu, 1st
 Earl of
 Saye and Sele,
 William Fiennes,
 1st Viscount
 Schomberg,
 Frederick
 Herman, duke of
 Seymour (of
 Sudeley), Thomas
 Seymour, Baron
 Shaftesbury,
 Anthony Ashley
 Cooper, 1st
 Earl of
 Shrewsbury,
 Charles Talbot,
 duke and 12th
 earl of
 Somerset, Edward
 Seymour, 1st
 duke of
 Stanhope, James
 Stanhope, 1st Earl
 Stirling, William
 Alexander, 1st
 Earl of
 Stafford, Thomas
 Wentworth, 1st
 earl of
 Stuart, House of
 Sussex, Thomas
 Radcliffe, 3rd
 earl of
 Tudor, House of
 Tyrconnell, Rory
 O'Donnell, 1st
 Earl of
 Tyrone, Conn
 O'Neill,
 1st Earl of
 Tyrone, Hugh
 O'Neill, 2nd
 Earl of
 Vane, Sir Henry,
 the Younger
 Walpole, Robert,
 1st earl
 of Orford
 Walsingham, Sir
 Francis
 Wildman,
 Sir John
 Wilkes, John
 William III
 Winthrop,
 John
 Wolsey, Thomas,
 Cardinal
 Wyatt, Sir
 Thomas, the
 Younger
France:
 Anne of
 Austria

Beaufort, François de Vendôme, duc de	La Salle, René-Robert Cavalier, Sieur de	Retz, Jean-François-Paul de Gondi, cardinal de	Frederick II (Prussia)
Bernis, François-Joachim de Pierre de	Le Tellier, Michel L'Hospital, Michel de	Richelieu, Armand-Jean du Plessis, cardinal et duc de	Frederick William (Brandenburg)
Bourbon, Charles III, 8e duc de	Lionne, Hugues de	Saxe, Maurice, comte de	Frederick William I (Prussia)
Bourbon, House of	Lorraine, Charles de Lorraine, 2nd cardinal de	Schomberg, Frederick Herman, duke of	Frederick William II (Prussia)
Cartier, Jacques	Louis XII	Séguier, Pierre	Habsburg, House of
Catherine de Médicis	Louis XIII	Sully, Maximilien de Béthune, Duke de	Hertzberg, Ewald Friedrich, Graf von
Champlain, Samuel de	Louis XIV	Terray, Joseph-Marie	Hohenzollern dynasty
Charles IX	Louis XV	Turenne, Henri de La Tour d'Auvergne, vicomte de	Joseph I (emperor)
Chevreuse, Marie de Rohan-Montbazou, duchesse de	Louis XVI	Vauban, Sébastien Le Prestre de	Joseph II (emperor)
Choiseul, Étienne-François de Choiseul, duc de	Louvois, François-Michel	Vergennes, Charles Gravier, comte de	Kaunitz, Wenzel Anton von
Colbert, Jean-Baptiste	Le Tellier, marquis de Luxembourg, François-Henri de Montmorency-Bouteville, duc de	Villars, Claude-Louis-Hector, duc de	Leopold I (Anhalt-Dessau)
Coligny, Gaspard II de, seigneur de Châtillon	Maintenon, Françoise d'Aubigné, marquise de	<i>Germany/Holy Roman Empire:</i>	Leopold I (emperor)
Condé, Louis I de Bourbon, 1er prince de	Malesherbes, Chrétien Guillaume de Lamoignon de	Charles V (emperor)	Leopold II (emperor)
Condé, Louis II de Bourbon, 4e prince de	Margaret of Angoulême	Charles VI (emperor)	Matthias (emperor)
Conti, François-Louis de Bourbon, prince de	Marie-Antoinette	Charles Theodore (Palatinate)	Maximilian I (emperor)
Dubois, Guillaume Fleury, André-Hercule de	Marie de Médicis	Charles William Ferdinand (Brunswick)	Maximilian II (emperor)
Francis I	Maupeou, René-Nicolas-Charles-Augustin de	Ernest Augustus (Hanover)	Montecuccoli, Raimondo
Francis II	Mazarin, Jules, Cardinal	Eugene of Savoy	Piccolomini-Pieri, Ottavio
Frontenac, Louis de Buade, comte de Pallau et de	Montmorency, Anne, Duke de	Ferdinand (Brunswick)	Rudolf II (emperor)
Guise, Claude de Lorraine, 1er duc de	Montpensier, Anne-Marie-Louise d'Orléans, Duchess de	Ferdinand I (emperor)	Tilly, Johann Tserclaes, Graf von
Guise, François de Lorraine, 2e duc de	Mornay, Philippe de, seigneur du Plessis-Marly	Ferdinand II (emperor)	Wallenstein, Albrecht Wenzel Eusebius von
Guise, Henri I de Lorraine, 3e duc de	Necker, Jacques	Ferdinand III (emperor)	Wittelsbach, House of
Henry II	Orléans, Gaston, duc d'	Francis I (emperor)	<i>Italy:</i>
Henry III	Orléans, Philippe II, duc d'	Frederick I (Brandenburg)	Alessandro (Florence)
Henry IV	Pigneau de Béhaine, Pierre-Joseph-Georges	Frederick III (Palatinate)	Alexander VI (pope)
La Rochefoucauld, François VI, Duke de	Pompadour, Jeanne-Antoinette Poisson, marquise de	Frederick I (Prussia)	Baglioni family
			Barberini family
			Borgia family
			Cenci, Beatrice
			Clement VII (pope)
			Contarini family
			Corsini family
			Cosimo I (Tuscany)
			Cosimo II (Tuscany)

- | | | | |
|--|---|---|--|
| Cosimo III
(Tuscany) | Hoorne, Filips van | Charles IX
(Sweden) | Balboa, Vasco
Núñez de |
| Doria family | Montmorency,
Graaf van | Charles X Gustav
(Sweden) | Bonaparte, Joseph |
| Este, House of | John Maurice of
Nassau | Charles XI
(Sweden) | Charles II |
| Farnese family | John William Friso | Charles XII
(Sweden) | Charles III |
| Ferdinand I
(Tuscany) | Louis of Nassau | Christian II
(Denmark) | Charles V
(Holy Roman
Empire) |
| Ferdinand II
(Tuscany) | Margaret of
Austria | Christian III
(Denmark) | Farnese,
Alessandro,
Duke di Parma e
Piacenza |
| Fieschi family | Maurice | Christian IV
(Denmark) | Ferdinand II |
| Fieschi,
Gian Luigi | Oldenbarnevelt,
Johan van | Christina | Ferdinand VI |
| Francis (I)
(Tuscany) | Orange, House of | De la Gardie,
Jacob Pontusson,
Count | Floridablanca,
José Moñino
y Redondo,
conde de |
| Gonzaga dynasty | Ruyter, Michiel | Frederick I
(Denmark) | Juan de Austria |
| Guicciardini,
Francesco | Adriaanszoon de
Tasman, Abel | Frederick (I)
(Sweden) | Juan José de
Austria |
| Julius II (pope) | Janszoon | Frederick II
(Denmark) | Margaret
of Austria |
| Leo X (pope) | Tromp, Maarten | Frederick III
(Denmark) | Olivares, Gaspar
de Guzmán
y Pimental,
conde-duque de |
| Machiavelli,
Niccolò | William I | Gustav I Vasa
(Sweden) | Orry, Jean |
| Medici family | William II | Gustav II Adolf
(Sweden) | Pérez, Antonio |
| Medici,
Giovanni de' | William III | Gustav III
(Sweden) | Philip I |
| Medici,
Lorenzino de' | William IV | John III (Sweden) | Philip II |
| Morosini family | William V | Oxenstierna (af
Södermöre), Axel,
Greve | Philip III |
| Savoy, House of | William Louis | Oxenstierna, Bengt
Gabrielsson,
Greve | Philip IV |
| Sforza family | Witt, Johan de | Alba, Fernando | Philip V |
| Sixtus V (pope) | <i>Portugal:</i> | Álvarez de
Toledo y
Pimentel, 3er
duque de | Riperdá, Juan
Guillermo |
| <i>Low Countries:</i> | Albuquerque,
Afonso de, the
Great | Álvarez de
Toledo y
Pimentel, 3er
duque de | Riperdá,
duque de |
| Coen, Jan | Cabral, Pedro | Alberoni, Giulio | Santa Cruz,
Alvaro de |
| Pieterszoon | Álvares | | Bazán,
Marqués de |
| Diemen,
Anthony van | Covilhã, Pêro da
Dias, Bartolomeu | | Soto,
Hernando de |
| Egmond,
Lamoraal,
Count van | Gama, Vasco da,
Henry the
Navigator | | Vespucci,
Amerigo |
| Farnese,
Alessandro,
Duke di Parma e
Piacenza | Magellan,
Ferdinand | | |
| Frederick Henry,
prince of Orange | Pombal, Sebastião
de Carvalho,
marquês de | | |
| Hembyze, Jan van | <i>Scandinavia:</i> | | |
| Heyn, Piet | Adolf Frederick
(Sweden) | | |
| | Armfelt, Gustaf
Mauritz | | |

INDEX: See entries under all of the terms above

Section 962. Eastern Europe, Southwest Asia, and North Africa from c. 1480 to c. 1800**A. The Christian states of eastern Europe**

1. Poland–Lithuania (1492–1795): gradual weakening of the monarchy, decline and dismemberment of the state
 - a. The Golden Age of the Polish–Lithuanian empire (1492–1572)
 - i. Foreign relations: Ottoman invasions, Russian invasion of Lithuania, alliance with Turks (1533) and reestablishment of Polish security, renewed Russian aggression
 - ii. Domestic developments: population movements, constitutional reform, prosperous foreign trade, exploitation of the peasantry and their reduction to serfdom, effects of the Renaissance and the Reformation
 - b. Establishment of the royal republic (1572–1648)
 - i. The Interregnum (1572–75) and reform of the monarchy: Stephen Bathory (1576–86) and Sigismund III Vasa (1587–1632), indecisive wars with Sweden for possession of the Baltic region
 - ii. Władysław IV Vasa (1632–48): the Cossack revolt, economic prosperity, increased power of the nobility, effect of the Counter-Reformation
 - c. The period of wars and disintegration (1648–97): the Cossack–Russian and Swedish invasions in the reign of John II Casimir (1648–68), loss of Ducal Prussia to Brandenburg (1657), Michael Wiśniowiecki (1669–73), John III Sobieski's (1674–96) victories over the Turks
 - d. The Saxonian era, the Russian Protectorate, and the partitions of Poland among Russia, Prussia, and Austria
 - i. The reigns of Augustus II (1697–1733) and Augustus III (1733–63): participation in the Great Northern War, relations with Prussia, the Seven Years' War (1756–63)
 - ii. The reign of Stanisław II August Poniatowski (1764–95): the Confederation of Bar, reform, the partitions of Poland (1772, 1793, and 1795)
2. Hungary: the Jagiellon kings (1490–1526) and the partition period (1526–1699)
 - a. The peasant revolt (1514), defeat by the Ottoman Turks at Battle of Mohács (1526)
 - b. Division into Ottoman and Habsburg sectors in the 16th century, the spread of Protestantism, the Fifteen Years' War, the rise of Transylvania, defeat of the Turks (1686) and subjection of all Hungary to the Habsburgs in 1699
3. Emergence of the Russian Empire (c. 1500–1796)
 - a. Extension of Muscovite control over Russia under Vasily III (1505–33), Ivan IV the Terrible (1533–84), and Boris Godunov (1598–1605); civil revolt in the Time of Troubles (1598–1613)
 - b. The Romanov Muscovy: election of Michael Romanov as tsar (1613) and continued autocracy under his successors, expansion into the Ukraine, 17th-century cultural and religious life
 - c. The beginning of westernization and further expansion under Peter I the Great (1689–1725): the Petrine state
 - i. The Table of Ranks and the new nobility: reform of the clerical hierarchy, urban legislation, building of St. Petersburg, conquest of the Baltic provinces
 - ii. Development of Russia's status as a European power in Peter's reign: westernization of its culture
 - iii. Peter I's weak successors: Anna (1730–40) and Elizabeth (1741–62)
 - d. Further westernization and expansion under Catherine II the Great (1762–96): partitions of Poland and successful wars against the Ottoman Empire
 - e. Education and social change in the 18th century: the impact of the Enlightenment

B. The Islāmic states of eastern Europe, Southwest Asia, and North Africa

1. The Ottoman Empire from 1481 to 1807, Morocco from 1459 to 1830
 - a. The Ottoman Empire as the dominant power of Southwest Asia and southeastern Europe (1481–1566)

- i. Consolidation of the empire in the reign of Bayezid II (1481–1512), Selim I's (1512–20) successes against Iran and seizure of Syria and Egypt, Süleyman I's (1520–66) conflicts with the Habsburgs in Hungary and annexation of Iraq
 - ii. Classical Ottoman society and administration: the class structure, the *mukata'a*, religious and civil law
 - b. Decline of the Ottoman Empire (1566–1807): corruption and nepotism
 - i. Foreign relations: conflicts with the Russians, Austrians, and Iranians
 - ii. Attempts at reform in government administration; defeats by Poles, Habsburgs, and Russians
 - c. Imperial disintegration in the 18th and early 19th centuries: westernization and rise of local rulers
 - d. Morocco: disunity after the fall of the Marinid dynasty, the anti-Portuguese policy of the Sa'di of Marrakesh, increasing isolation under the 'Alawī dynasty (1659–1830)
2. Iran and Afghanistan
- a. Iran from c. 1500 to 1779
 - i. The rise of the Shi'ite Šafavid dynasty: conflict with the Turks, possession of western Afghanistan, disintegration and later restoration of the state by 'Abbās I (1587–1629), relations with European powers, decline and foreign invasions in the later 17th century, the arts under the Šafavids
 - ii. The expulsion (1730–32) of the Afghans, Russians, and Turks by Nādir Shāh; invasions of India and Turkistan (1738–39); attempts to unite Shi'ite and Sunni Muslims; establishment of Zand and Qājār dynasties
 - b. Afghanistan from c. 1500 to 1812: national awakening and rise of Afghan power in the early 18th century, subjection by Nādir Shāh (1732), establishment of the Durrānī dynasty (1747), intrusions in India and involvement in British affairs

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and biographies dealing with eastern Europe, Southwest Asia, and North Africa from c. 1480 to c. 1800

Afghanistan	Cairo	Istanbul	Saint Petersburg
Africa	Cyprus	Jerusalem	Steppe, The
Alexandria	Czech and Slovak	Jordan	History of the
Arabia	Republics	Lebanon	Eurasian
Asia	Damascus	Moscow	Syria
Austria	Egypt	North Africa	Transcaucasia
Baghdad	European History	Palestine	Turkey and
Balkan States	and Culture	Peter I the Great,	Ancient Anatolia
Baltic States	Hungary	of Russia	Ukraine
Beirut	Iran	Poland	Warsaw
Belarus	Iraq	Prague	
Budapest		Russia	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>international:</i>	Livonian War	Three Kings,	nizam-ı cedid
Åbo, Treaty of	Mohács, Battle of	Battle of the	Ottoman Empire
Altranstädt,	Northern War,	Transylvania	pasha
treaties of	First	Vienna, Siege of	Phanariote
Andrusovo,	Northern War,	Zenta, Battle of	Rumelia
Truce of	Second	<i>Ottoman Empire:</i>	Sublime Porte
Baltic states	Podolia	aga	vizier
Belgrade, Treaty of	Poland,	Aleppo	<i>Poland:</i>
Beresteczko,	Partitions of	'ayn	Bar,
Battle of	Polish Succession,	bey	Confederation of
capitulation	War of the	derebey	Galicja
Chāldirān,	Russo-Turkish wars	dey	Henrician Articles
Battle of	Silesia	Janissary	Warsaw,
Deulino, Truce of	Stolbovo, Treaty of	Jelāli Revolts	Compact of
Lepanto, Battle of		kanun	

Zebrzydowski Rebellion <i>Russian Empire:</i> Catherine the Great, Instruction of Cossack	Gentry, Charter to the grand duke oprichnina pale Pereyaslav Agreement	streltsy Troubles, Time of tsar zemsky sobor <i>other:</i> 'Abid al-Bukhārī	Barbary pirate Dózsa Rebellion dragoman Peacock Throne Wesselényi Conspiracy
Biographies			
<i>Hungary:</i> Bethlen, Gábor Esterházy family John	Sigismund III Vasa Stanisław I Stanisław II August Poniatowski	Golitsyn, Vasily Vasilyevich, Knyaz Golovkin, Gavriil Ivanovich, Count	Potemkin, Grigory Aleksandrovich Pugachov, Yemelyan Ivanovich
<i>Iran:</i> 'Abbās I Ismā'il I Nādir Shāh Šafavid dynasty Zand dynasty	Władysław IV Vasa Zamoyski family <i>Russian Empire:</i> Alexis Anna	Gordon, Patrick Ivan IV Khmelnysky, Bohdan Križanić, Juraj Michael Münnich, Burkhard Christoph, Count von Ordyn- Nashchokin, Afanasy Lavrentyevich Orlov, Grigory Grigoryevich, Graf	Razin, Stenka Repnin, Nikolay Vasilyevich, Prince Romanov dynasty Shcherbatov, Mikhail Mikhaylovich Sophia Stroganov family Suvorov, Aleksandr Vasilyevich, Graf Tolstoy, Pyotr Andreyevich, Count Vasily (IV) Shuysky Vorontsov, Mikhail Illarionovich
<i>Ottoman Empire:</i> Bayezid II Köprülü Fazıl Ahmed Paşa Köprülü Mehmed Paşa Mahmud I Selim I Selim II Selim III Süleyman I	Bering, Vitus Bestuzhev-Ryumin, Aleksey Petrovich, Count Biron, Ernst Johann, Reichsgraf von Catherine II Chirikov, Aleksey Ilich Dmitry, False	Michael Münnich, Burkhard Christoph, Count von Ordyn- Nashchokin, Afanasy Lavrentyevich Orlov, Grigory Grigoryevich, Graf Osterman, Andrey Ivanovich, Graf Panin, Nikita Ivanovich, Graf Peter III	Shcherbatov, Mikhail Mikhaylovich Sophia Stroganov family Suvorov, Aleksandr Vasilyevich, Graf Tolstoy, Pyotr Andreyevich, Count Vasily (IV) Shuysky Vorontsov, Mikhail Illarionovich <i>other:</i> Aḥmad Shāh Durrānī Āl Bū Sa'īd dynasty Bashīr Shihāb II Ismā'il
<i>Poland:</i> Augustus II John III Sobieski Kościuszko, Tadeusz Sigismund I Sigismund II Augustus	Dolgoruky, Vasily Lukich, Knyaz Dolgoruky, Vasily Vladimirovich, Knyaz Dolgoruky family Elizabeth Godunov, Boris		

INDEX: See entries under all of the terms above

Section 963. Europe from 1789 to c. 1920

- A. European political and economic revolution (1789–1850): the French Revolution and its effects, the development and effects of industrialization
1. The French Revolution and its reverberating effects on Europe (1789–1815)
 - a. The climate of change: “patriotism” in America and the Netherlands (1770–90)
 - b. France from 1789 to 1815: the Revolution, the First Republic, and the First Napoleonic Empire
 - i. The revolt of the Third Estate: uprisings in Paris and the provinces, the reforms of the Constituent Assembly, abolition of the monarchy, Marat and the Jacobins, the Legislative Assembly
 - ii. The First Republic to 1795: the Convention, Danton, Robespierre, the Committee of Public Safety and the Terror, the Thermidorian reaction
 - iii. The Directory (1795–99) and the rise of Napoleon Bonaparte: as first consul (1799–1804) and emperor (1804), the Code Napoléon and reconciliation with the church
 - iv. France under the Napoleonic First Empire: social, economic, and religious reforms
 - c. International war and diplomacy in the Age of the French Revolution

- i. The War of the First Coalition (1792–97): French support for revolution in neighbouring lands and annexation of Nice, Savoy, Austrian Netherlands, the Rhineland, and the Batavian Republic; Napoleon's Italian Campaign; the Treaty of Campo Formio (1797)
- ii. The French expedition to Egypt and Syria (1798–1802): Continental campaigns of the Second Coalition (1798–1802), French occupation of Rome and Naples, Marengo and Hohenlinden, Peace of Lunéville (1801) and Treaty of Amiens (1802), Napoleon's reorganization of the German states and the formal end of the Holy Roman Empire (1806)
- iii. The Third Coalition (1805–07) and the battles of Trafalgar, Austerlitz, Jena, and Friedland: the subjugation of Prussia, Treaty of Tilsit (1807) and the peak of Napoleon's power, the Continental System and its failure
- iv. The Franco-Austrian War (1809), the Spanish uprising and the Peninsular War (1808–14), Napoleon's defeat in the Russian campaign (1812) and the campaign of the Fourth Coalition, downfall (1814) and exile of Napoleon
- v. The Hundred Days and Napoleon's final defeat at Waterloo (1815), the Congress of Vienna and Metternich's attempt to restore the old order in Europe
- d. Political, economic, and social effects of French occupation in Germany, Italy, Switzerland, and the Low Countries
- e. Great Britain from 1789 to 1815
 - i. The influence of the French Revolution on the growth of English radicalism: governmental hostility to reform, Pitt's ministries and the war with France, Canning and Castlereagh, British gains in the peace settlements
 - ii. Suppression of the Irish Rebellion of 1798 and union of Great Britain and Ireland (1801): Irish social, economic, and cultural life in the 17th and 18th centuries
- f. Russia in the reigns of Paul I (1796–1801) and Alexander I (1801–25): Russian participation in the Napoleonic Wars, the initial liberal reforms of Alexander I
- g. Prussia (1786–1815)
 - i. Military decline following the death of Frederick II the Great: participation in the French Revolutionary Wars, defeat by Napoleon in 1806
 - ii. The Stein reforms: Prussian leadership of Germany in the wars of liberation (1813–14), territorial acquisitions in the Vienna peace settlement (1815)
- h. Austria (1790–1815): the reigns of Leopold II (1790–92) and Francis II (1792–1806; as emperor of Austria, Francis I, 1804–35); participation in the coalitions against Napoleon, shift to compliance with him, and eventual intervention in the wars of liberation
 - i. The smaller German states under French influence: the Confederation of the Rhine
- j. Spain and Portugal
 - i. Spain in the reign of Charles IV (1788–1808), French occupation (1808) and British aid in the War of Independence (Peninsular War), restoration of the Bourbons
 - ii. Portugal: alliance with Britain in the struggle against France
- k. Scandinavia from 1789 to 1815
 - i. Denmark: defeat by the British (1801), alliance with France after 1807, the loss of Norway to Sweden (1814)
 - ii. Sweden: Gustav IV and Charles XIII, the loss of Finland to Russia (1809), installation of Bernadotte as crown prince (1810), his anti-Napoleonic policy and the acquisition of Norway
- l. Italy during the French Revolution: support of revolutionary goals, French invasion and establishment of the republics, the French Consulate and the Napoleonic Empire
- 2. Pan-European developments in the first half of the 19th century: economic, intellectual, cultural, and social movements
 - a. The Industrial Revolution
 - i. British commercial, agricultural, and military growth: the factory system and advances in textile and machine technology, development of railroads
 - ii. Conditions on the Continent and the spread of the factory system to Belgium, France, and Germany

- iii. The social consequences of the Industrial Revolution: division between capitalist and worker, wages and living and working conditions, new abundance of manufactured goods
- b. The legacy of the French Revolution: cultural nationalism, populism, influence of Napoleon
- c. The Romantic movement: individualism and concern for nature and “folk” in contrast with the Enlightenment
- d. New facilities for scientific study in France and other Continental countries: effects of technological developments and scientific thought on society, principle of evolution
- e. Philosophy: the role of Immanuel Kant and his disciples (Fichte, Hegel, and Schopenhauer), German Idealism
- f. Religion and its alternatives: Catholic and Protestant revivals, Jewish emancipation, scientific positivism and the cult of art
- g. The beginning of “scientific history” and modern philology
- h. International war and diplomacy in the age of Metternich
 - i. Congress of Europe: the Quadruple and Holy alliances for maintenance of the Vienna settlement, French intervention in Spain (1823), Austrian intervention in Italy (1821 and 1830), changes in the Congress system with the Revolution of 1830 in France and Belgium
 - ii. General European unrest: the revolutions of 1848 and their suppression, Austrian intervention in Italy, Russian intervention in Hungary
- i. Great Britain and Ireland (1815–50)
 - i. Economic depression and social unrest following the Napoleonic Wars: repression by the government
 - ii. Political and social reform measures (1822–48); *e.g.*, penal reforms, Catholic Emancipation (1829), Peel’s new police force (1829), First Reform Bill (1832), abolition of slavery in British colonies (1833), new Poor Law (1834), repeal of the Corn Laws (1846), Navigation Acts, the Chartist movement, the growth of trade unionism and the Factory Act (1847), Public Health Act (1848)
 - iii. Developments in Ireland: the Great Famine of the 1840s, Roman Catholic unrest, O’Connell and the Young Ireland movement
- j. France from 1814 to 1852
 - i. The Restoration (1814, 1815–30): moderate constitutionalism under Louis XVIII, reaction and clericalism under Charles X
 - ii. The Revolution of 1830, Louis-Philippe and the July monarchy, the preservation of the status quo under Guizot, growing dissatisfaction with the regime in the 1840s
 - iii. The Revolution of 1848: Socialist thought and the establishment of the Second Republic, suppression of Socialist experiments, presidency of Louis-Napoléon
- k. Germany from 1815 to *c.* 1850
 - i. The German Confederation: Austrian domination under Metternich, the student national unity movement and its repression by the Carlsbad Decrees (1819), beginning of industrialization and the Zollverein
 - ii. The revolutions of 1848–49: the Frankfurt National Assembly and its failure to unite Germany
 - iii. Frederick William IV: restoration of the German Confederation, return to conservative policies, continued industrialization
- l. The Austrian Empire from 1815 to 1850
 - i. Development of national consciousness among the peoples of the empire: cultural revival among Magyars, Croats, Serbians, Poles, Romanians, Czechs, Slovaks, and Slovenes; German and Italian nationalism
 - ii. Metternich’s hostility to liberalism: Austria as a symbol of reaction in Italy
 - iii. The revolutions of 1848 and 1849 in Vienna, Prague, and Budapest
- m. The Italian states from 1815 to 1850
 - i. The Vienna settlement: the Austrian Habsburgs in Lombardy–Venetia, the Bourbons in the Two Sicilies, Victor Emmanuel in Savoy, the Carbonari

- ii. Abortive revolutions in Naples and Piedmont (1820); economic slump and revival; rebellions in Modena, Parma, the Romagna, the Marches, and Umbria (1831)
 - iii. The *Risorgimento*: Mazzini, Young Italy, and Young Europe; the early liberalism of Pope Pius IX
 - iv. The revolutions of 1848: the first phase of the Italian War of Independence, defeat of Piedmont by Austria (1848–49)
 - n. Switzerland from 1815 to 1860: conservative constitution of 1815, the Sonderbund War (1847), the new federal state established (1848–60), policy of neutrality
 - o. Russia from 1815 to c. 1850: later conservatism of Alexander I, the Decembrist revolt (1825), Nicholas I's (1825–55) conservative policies
 - i. Rule by bureaucracy, social classes, intellectual life, the empire and its various nationalities
 - ii. Foreign policy: conflict with Poland, relations with Turkey
 - p. The Low Countries from 1814 to 1848: union of The Netherlands, Luxembourg, and Belgium (1814); Belgian Revolution (1830) and establishment as a separate monarchy under Leopold I (1831–65); constitutional reform (1848) in The Netherlands
 - q. Spain and Portugal from 1815 to 1850
 - i. Spain under Ferdinand VII, revolution and abortive liberal government (1820–23), loss of South American empire (1820s), Isabella II and the succession dispute, First Carlist War (1833–39) and the “Spanish marriages” controversy
 - ii. Portuguese loss of Brazil (1822), civil war between constitutionalists and absolutists (1832–34), British intervention (1826–34), Maria II (1834–53) and civil strife between Septembrists and Saldanha
 - r. Scandinavia from 1815 to 1850
 - i. Denmark in the reigns of Frederick VI (1808–39) and Christian VIII (1839–48): beginning of economic problems, tendencies toward constitutional government culminating in the constitution of 1849, war over Schleswig-Holstein (1848–51)
 - ii. Developments in Sweden–Norway: conservative era under Charles XIV John (1818–44), liberal reforms after 1840 and under Oscar I (1844–59), Norway's struggle to assert independence from Sweden
 - iii. Finland and Iceland: Finnish political organization and Russian influence, the position of Iceland after the Treaty of Kiel (1814)
 - s. The Balkan states from c. 1804 to 1850
 - i. Serbian uprising (1804–13) and the rise of the principality, restoration of Ottoman power in Serbia (1813–15), Serbian autonomy (1830) under Ottoman Empire, Miloš Obrenović recognized as prince of Serbia (1833–39) and government of Alexander Karageorge (1842–58)
 - ii. Greek revolution (1821–30) and establishment of independence, internal strife under Otho I (1832–62), constitutional government introduced in 1843
- B. Realism and materialism, nationalism, the reorganization of Europe, imperialist expansion (1850–c. 1920)
- 1. European cultural and economic life from 1850 to 1920
 - a. Philosophy and political and social thought: the prevalence of Determinism and Materialism
 - b. Developments in the arts, philosophy, and religion
 - c. Scientific theory and practice: Einsteinian relativity, the social effects of medical advances, development of the behavioral sciences, new views of the universe
 - d. Economic life: the course of industrialization (1870–1914)
 - i. Industrial proliferation: expansion into new areas such as the U.S., eastern Europe, and Japan
 - ii. Changing balance of economic power in Europe: emergence of Germany as the leading industrial power, decline of British industrial strength
 - iii. The revolution in transportation and communications: steam navigation and the beginning of air travel; the internal-combustion engine; the telegraph, telephone, and radio; industrialization on the eve of World War I

2. International war and diplomacy from 1850 to c. 1920: *Realpolitik* and European diplomatic realignments
 - a. The era of Italian and German unification
 - i. Final dissolution of the Congress of Vienna alliance system: the Crimean War (1853–56) and its aftermath
 - ii. The Italian War of Independence: French intervention against Austria in Italy, the establishment of the Kingdom of Italy (1861)
 - iii. Bismarck and the creation of the German Empire: victories over Denmark (1864), Austria (1866), and France (1870–71)
 - b. The first period of German predominance
 - i. Bismarck's system of alliances: the Dreikaiserbund and the isolation of France, the Russo-Turkish War (1877–78) and the Congress of Berlin (1878–79), the Triple Alliance (1882)
 - ii. The Franco-Russian alliance (from 1893) and the Entente Cordiale (1904): Russia's defeat in the Far East (1904–05) and the formation of the Triple Entente (1907)
 - iii. Prelude to World War I: the Moroccan and Bosnian crises, the Balkan Wars (1912–13), the outbreak of war between the great powers (1914)
 - c. The resurgence of European imperialism (c. 1875–1914)
 - i. Renewed interest in overseas expansion by the European powers in the late 19th century: new acquisitions and new colonial powers, development of new theories of imperialism
 - ii. The European penetration of Asia and the partitioning of Africa: Russian expansion, economic penetration of China, rise of Japan, scramble for Africa
 - d. World War I (1914–18) and the Treaty of Versailles (1919)
 - i. The Serbian crisis and general mobilization: the opening German offensive in the east and west (August 1914), stabilization of the Western Front, trench warfare, new military technology (air power, tanks, and poison gas), the Battle of Verdun, renewed stalemate
 - ii. The entrance of Italy, Turkey, Japan, and other nations into the war: campaigns in the Balkans and the Middle East
 - iii. German submarine warfare and the U.S. entry into the war (1917); the Russian Revolution (1917), military collapse, and the Treaty of Brest-Litovsk (1918); the last Allied offensive and the armistice (1918)
 - iv. Total war and the mobilization of whole populations: the dissolution of the Austro-Hungarian, Russian, and Ottoman empires
 - v. The leadership, industrial strength, strategic plans and goals, and tactical and logistical procedures of the belligerents
 - vi. The Paris Peace Conference (1919–20) and the peace treaty: Wilson's influence; German reparations, restrictions, and territorial losses; reorganization of central Europe and the Middle East by the Allies; the mandates and the League of Nations
3. The European states from 1850 to c. 1920
 - a. Great Britain and Ireland and expansion of overseas empire (1850–1920)
 - i. Mid-Victorian politics and economics: liberalism and free trade, the Great Exhibition (1851), Russell's and Palmerston's foreign policies regarding the Crimean War and the Indian Mutiny, Second Reform Bill (1867)
 - ii. Mid-Victorian society and religion: Victorian social attitudes (duty, thrift, hard work, and character), liberalism and the High Church movement, revival of Scottish Calvinism
 - iii. Gladstone's liberalism and "Tory Democracy" and imperialism under Disraeli: Third Reform Bill (1884); the Irish Question and the rise of Fenianism, Parnell, and the Home Rule movement; Chamberlain and the split in the Liberal Party; Fabian socialism and growth of the Labour movement; South African War (1899–1902)
 - iv. The return of the Liberals (1905–14): Lloyd George's people's budget and National Insurance Act (1911), Parliament Act of 1911, continuing struggle over Ireland and Unionism in Ulster

- v. British participation in World War I: Lloyd George's Coalition government, the Easter Rising of 1916 in Ireland
- b. France from 1852 to 1920: the Second Empire and the Third Republic
 - i. Napoleon III's authoritarian policies and reassertion of France's role in Europe (the Crimea and Italy): partnership with Britain (1852–60), the liberal years (1859–70), foreign policy failures and defeat by Germany (1871)
 - ii. The siege of Paris, the Commune, and the establishment of the Third Republic (1870); attempts at restoration; the "Republican Republic"; opportunist control under Gambetta; the Boulangists; colonial expansion; the Dreyfus affair; separation of church and state (1905)
 - iii. The prewar years: conflicts between French rightists and Socialists, alignment with Russia and Britain before World War I, nationalism and revanchism
 - iv. World War I (1914–18): German occupation of northeastern France, the crisis of 1917, the Clemenceau government, French human and material losses in the war
- c. The unification of Germany and Prussia (1850–1920)
 - i. William I and tentative reform: clashes with the liberals, Bismarck and reform of the Prussian Army, parliamentary subservience to the crown
 - ii. Prussian and Austrian differences over the subjugation of Schleswig-Holstein (1864–66), the exclusion of Austria and the union of north and south Germany in the German Empire after the defeat of France (1871)
 - iii. Bismarck as imperial chancellor (1871–90): *Kulturkampf* and the breach with the National Liberals, anti-Socialist measures and social legislation, Bismarck's consolidation of German power and formation of the Triple Alliance (1882)
 - iv. The accession of Emperor William II (1888) and the fall of Bismarck; chancellorships of Caprivi, Hohenlohe, and Bülow (1890–1909); estrangement from Russia and rivalry with Britain; colonial expansion; militarists and Social Democrats in the period before World War I
 - v. World War I (1914–18) and increasing influence of the army: German military defeat (1918), establishment of the German Republic (1919)
- d. The Austrian and Austro-Hungarian Empire from 1850 to 1920
 - i. Constitutional experiments: the Kremsier and Stadion constitutions; the "Bach System," the October Diploma (1860), and the February Patent (1861); federalism and centralism (1850–67); the role of Emperor Francis Joseph (1848–1916); exclusion from Italy (1859) and Germany (1866); the *Ausgleich* (Compromise) and the establishment of the Dual Monarchy (1867)
 - ii. Austria: the liberal ascendancy under the Auersperg ministry (1871–78) and the coalition of clericals, German aristocrats, and Slavs under Taaffe (1879–93); relations between Austrians and Slavic minorities in the empire; the introduction of universal male suffrage (1907); foreign policy (1878–1908); annexation of Bosnia and Herzegovina and the crises in the Balkans
 - iii. Hungary: the Andrassy government, internal conflict between the opponents and advocates of the Compromise of 1867, social reforms and economic progress, Magyar supremacy maintained under Tisza (1875–90)
 - iv. Adherence to the Triple Alliance, increasing governmental paralysis and subordination to Germany during World War I, the dissolution of the Habsburg monarchy (1918) and the dismemberment of the empire
- e. The Russian Empire from c. 1850 to 1917
 - i. Defeat in the Crimean War (1853–56), abolition of serfdom (1861) and local government reforms under Alexander II (1855–81), Polish rebellion of 1863 and the spread of revolutionary sentiment, the assassination of the Tsar (1881)
 - ii. Reversal of the reform movement under Alexander III (1881–94), the *zemstvos*, government hostility to non-Russian minorities, Nicholas II (1894–1917), anti-reform policies, foundation of the Social Democrats and Social Revolutionaries
 - iii. Economic, cultural, and social developments: Russification policies, foreign policies
 - iv. Disorders following defeat in the Russo-Japanese War (1904–05), the Dumas, World War I and the abolition of the monarchy (1917)
- f. Italy from 1850 to 1920

- i. Cavour and the unification of Italy under Victor Emmanuel of Piedmont: alliance with France and domestic liberalism, papal opposition, Austrian defeat and territorial cessions in northern Italy in the war of 1859, Garibaldi and the conquest of the south, the annexation of Venetia from Austria (1866) and acquisition of Rome (1870)
 - ii. The Kingdom of Italy: Minghetti, Depretis, and Crispi; Italian adherence to the Triple Alliance; growth of Socialism, labour movements, and militant nationalism; the Giolitti era; participation in World War I
 - g. Switzerland from 1850 to 1920: domestic policies, neutrality in World War I
 - h. Spain and Portugal
 - i. Continued civil strife in Spain; control by the military; Carlists, *moderados*, *progressistas*, and republicans; the First Republic (1873–74); constitutional monarchy in 1876; further colonial losses in the Spanish-American War (1898)
 - ii. The reaction against liberalism following Spain's defeat, Spanish involvement in Morocco, civil tensions and neutrality in World War I
 - iii. Alternating progressive and conservative governments in Portugal under Pedro V (1853–61) and Luís I (1861–89), dispute with Great Britain over colonial policies, financial difficulties, dictatorship in 1906, the Portuguese Republic (1910) and Portugal's adherence to the British alliance in World War I
 - i. Scandinavia from 1850 to 1920
 - i. Denmark: the Schleswig-Holstein question, defeat by Prussia and Austria (1864) and loss of the duchies, social and economic change under the Conservative regime
 - ii. Sweden–Norway: parliamentary reforms in Sweden under Charles XV (1859–72), foreign policy, attitudes in Sweden and in Norway toward the Swedish–Norwegian union
 - iii. Finland and Iceland: the language problem and political reforms in Finland, its relations with Russia, Iceland's demands for self-government
 - j. The Low Countries from 1848 to 1920
 - i. The Netherlands: liberalization after 1848, the establishment of the independence of Luxembourg (1890), Queen Wilhelmina and World War I
 - ii. Belgian Liberal government (1857–84), rise of Catholic and Belgian Workers' (Socialist) parties, the education controversy and Catholic party rule (1884–1914), universal male suffrage and child labour laws, Leopold II's establishment of Congo Free State (1885) and annexation as Belgian Congo (1908), Flemish resistance to the French-speaking elite
 - iii. World War I: Dutch neutrality and the German conquest of Belgium
 - k. The Balkan States from 1850 to 1920: power conflicts resulting in the Balkan Wars (1912–13) and World War I
 - i. Greece: the overthrow of Otho I (1862), the constitution of 1864, acquisition of the Ionian Islands (1864) and Thessaly (1881), Cretan union with Greece (1908), Venizélos' policies, eventual adherence to the Triple Entente in World War I
 - ii. Serbia: restoration of Miloš Obrenović in 1858, defeat by Turkey (1876), the Kingdom of Serbia (1882), the pro-Austrian policy of the Obrenović dynasty, restoration of the Karageorgević dynasty and pro-Russian orientation, conflict with Austria-Hungary, conquest by the Central Powers in World War I
 - iii. Bulgaria: "great Bulgaria" established by the Treaty of San Stefano (1878), Prince Alexander I and Russian influence (1879–86), Ferdinand I (1887–1918) and Stambolov's formation of a government, revolt of the Macedonian minority (1903), separation from Turkey (1908), adherence to the Central Powers in World War I
 - iv. Romania: union of Moldavia and Walachia under Alexandru Cuza (1861), Carol I (1866–1914; king after 1881), independence from Turkey (1878), alignment with the Triple Entente and conquest by the Central Powers in World War I

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and biographies dealing with Europe from 1789 to c. 1920

Amsterdam	Balkan States	Belarus	Bismarck
Athens	Baltic States	Belgium	Budapest
Austria	Barcelona	Berlin	Cologne

Czech and Slovak Republics	Hungary	Milan	Sweden
Denmark	Iceland	Moscow	Switzerland
Dublin	International Relations,	Naples	Ukraine
Edinburgh	20th-Century	Napoleon	United Kingdom
European History and Culture	Ireland	Netherlands, The	Venice
Finland	Italy	Norway	Victoria and the Victorian Age
Florence	Lisbon	Paris	Vienna
France	London	Poland	Warsaw
Geneva	Luxembourg	Portugal	Wellington
Germany	Madrid	Prague	World Wars, The
Greece	Malta	Rome	
Hamburg	Manchester	Russia	
	Marseille	Spain	

MICROPAEDIA: Selected entries of reference information

General subjects

culture:

capitalism
 Classicism and Neoclassicism
 Industrial Revolution
 laissez-faire
 Marxism
 nationalism
 Romanticism
 Socialism
international relations—French
Revolutionary period and aftermath:
 Aix-la-Chapelle, Congress of
 Amiens, Treaty of
 Batavian Republic
 Borodino, Battle of
 Campo Formio, Treaty of
 Çanak, Treaty of
 Dresden, Battle of
 Europe, Concert of
 Eylau, Battle of
 First of June, Battle of the
 Fleurus, Battle of
 French Revolutionary and Napoleonic wars
 Friedland, Battle of
 Holy Alliance
 Jassy, Treaty of
 Jena, Battle of
 Laibach, Congress of
 Leipzig, Battle of
 Lodi, Battle of
 Mantua, Siege of
 Marengo, Battle of
 Paris, Treaties of

Peninsular War
 Pressburg, Treaty of
 Pyramids, Battle of the
 Quadruple Alliance (1813)
 Schönbrunn, Treaty of
 Tilsit, Treaties of
 Toulon, Siege of
 Trafalgar, Battle of
 Troppau, Congress of
 Ulm, Battle of
 Verona, Congress of
 Vienna, Congress of
 Wagram, Battle of
 Waterloo, Battle of
international relations—nationalism and balance of powers:
 Algeciras Conference
 Alma, Battle of the
 Balaklava, Battle of
 Balkan League
 Balkan Wars
 Berlin, Congress of
 Bosnian Crisis of 1908
 Bulgarian Horrors
 Crimean War
 Dreikaiserbund
 Dual Alliance
 Eastern Question
 Edirne, Treaty of 1830,
 Revolutions of 1848,
 Revolutions of Entente Cordiale

Europe, Concert of
 Franco-German War
 Greco-Turkish wars
 Hague Convention
 Italo-Turkish War
 Königgrätz, Battle of
 Moroccan crises
 Neuchâtel crisis
 Novara, Battle of
 Pan-Slavism
 Paris, Treaty of power, balance of
 Quadruple Alliance (1834)
 Règlement Organique
 Reinsurance Treaty
 Russo-Japanese War
 Russo-Turkish wars
 San Stefano, Treaty of
 Sedan, Battle of
 Serbo-Bulgarian War
 Serbo-Turkish War
 Sevastopol, Siege of
 Solferino, Battle of
 Straits Question
 Triple Alliance
 Villafranca, Conference of
 Vlorë proclamation
international relations—World War I and aftermath:
 Allied Powers
 Brest-Litovsk, treaties of
 Constantinople Agreement
 Corfu Declaration

Dardanelles Campaign
 Fourteen Points
 Isonzo, Battles of the
 June Offensive
 Jutland, Battle of
 Lusitania
 Marne, First Battle of the
 Marne, Second Battle of the
 Meuse-Argonne, battles of the
 Mudros, Armistice of
 Paris Peace Conference
 Saint-Germain, Treaty of
 Saint-Jean-de-Maurienne, Agreement of
 San Remo, Conference of
 Somme, First Battle of the
 Somme, Second Battle of the
 Sykes-Picot Agreement
 Trianon, Treaty of
 Verdun, Battle of
 Versailles, Treaty of
 World War I
national affairs—Britain and Ireland:
 Catholic Emancipation
 Chartism
 Clapham Sect
 Combination Acts
 Conservative Party
 Corn Laws

- Don Pacifico
 Affair
 Easter Rising
 Fabian Society
 Fenian
 Guild Socialism
 Home Rule
 Irish Potato
 Famine
 Irish Rebellion
 Labour Party
 Land League
 Liberal Party
 London Dock
 Strike
 Luddite
 Oxford Movement
 Parliament Act of
 1911
 Peterloo Massacre
 Phoenix Park
 murders
 pocket borough
 Reform Bill
 Taff Vale Case
 test act
 Tolpuddle Martyrs
 Union, Act of
 (Britain-Ireland)
 United Irishmen,
 Society of
national affairs—
France:
 Action Française
 Alsace-Lorraine
 anticlericalism
 assignat
 Bastille
 Batavian Republic
 Bonapartist
 Brumaire, Coup of
 18-19
 Chouan
 Cisalpine Republic
 Civil Constitution
 of the Clergy
 Continental
 System
 Corps Législatif
 Directory
 1801, Concordat of
 émigré
 Enragé
 Entente Cordiale
 Feuillants, Club
 of the
 Fourierism
 French Revolution
 Gauches,
 Cartel des
 Girondin
 guillotine
- Hébertist
 Helvetic Republic
 Hundred Days
 Jacobin Club
 July Revolution
 Montagnard
 Napoleonic Code
 National Assembly
 National
 Convention
 Orléanist
 Paris,
 Commune of
 Peninsular War
 Plain, The
 Public Safety,
 Committee of
 Revolutionary
 Tribunal
 Rights of Man and
 of the Citizen,
 Declaration
 of the
 Roman Republic
 sansculotte
 September
 Massacres
 Tennis Court
 Oath
 Terror, Reign of
 Thermidorian
 Reaction
 ultra
 Vendée, Wars
 of the
 Ventôse Decrees
national affairs—
Germany and
Austria:
 Agrarian League
 Austria-Hungary
 Burschenschaft
 Carlsbad Decrees
 Centre Party
 Deutschlandlied
 1848,
 Revolutions of
 Ems telegram
 Erfurt Union
 Parliament
 Frankfurt National
 Assembly
 Freikorps
 German
 Confederation
 Heimwehr
 Junker
 Kulturkampf
 March laws
 Olmütz,
 Punctuation of
 Pan-Germanism
- Prussia
 Rhine,
 Confederation
 of the
 Seven Weeks' War
 Social Democratic
 Party of Germany
 Spartacus League
 Zollverein
national affairs—
Italy:
 Carbonaro
 Cisalpine Republic
 Cispadine
 Republic
 Custoza, Battles of
 fascio siciliano
 Fiume question
 Guarantees,
 Law of
 Irredentist
 Italo-Turkish War
 Ligurian Republic
 Parthenopean
 Republic
 Popolare
 Risorgimento
 Roman Republic
 Solferino,
 Battle of
 Statuto Albertino
 Thousand,
 Expedition of the
 Villafranca,
 Conference of
 Young Italy
national affairs—
Poland:
 Congress Kingdom
 of Poland
 Cracow,
 Republic of
 January
 Insurrection
 liberum veto
 November
 Insurrection
 Poland,
 Partitions of
 Warsaw, Duchy of
national affairs—
Russia:
 Black Hundreds
 Bloody Sunday
 Bolshevik
 Bund
 Decembrist
 Duma
 Emancipation
 Manifesto
 January
 Insurrection
- Kadet
 Labour,
 Liberation of
 Leninism
 Liberation,
 Union of
 Menshevik
 mir
 Narodnaya Volya
 Narodnik
 November
 Insurrection
 October Manifesto
 Octobrist
 Orthodoxy,
 Autocracy, and
 Nationality
 Pan-Slavism
 Progressive Bloc
 Russian
 Revolution of
 1905
 Russian
 Revolution of
 1917
 Russian
 Social-Democratic
 Workers' Party
 Russo-Japanese
 War
 Russo-Turkish
 wars
 Slavophile
 Socialist
 Revolutionary
 Party
 Stolypin land
 reform
 Third Department
 Zemlya i Volya
 zemstvo
national affairs—
Scandinavia:
 Bodø Affair
 Eider Program
 Kiel, Treaty of
 Pan-Scandinavianism
 Riksdag
national affairs—
Spain and Portugal:
 Carlism
 Oranges, War
 of the
 Peninsular War
 Pragmatic
 Sanction of King
 Ferdinand VII
 Spanish-
 American War
 Spanish Marriages,
 Affair of the
 Verona, Congress of

national affairs—
other:
Flemish movement
Greek
Independence,
War of
Guarantees, Law of
Moldavia

Sonderbund
Walachia
overseas empires and
commerce:
Algeciras
Conference
Berlin, Congress of
Bowring Treaty
British East Africa

British Empire
British South
Africa Company
British West Africa
Clayton–Bulwer
Treaty
East India
Company
Fashoda Incident

French Equatorial
Africa
French West Africa
German East Africa
German South West
Africa
influence, sphere of
Open Door policy
protectorate

Biographies

Austrian Empire and
Austria-Hungary:
Andrássy, Gyula,
Count
Beneš, Edvard
Berchtold,
Leopold,
Count von
Beust, Friedrich
Ferdinand,
Graf von
Charles, Archduke
Cobenzl, Ludwig,
Graf von
Conrad von
Hötzenhof,
Franz, Graf
Deák, Ferenc
Francis II
(Germany/Holy
Roman Empire)
Francis Ferdinand,
Archduke of
Austria-Este
Francis Joseph
Gentz, Friedrich
Habsburg,
House of
Károlyi, Mihály,
Count
Kaunitz, Wenzel
Anton von
Kossuth, Lajos
Kun, Béla
Leopold II
(Germany/Holy
Roman Empire)
Metternich,
Klemens,
Fürst von
Radetzky, Joseph,
Count
Rudolf, Archduke
and Crown
Prince of Austria
Schwarzenberg,
Felix, Prince zu
Schwarzenberg,
Karl Philipp,
Prince zu
Stadion, Johann
Philipp, Graf von

Balkans:
Carol I
Dhiliyiánnis,
Theódoros
Ferdinand
(Bulgaria)
Ferdinand I
(Romania)
Garašanin, Ilija
Kapodístrias,
Ioánnis Antónios,
Count
Karageorge
Mavrokordátos,
Aléxandros
Milan IV (or II)
Miloš
Nicholas I
(Montenegro)
Otto (Greece)
Pašić, Nikola
Peter I
(Montenegro)
Peter I (Serbia)
Stamboliyski,
Aleksandūr
Venizélos,
Eleuthérios
Britain and Ireland:
Aberdeen, George
Hamilton-Gordon,
4th Earl of
Albert, Prince
Consort of Great
Britain and
Ireland
Asquith, H.H.
Balfour, Arthur
James Balfour,
1st earl of
Bentinck, Lord
William
Bright, John
Brougham and
Vaux, Henry
Peter Brougham,
1st Baron
Campbell-Bannerman,
Sir Henry
Canning, Charles
John Canning,
Earl

Canning, George
Cardigan,
James Thomas
Brudenell, 7th
Earl of
Carson, Edward
Henry Carson,
Baron
Casement, Sir
Roger
Castlereagh,
Robert Stewart,
Viscount
Chamberlain,
Joseph
Churchill, Lord
Randolph
Churchill, Sir
Winston
Clare, John
Fitzgibbon, 1st
earl of
Cobbett, William
Cobden, Richard
Cockburn, Sir
Alexander James
Edmund
Collingwood,
Cuthbert
Collingwood, 1st
Baron
Collins, Michael
Cornwallis, Charles
Cornwallis, 1st
Marquess and
2nd Earl
Cromer, Evelyn
Baring, 1st Earl of
Curzon, George
Nathaniel
Curzon,
Marquess
Dalhousie,
James Andrew
Broun Ramsay,
Marquess and
10th Earl of
Derby, Edward
Stanley, 14th
earl of

Devonshire,
Spencer Compton
Cavendish, 8th
Duke of
Dillon, John
Disraeli, Benjamin
Dundonald,
Thomas
Cochrane, 10th
Earl of
Edward VII
Fisher, John
Arbuthnot Fisher,
1st Baron
Forster, William
Edward
Fox, Charles James
French, John
George III
George IV
George V
Gladstone,
William Ewart
Goldie, Sir George
Grenville, William
Wyndham
Grenville, Baron
Grey, Charles
Grey, 2nd Earl
Grey, Sir Edward,
3rd Baronet
Griffith, Arthur
Haig, Douglas
Haig, 1st Earl
Haldane, Richard
Burdon
Hardie, J. Keir
Howe, Richard
Howe, Earl
Hyndman, Henry
Mayers
Jellicoe, John
Rushworth
Jellicoe, 1st Earl
Kitchener, Horatio
Herbert
Kitchener,
1st Earl
Lansdowne, Henry
Charles Keith
Petty-Fitzmaurice,
5th marquess of

- Lawrence, John
Laird Mair
Lawrence, 1st
Baron
Lawrence, T.E.
Liverpool, Robert
Banks Jenkinson,
2nd Earl of
Livingstone, David
Lloyd George,
David
Lugard, F.D.
Macaulay, Thomas
Babington
Macaulay, Baron
Melbourne,
William Lamb,
2nd Viscount
Napier, Robert
Napier, 1st
Baron
Nelson, Horatio
Nelson, Viscount
Northcote, Sir
Stafford Henry,
8th Baronet
O'Connell, Daniel
Palmerston, Henry
John Temple, 3rd
Viscount
Parnell, Charles
Stewart
Pearse, Patrick
Henry
Peel, Sir Robert
Perceval, Spencer
Pitt, William, the
Younger
Portland, William
Henry Cavendish
Bentinck, 3rd
Duke of
Raglan, FitzRoy
James Henry
Somerset, 1st
Baron
Redmond, John
Ripon, George
Frederick Samuel
Robinson, 1st
Marquess of
Rosebery.
Archibald Philip
Primrose, 5th
earl of
Russell, John
Russell, 1st Earl
Salisbury, Robert
Arthur Talbot
Gascoyne-
Cecil, 3rd
marquess of
- Shaftesbury,
Anthony Ashley
Cooper, 7th
Earl of
Sidmouth, Henry
Addington, 1st
Viscount
Stanley, Sir Henry
Morton
Tone, Wolfe
Victoria
Wellesley, Richard
Colley Wellesley,
Marquess
Wellington, Arthur
Wellesley, 1st
Duke of
Wilberforce,
William
William IV
Wilson, Sir Henry
Hughes, Baronet
Wolseley, Garnet
Joseph Wolseley,
1st Viscount
- France:*
Babeuf,
François-Noël
Barras,
Paul-François-
Jean-Nicolas,
vicomte de
Berthier,
Louis-Alexandre
Blanc, Louis
Bonaparte, Jérôme
Bonaparte, Joseph
Bonaparte, Lucien
Boulanger, Georges
Bourbon, House of
Briand, Aristide
Brissot,
Jacques-Pierre
Broglic, Victor, 3^e
duc de
Broglic, Albert, 4^e
duc de
Caillaux, Joseph
Cambacérès,
Jean-Jacques-
Régis de
Cambon, Joseph
Carnot, Lazare
Caulaincourt,
Armand,
marquis de
Charles X
Clemenceau,
Georges
Couthon, Georges
Danton, Georges
- Decazes, Élie,
Duke
Delcassé,
Théophile
Desmoulins,
Camille
Dreyfus, Alfred
Dumouriez,
Charles-François
du Périer
Enfantin,
Barthélemy-Prosper
Foch, Ferdinand
Fouché, Joseph
Gambetta, Léon
Guizot, François
Hébert,
Jacques-René
Hoche, Lazare
Jaurès, Jean
Joffre,
Joseph-Jacques-
Césaire
Joséphine
Lafayette,
Marie-Joseph-
Paul-Yves-
Roch-Gilbert
du Motier,
marquis de
Lamartine,
Alphonse de
Ledru-Rollin,
Alexandre-Auguste
Lesseps,
Ferdinand,
Viscount de
Loubet, Émile
Louis XVI
Louis XVIII
Louis-Philippe
Lyautey,
Louis-Hubert-
Gonzalve
Mac-Mahon,
Marie-Edme-
Patrice-Maurice,
comte de
Macdonald,
Jacques-Alexandre
Marat, Jean-Paul
Marie-Antoinette
Marie-Louise
Masséna, André
Mirabeau,
Honoré-Gabriel
Riqueti, comte de
Moreau, Victor
Napoleon I
Napoleon III
Necker, Jacques
- Nemours,
Louis-Charles-
Philippe-Raphaël
d'Orléans,
Duke de
Ney, Michel
Ollivier, Émile
Orléans,
Louis-Philippe-Joseph
duc d'
Pichegru, Charles
Poincaré,
Raymond
Pozzo di Borgo,
Charles-André,
Count
Robespierre,
Maximilien-François
Marie-Isidore de
Roland,
Jean-Marie
Roland,
Jeanne-Marie
Saint-Just,
Louis de
Sieyès,
Emmanuel-Joseph
Talleyrand,
Charles-
Maurice de
Thiers, Adolphe
Villèle, Joseph,
comte de
Viviani, René
Waldeck-Rousseau,
René
- Germany:*
Bennigsen,
Rudolf von
Bethmann
Hollweg,
Theobald von
Bismarck,
Otto von
Blücher, Gebhard
Leberecht von
Bülow, Bernhard,
Fürst von
Caprivi, Leo,
Graf von
Dahlmann,
Friedrich
Ebert, Friedrich
Engels, Friedrich
Erzberger,
Matthias
Frederick
Augustus I
Frederick
Augustus II
Frederick
William II

- Frederick
William III
- Frederick
William IV
- Gneisenau,
August, Count
Neidhardt von
- Hardenberg, Karl
August, Fürst von
- Hindenburg,
Paul von
- Hohenlohe-
Schillingsfürst,
Chlodwig Karl
Viktor, Fürst zu
- Hohenzollern
dynasty
- Holstein,
Friedrich von
- Kiderlen-Wächter,
Alfred von
- Louis I (Bavaria)
- Louis II (Bavaria)
- Ludendorff, Erich
- Marx, Karl
- Maximilian I
(Bavaria)
- Maximilian II
(Bavaria)
- Moltke,
Helmuth von
- Radowitz, Joseph
Maria von
- Roon, Albrecht
Theodor Emil,
Graf von
- Scharnhorst,
Gerhard Johann
David von
- Schlieffen, Alfred,
Graf von
- Stein, Karl,
Reichsfreiherr
vom und zum
- Tirpitz, Alfred von
- William I
(German Empire)
- William II
(German Empire)
- Italy:*
Bandiera, Attilio;
and Bandiera,
Emilio
- Bonaparte, Joseph
- Bourbon,
House of
- Cavour, Camillo
Benso, conte di
- Charles Albert
- Charles Felix
- Consalvi, Ercole
- Crispi, Francesco
- D'Annunzio,
Gabriele
- Depretis, Agostino
- Farini, Luigi Carlo
- Ferdinand I
(Naples)
- Ferdinand II
(Naples)
- Francis I (Naples)
- Francis II (Naples)
- Garibaldi,
Giuseppe
- Gioberti,
Vincenzo
- Giolitti, Giovanni
- Mazzini, Giuseppe
- Murat, Joachim
- Orlando, Vittorio
Emanuele
- Pelloux, Luigi
- Savoy, House of
- Umberto I
- Victor
Emmanuel I
- Victor
Emmanuel II
- Victor
Emmanuel III
- Visconti-Venosta,
Emilio, Marchese
- Low Countries:*
Albert (Belgium)
- Bonaparte, Louis
- Leopold I
(Belgium)
- Leopold II
(Belgium)
- William I
(Netherlands:
king)
- William II
(Netherlands:
king)
- William III
(Netherlands:
king)
- Portugal:*
Beresford, William
Carr Beresford,
Viscount
- Charles
John VI
- Maria I
- Maria II
- Michael
- Pedro I (Brazil)
- Russia:*
Alexander I
- Alexander II
- Alexander III
- Alexandra
- Arakcheyev,
Aleksy
- Andreyevich,
Graf
- Bennigsen, Leonty
Leontyevich,
Graf von
- Catherine II
- Chernyayev,
Mikhail
Grigoryevich
- Gorchakov,
Mikhail
Dmitriyevich,
Prince
- Guchkov,
Aleksandr
Ivanovich
- Ignatyev, Nikolay
Pavlovich, Graf
- Kerensky,
Aleksandr
Fyodorovich
- Kornilov, Lavr
Georgiyevich
- Kutuzov, Mikhail
Illarionovich,
Prince
- Lenin, Vladimir
Ilich
- Lobanov-Rostovsky,
Aleksy
Borisovich,
Knyaz
- Lvov, Georgy
Yevgenyevich,
Prince
- Milyukov, Pavel
Nikolayevich
- Milyutin, Dmitry
Aleksyevich,
Count
- Nesselrode, Karl
Vasilyevich,
Count
- Nicholas I
- Nicholas II
- Orlov, Aleksy
Fyodorovich,
Knyaz
- Paskevich, Ivan
Fyodorovich
- Paul
- Plekhanov,
Georgy,
Valentinovich
- Pobedonostsev,
Konstantin
Petrovich
- Rasputin, Grigory
Yefimovich
- Rostopchin,
Fyodor
Vasilyevich, Graf
- Savinkov, Boris
Viktorovich
- Shāmil
- Skobelev, Mikhail
Dmitriyevich
- Speransky, Mikhail
Mikhaylovich,
Graf
- Stolypin, Pyotr
Arkadyevich
- Witte, Sergey
Yulyevich, Graf
- Scandinavia:*
Branting, Karl
Hjalmar
- Charles XIII
(Sweden)
- Charles XV
(Sweden)
- Christian VIII
- Christian IX
- Christian X
- Frederick VI
(Denmark)
- Frederick VII
(Denmark)
- Frederick VIII
(Denmark)
- Gustav IV Adolf
- Gustav V
- Haakon VII
- Oscar I
- Oscar II
- Spain:*
Alfonso XII
- Alfonso XIII
- Bonaparte, Joseph
- Cánovas del
Castillo, Antonio
- Carlos Luís de
Borbón
- Carlos María de
los Dolores de
Borbón
- Carlos María
Isidro de Borbón
- Castelar y Ripoll,
Emilio
- Charles IV
- Ferdinand VII
- Godoy, Manuel de
- Isabella II
- María Cristina I
- María Cristina II
- Serrano y
Domínguez,
Francisco

Section 964. European Colonies in the Americas from 1492 to c. 1790

- A. The geography and ethnography of the Americas
- B. Spanish and Portuguese colonies in the Americas, other European powers in South America and the Caribbean to c. 1790
 - 1. Spanish discovery, exploration, and conquest of the Caribbean islands, Mexico, Central America, Peru, Venezuela, Colombia, and Río de la Plata (1492–c. 1550)
 - 2. Spain's colonial empire
 - a. Colonial administration: the Council of the Indies, viceroys and other provincial officials, *audiencias*, legal restrictions on public officials
 - b. Indian policy: slavery and peonage under the *encomienda* and *repartimiento*, the missionary role of the Roman Catholic Church, decline of the Indian population, introduction of black slaves
 - c. Colonial economy: expansion of agriculture; gold and silver mining; cattle industry; mercantilism, smuggling, and piracy
 - 3. The exploration and colonization of Brazil by the Portuguese (from 1500)
 - a. Colonial economic policies: introduction of black slavery, gold and diamond mining, agricultural and commercial development
 - b. Colonial administration: establishment of captaincies (1533), centralized royal control (1549), role of the Roman Catholic Church, the Brazilian racial mixture
 - 4. Administrative reforms of the Spanish Bourbon kings (1700–88): decentralization of the governments of Peru, Venezuela, and Chile; encouragement of trade and agriculture
 - 5. Spanish colonial expansion into North America (c. 1600–1790): settlements and religious missions
 - 6. English, French, and Dutch territorial and economic expansion (from c. 1600) into areas of Spanish and Portuguese colonization in Latin America and the Caribbean
- C. Norse, English, Dutch, and Swedish discoveries, explorations, and settlements in North America (c. 1000–1763)
 - 1. Norse voyages to Greenland and North America (c. 1000)
 - 2. Early English exploration and attempted settlement (1497–c. 1600), Dutch and Swedish settlement and later expulsion by the English
 - 3. Development of the English colonies in North America
 - a. The founding of the 13 Colonies: economic, political, and religious reasons for settlement
 - b. Economic, political, and social development
 - i. British economic policies: mercantilism and the Navigation Acts
 - ii. Colonial administration: loose royal control prior to 1763, self-government and local political activity
 - iii. Social mobility and the rise of economic classes: immigration and the introduction of slavery, agricultural and commercial development
 - c. Colonial cultural and scientific achievements; e.g., the American Philosophical Society, newspapers and almanacs, the beginning of public education, the “Great Awakening”
 - d. Conflicts with the French and Indians and expulsion of French power from North America (1763)
- D. French discoveries, explorations, and settlements in North America: New France and Louisiana (1524–1763)
 - 1. The settlement of New France: missionaries, Indian relations, and the fur trade; royal administration and joint-stock companies
 - 2. Expansion and eventual conflict with the English, resulting in the eclipse of French power in North America (1763)

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and a biography dealing with European colonies in the Americas from 1492 to c. 1790

Arctic, The	Latin America,	New Orleans	South America
Boston	The History of	New York City	United States of
Canada	Mexico	North America	America
Columbus	Montreal	Philadelphia	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>English and French colonization of North America:</i>	Mayflower	1763,	Indies,
Acadia	Compact	Proclamation of	Laws of the
Albany Congress	Mississippi Bubble	Sovereign Council	mameluco
Culpeper's	Molasses Act	Sugar Act	New Granada,
Rebellion	Monongahela,	Walking Purchase	Viceroyalty of
French and	Battle of the	Yamasee War	New Spain,
Indian War	New England,	<i>Spanish and</i>	Viceroyalty of
French Shore	Council for	<i>Portuguese</i>	Palmares
Hat Act	New England	<i>colonization of the</i>	Peru,
Hudson's Bay	New France	<i>Americas:</i>	Viceroyalty of
Company	Confederation	alcalde	Pueblo Rebellion
Iron Act	New Hampshire	asiento de negros	Real Cuerpo de
Iroquois	Grants	audiencia	Minería
Confederacy	Nootka Sound	bandeira	reducción
Jamestown	controversy	cabildo	repartimiento
King George's War	Paxton Boys	caciquism	residencia
King Philip's War	uprising	Cíbola, Seven	Riód de la Plata,
King William's	Pilgrim Fathers	Golden Cities of	Viceroyalty of the
War	Plymouth	conquistador	Santo Domingo
London Company	Company	Contratación,	Spanish treasure
Lost Colony	Powhatan War	Casa de	fleet
Massachusetts Bay	proprietary colony	corregidor	Strangford Treaty
Colony	Quebec, Battle of	donatário	<i>other:</i>
Mayflower	Queen	Eldorado	Middle Passage
	Anne's War	encomienda	New Sweden
	Salem witch trials	fazenda	Vinland

Biographies

<i>English explorers and colonizers:</i>	<i>French explorers and colonizers:</i>	Laval, François de	Díaz de Solís,
Cabot, John	Bienville,	Montmorency	Juan
Cabot, Sebastian	Jean-Baptiste	Roberval,	Las Casas,
Cook, James	Le Moynes de	Jean-François de	Bartolomé de
Hudson, Henry	Cartier, Jacques	La Rocque,	Narváez,
Johnson, Sir	Champlain,	Sieur de	Panfilo de
William, 1st	Samuel de	<i>Spanish and</i>	Soto,
Baronet	Frontenac, Louis	<i>Portuguese explorers</i>	Hernando de
Mather, Cotton	de Buade, comte	<i>and colonizers:</i>	Velázquez, Diego
Mather, Increase	de Palluau et de	Balboa, Vasco	Vespucci,
Penn, William	Iberville, Pierre Le	Núñez de	Amerigo
Pocahontas	Moyne d'	Cabral, Pedro	<i>other:</i>
Smith, John	La Salle,	Álvares	Bering, Vitus
Stirling, William	René-Robert	Columbus,	Chirikov, Aleksey
Alexander, 1st	Cavalier, Sieur de	Christopher	Ilich
earl of	La Vérendrye,	Coronado,	John Maurice of
Williams, Roger	Pierre Gaultier de	Francisco	Nassau
Winthrop, John	Varenes, et de	Vázquez de	

INDEX: See entries under all of the terms above

Section 965. Development of the United States and Canada from 1763 to 1920

- A. The United States to 1865: national formation and territorial expansion, conflict between North and South
 1. Establishment and consolidation of the United States (1763–1816)
 - a. The American Revolutionary period (1763–87)
 - i. Political and economic opposition to Britain’s taxation policies culminating in the Declaration of Independence (1776)
 - ii. The U.S. War of Independence (1775–83): land and sea campaigns, military leadership, French military support, peace treaty (1783)
 - iii. The government of the Articles of Confederation (1781–87) and evolution of a western lands policy
 - b. The strengthening of the national government (1787–1816)
 - i. The Constitutional Convention, the federal Constitution, and the struggle for ratification (1787–89)
 - ii. Development of national policies and formation of political parties: Hamilton’s economic policies, foreign relations during the administrations of Washington and John Adams, Federalists and Democratic-Republicans
 - iii. Jefferson’s administration and the Louisiana Purchase (1803), Madison’s administration and the War of 1812, role of the Supreme Court
 2. The United States from 1816 to 1850: nationalism, expansionism, extension of the franchise, and industrialization
 - a. Strengthening of national feelings: administrations of Monroe and John Quincy Adams, Supreme Court under Marshall
 - i. “The Era of Good Feelings” (1816–24): nationalism and sectionalism, the Missouri Compromise (1820)
 - ii. Developments in commerce and finance: industrialization and early labour movements, transportation and internal improvements, cotton and slavery
 - iii. Social development: German and Irish immigration (1830–50), urbanization and social mobility
 - b. Jacksonian democracy (1829–41): extension of the franchise; development of Democratic, Whig, and minor party politics; bank war; nullification; Indian removal policy
 - c. The “Age of Reform” (1830–50): the Abolitionist movement and other reform activities, diverse religious attitudes
 - d. Westward expansionism: annexation of Texas, acquisition of Oregon, the Mexican War (1846–48) and the annexation of California and New Mexico, the Compromise of 1850
 - e. Cultural development to 1850: the growth of the novel, poetry, music, the visual arts, historical writings, the Transcendentalist movement
 3. The United States from 1850 to 1865: sectionalism, secession, and Civil War
 - a. Sectionalism and slavery: economic and psychological bases of slavery, the failure of popular sovereignty, the Abolitionist movement, literature of the period
 - b. Political and geographical polarization: disruption of the Democratic and Whig parties, emergence of the Republican Party, and Lincoln’s election (1860)
 - c. Secession of the Southern states and the Civil War (1860–65)
 - i. Relative military strengths: strategies and tactics of North and South
 - ii. The land and sea war (1861–65): initial Confederate victories, Union success in the West and final victory over the South
 - iii. Foreign affairs of the Union and the Confederacy, moves toward emancipation during the war
- B. The United States from 1865 to 1920: Reconstruction, industrialization, increased immigration, development of the West, and emergence as a world power
 1. Radical Reconstruction (1866–77) and the New South (1877–1900)

- a. Lincoln's plan for Reconstruction and congressional opposition (1864–65), conflicts between the Radical Republican-controlled Congress and Andrew Johnson, state "Black Codes" and federal civil rights legislation
 - b. Reconstruction (1866–77): freedmen, sharecropping, and "Black Reconstruction"; Grant's administrations and the decline of Republican control in the South
 - c. The New South (1877–1900): conservative Democrats in control and erosion of black rights, Populist resurgence in the 1890s, white supremacy and Jim Crow legislation, the black response
2. The transformation of American society: the United States from 1865 to 1900
 - a. Urbanization and immigration: southern and eastern European immigrants and growth of slums, problems of prejudice, rise of city machine politics, development of public education
 - b. The development of the West (1865–1900)
 - i. The quest for gold and silver: boom and bust in mining towns
 - ii. Cattlemen and the open range: the cattle industry (1866–88), the cowboy and cattle drives, conflicts with settlers
 - iii. Westward expansion of the railroads: early government subsidies, relationship of the transcontinental carriers to the national economy
 - iv. Violation of the Indian treaties: settlers' encroachments on Indian lands, Indian wars, corruption among agents of the Bureau of Indian Affairs
 - c. The industrialization of the American economy: the manufacturing boom
 - i. Technological advances in the iron and steel industry: exploitation of oil, ores, lumber, and other natural resources
 - ii. Development of trusts and holding companies: development of a legal climate favourable to big business
 - d. U.S. foreign trade and commerce: growth of exports and imports
 - e. Emergence of national labour union organizations: strikes and boycotts, collective bargaining, antilabour stance of government, the Haymarket Riot (1886)
 - f. National politics (1877–1900): general ascendancy of Congress and decline of the presidency
 - i. Aftermath of the disputed election of 1876: the Compromise of 1877, the end of Southern Reconstruction, and Hayes's administration (1877–81); inflation and the silver issue
 - ii. The election of 1880 and the presidency of Garfield: Garfield's assassination (1881), Arthur's administration (1881–85), establishment of the Civil Service Commission (1883)
 - iii. The election of 1884 and Cleveland's first administration (1885–89): the reemergence of presidential leadership, the Treasury surplus and tariff issues, the Interstate Commerce Act (1887) and federal regulation of railroads
 - iv. The election of 1888 and Benjamin Harrison's administration (1889–93): congressional leadership, the Sherman Anti-Trust and Sherman Silver Purchase acts, and the McKinley Tariff Act (1890)
 - v. Depressed agricultural conditions (1887–97): the Farmers' Alliances and the establishment of the Populist Party (1891), farmers' defection from Republican Party
 - vi. The election of 1892 and Cleveland's second administration (1893–97): gold reserves and the Panic of 1893, repeal of the Sherman Silver Purchase Act (1893), lowering of the tariff
 - vii. The election of 1896 and McKinley's administration (1897–1901): the raising of the tariff (1897) and the Gold Standard Act (1900), gradual economic recovery
3. Imperialism, the Progressive Era, and the rise to world power (1896–1920)
 - a. The emergence of the U.S. as an imperial power
 - i. The Spanish–American War and U.S. suzerainty over Cuba; acquisition of the Philippines, the Hawaiian Islands, and Puerto Rico (1898)
 - ii. The "Open Door" policy and armed intervention in China (1900)
 - iii. Acquisition of the Panama Canal Zone (1903) and the Roosevelt Corollary to the Monroe Doctrine: intervention in Haiti, the Dominican Republic, Cuba, and Nicaragua

- b. The Progressive Movement (c. 1896–1920)
 - i. Scholars, social workers, and “muckrakers” as leaders of the Progressive Movement; social and political urban reforms by state government
 - ii. Theodore Roosevelt’s administrations (1901–09) and expansion of presidential power and regulatory legislation, Taft’s administration (1909–13) and the defection of Progressive Republicans in the 1912 election
 - iii. Wilson’s first administration (1913–17): tariff, currency, credit, tax, and labour reforms; intervention in Mexican affairs
- c. The role of the U.S. in World War I
 - i. Initial U.S. neutrality: loans and supplies to the Allies, submarine warfare and the break with Germany
 - ii. U.S. entry into the war: mobilization of manpower and the economy, decisive effect of U.S. military forces on the Western Front (1918)
 - iii. Wilson’s policies at the Paris Peace Conference (1919) and the U.S. Senate rejection of the Treaty of Versailles (1920), the election of 1920 and the return to isolationism
- 4. Cultural developments from 1865 to 1920
 - a. Advances in fiction, poetry, drama, music, and the visual arts
 - b. Developments in education and historical writings, growth of American philosophy
- C. Canada under British colonial rule from 1763 to 1867, the Dominion of Canada from 1867 to 1920
 - 1. British colonial administration: the Quebec Acts of 1763 and 1774, immigration of United Empire Loyalists after U.S. War of Independence, establishment of French- and English-speaking provinces
 - 2. Social, political, and economic development from 1790 to 1850
 - a. Immigration, westward expansion, and the fur trade; participation in the War of 1812
 - b. Dissension between French and English settlers: the rebellions of 1837, the Union of Upper and Lower Canada (1841), self-government for domestic affairs (1848)
 - 3. The Dominion of Canada from 1867 to 1920
 - a. The Confederation movement and the establishment of the Dominion (1867)
 - b. Westward expansion and internal disunity
 - i. Louis Riel and the first Métis-Indian rebellion (1870), establishment of the provinces of Manitoba and British Columbia
 - ii. The transcontinental railroad, suppression of the second Métis-Indian rebellion (1885), economic depression and downfall of the Conservative government (1896)
 - c. Liberal governments under Laurier and economic prosperity (1896–1911)
 - i. The Klondike gold rush (1897) and the settlement of the Northwest Territories, creation of the provinces of Alberta and Saskatchewan (1905)
 - ii. Involvement in Britain’s imperialist policies: participation in South African War (1899), border disputes with the United States
 - d. Economic nationalism and the Conservative government (1911–17): participation in World War I, recognition of Canadian autonomy (1917)

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and biographies dealing with the development of the United States and Canada from 1763 to 1920

Boston	Lincoln	Philadelphia	Washington, D.C.
Canada	Montreal	San Francisco	Washington,
Chicago	New Orleans	Toronto	George
Franklin	New York City	United States of	
Jefferson	North America	America	

MICROPAEDIA: Selected entries of reference information

General subjects

- Canada:*
- Aroostook War
 - Assiniboia
 - Bering Sea Dispute
 - British North America Act
 - Canada Company
 - Canada East
 - Canada West
 - Charlottetown Conference
 - Clear Grits
 - Clergy Reserves
 - Hunters' Lodges
 - Jesuit Estates controversy
 - Liberal Party of Canada
 - métis
 - North West Company
 - Pacific Scandal
 - Parti Rouge
 - Progressive Conservative Party of Canada
 - Quebec, Battle of
 - Quebec Act
 - Red River Settlement
 - Reform Party
 - Rush-Bagot Agreement
 - Seven Oaks Massacre
- United States—Revolutionary period:*
- Bennington, Battle of
 - Bonhomme
 - Richard and Serapis, engagement between
 - Boston, Siege of
 - Boston Tea Party
 - Brandywine, Battle of the
 - Bunker Hill, Battle of
 - Camden, Battle of
 - Carlisle Commission
 - Cherokee wars and treaties
 - Cherry Valley Raid
 - Continental Congress
 - Correspondence, Committees of
 - Cowpens, Battle of
 - Declaratory Act
 - Democratic Party
 - Embargo Act
 - Essex Junto
 - Fallen Timbers, Battle of
 - Franco-American Alliance
 - Germantown, Battle of
 - Gnadenhütten Massacre
 - Green Mountain Boys
 - Guilford Court House, Battle of
 - Independence, Declaration of
 - Intolerable Acts
 - Kings Mountain, Battle of
 - Lexington and Concord, Battles of
 - Long Island, Battle of
 - Loyalist minuteman
 - Monmouth Court House, Battle of
 - Moore's Creek Bridge, Battle of
 - Nonimportation Agreements
 - Oriskany, Battle of
 - Paris, Peace of
 - Pinckney's Treaty
 - Purple Heart
 - Quartering Act
 - Quebec, Battle of
 - Regulators of North Carolina
 - Republican Party
 - Saintes, Battle of the
 - Saratoga, Battles of
 - Stamp Act
 - Stars and Stripes
 - Suffolk Resolves
 - Tea Act
 - Townshend Acts
 - Trenton and Princeton, battles of
 - Tripolitan War
 - United States War of Independence
 - Valley Forge
 - Virginia Capes, Battle of
 - Virginia Declaration of Rights
 - White Plains, Battle of
 - Wyoming Massacre
 - XYZ Affair
 - Yorktown, Siege of
- United States—early years:*
- Alien and Sedition Acts
 - American Fur Company
 - Annapolis Convention
 - Anti-Federalists
 - Châteauguay, Battle of
 - Chippewa, Battle of
 - Confederation, Articles of
 - Constitution of the United States
 - Constitutional Convention, U.S.
 - Creek War
 - Democratic Party
 - 1812, War of
 - Embargo Act
 - Essex Decision
 - Fallen Timbers, Battle of
 - Federalist, The
 - Federalist Party
 - Fries's Rebellion
 - Ghent, Treaty of
 - Hartford Convention
 - Jay Treaty
 - Lake Erie, Battle of
 - Lewis and Clark Expedition
 - Locofoco Party
 - Louisiana Party
 - Lundy's Lane, Battle of
 - Marbury v. Madison
 - Monroe Doctrine
 - National Republican Party
 - New Orleans, Battle of
 - Northwest Ordinances
 - Northwest Territory nullification
 - Pinckney's Treaty
 - Republican Party
 - Rights, Bill of
 - Saint Clair's Defeat
 - Shays's Rebellion
 - Star-Spangled Banner, The
 - Thames, Battle of the
 - Tippecanoe, Battle of
 - Uncle Sam
 - Virginia and Kentucky Resolutions
 - War Hawk
 - West Florida Controversy
 - Western Reserve
 - Whig Party
 - Whiskey Rebellion
- United States—nationalism and westward expansion:*
- Alamo
 - Alaska Purchase
 - Bear Flag Revolt
 - Buena Vista, Battle of
 - Cerro Gordo, Battle of
 - Chisholm Trail
 - Clayton-Bulwer Treaty
 - Comstock Lode
 - Contreras, Battle of
 - cowboy
 - Gadsden Purchase

- Guadalupe
 Hidalgo,
 Treaty of
 Homestead
 Movement
 Indian
 Removal Act
 Indian Territory
 Little Bighorn,
 Battle of the
 Manifest Destiny
 Mexican War
 Oregon Question
 Oregon Trail
 Ostend Manifesto
 Palo Alto,
 Battle of
 Russian-
 American
 Company
 San Jacinto,
 Battle of
 Sante Fe Trail
 Seminole Wars
 Southern Overland
 Mail Company
 Westward
 Movement
 Young America
 Movement
*United States—
 sectional crisis:*
 Ableman v. Booth
 abolitionism
 Alabama claims
 American
 Anti-Slavery
 Society
 American
 Colonization
 Society
 Antietam, Battle of
 Appomattox Court
 House
 Atlanta Campaign
 Big Black River,
 Battle of
 black code
 Bleeding Kansas
 Bull Run,
 battles of
 carpetbagger
 Chancellorsville,
 Battle of
 Chattanooga,
 Battle of
 Chickamauga
 Creek, Battle of
 Civil War
 Cold Harbor,
 battles of
- Confederate States
 of America
 Confiscation Acts
 Constitutional
 Union Party
 Copperhead
 Crittenden
 Compromise
 Dixie
 Draft Riot of 1863
 Dred Scott
 decision
 1850,
 Compromise of
 Electoral
 Commission
 Emancipation
 Proclamation
 Force Acts
 Fredericksburg,
 Battle of
 Free-Soil Party
 Freedmen's Bureau
 Fugitive Slave Acts
 Gettysburg,
 Battle of
 Gettysburg
 Address
 Hampton Roads
 Conference
 Harpers Ferry
 Raid
 Hunkers and
 Barnburners
 Jim Crow law
 Kansas-
 Nebraska Act
 Kenner mission
 Know-Nothing
 party
 Ku Klux Klan
 Lecompton
 Constitution
 Liberal Republican
 Party
 Liberty Party
 Lincoln-Douglas
 Debates
 McCardle, Ex
 Parte
 Memphis Race
 Riot
 Merryman, Ex
 Parte
 Milligan, Ex Parte
 Missouri
 Compromise
 Mobile Bay,
 Battle of
- Monitor and
 Merrimack,
 Battle of
 Nashville, Battle of
 Nashville
 Convention
 Ohio Idea
 Pea Ridge,
 Battle of
 Peninsular
 Campaign
 personal liberty
 laws
 Petersburg
 Campaign
 popular
 sovereignty
 Radical
 Republican
 Reconstruction
 Red River
 Campaign
 Seven Days'
 Battles
 Shenandoah
 Valley
 Campaigns
 Shiloh, Battle of
 Stones River,
 Battle of
 Tenure of
 Office Act
 Topeka
 Constitution
 Underground
 Railroad
 Union League
 Vicksburg
 Campaign
 Wade-Davis Bill
 Wilderness, Battle
 of the
 Wilmot Proviso
 Wilson's Creek,
 Battle of
*United States—
 urbanization,
 industrialization,
 and the agrarian
 revolt:*
 Coxey's Army
 Free Silver
 Movement
 Granger
 movement
 Greenback
 movement
 Hammer v.
 Dagenhart
 Haymarket Riot
- Industrial Workers
 of the World
 Knights of Labor
 Molly Maguires
 Mugwump
 Populist
 Movement
 Pullman Strike
 Slaughterhouse
 Cases
*United States—
 war with Spain,
 Progressivism, and
 the rise to world
 power:*
 Big Stick Policy
 Bryan-Chamorro
 Treaty
 Bull Moose Party
 Dollar Diplomacy
 Fourteen Points
 Gentlemen's
 Agreement
 Hay-Bunau-Varilla
 Treaty
 International
 Boundary
 Waters Treaty
 King-Crane
 Commission
 Lansing-Ishii
 Agreement
 Maine,
 destruction
 of the
 Manila Bay,
 Battle of
 New Nationalism
 Open Door policy
 Paris, Treaty of
 (1898)
 Platt Amendment
 Preparedness
 Movement
 Root-Takahira
 Agreement
 Rough Rider
 Santiago, Battle of
 Spanish-
 American War
 Veracruz incident
other:
 Anti-Saloon
 League
 Atlanta
 Compromise
 Bank War
 Bering Sea
 Dispute
 Black Friday
 Brook Farm

Brownsville Affair
Chicago Race
Riot of 1919
Crédit Mobilier
Scandal
Dawes General
Allotment Act

East Saint Louis
Race Riot
of 1917
Niagara
Movement
Nonpartisan
League

Prohibition Party
Resumption Act
of 1875
slave rebellions
Stalwart
Talented Tenth

Tammany Hall
Universal Negro
Improvement
Association
Wounded Knee

Biographies

American Indian leaders:

Brant, Joseph
Cochise
Crazy Horse
Dull Knife
Geronimo
Joseph, Chief
McGillivry,
Alexander
Pontiac
Red Jacket
Sitting Bull
Tecumseh
Washakie

Canadians:

Baldwin, Robert
Borden, Sir Robert
Brown, George
Durham, John
George Lambton,
1st earl of
Galt, Sir
Alexander
Tilloch
Lansdowne, Henry
Charles Keith
Petty-Fitzmaurice,
5th marquess of
Laurier, Sir Wilfrid
Macdonald, Sir
John
Mackenzie,
William Lyon
Papineau, Louis
Joseph
Riel, Louis

U.S. Abolitionists:

Brown, John
Delany, Martin R.
Douglass,
Frederick
Garrison, William
Lloyd
Julian, George W.
Tappan, Arthur

U.S. diplomats:

Blaine, James
Harris, Townsend
House, Edward M.
Page, Walter
Hines

Randolph, John *U.S. explorers and frontiersmen:*

Boone, Daniel
Carson,
Christopher
Clark, George
Rogers
Cody, William F.
Crockett, Davy
Frémont, John C.
Peary, Robert
Edwin
Whitman, Marcus

U.S. industrialists:

Hanna, Mark
Hewitt, Abram
Martin, Luther
Rockefeller,
John D.
Vanderbilt family
See also Section
732 of Part Seven

U.S. military

leaders—Civil War:
Beauregard, P.G.T.
Bragg, Braxton
Breckinridge,
John C.
Burnside, Ambrose
Everett
Butler,
Benjamin F.
Early, Jubal A.
Farragut, David
Forrest, Nathan
Bedford
Grant, Ulysses S.
Hood, John B.
Hooker, Joseph
Jackson, Thomas
Jonathan
Johnston,
Joseph E.
Lee, Robert E.
Longstreet, James
McClellan,
George B.
Meade, George G.
Pope, John
Rosecrans,
William S.

Sheridan, Philip H.
Sherman, William
Tecumseh
Stuart, Jeb
Thomas,
George H.

U.S. military leaders—Mexican War:

Gorgas, Josiah
Kearney, Stephen
Watts
Scott, Winfield
Taylor, Zachary

U.S. military

leaders— Revolutionary War:

Arnold, Benedict
Greene, Nathanael
Hale, Nathan
Hampton, Wade
Jones, John Paul
Kościuszko,
Tadeusz
Lafayette,
Marie-Joseph-
Paul-Yves-
Roch-Gilbert
du Motier,
marquis de
Washington,
George

U.S. military

leaders—other:

Custer, George
Armstrong
Jackson, Andrew
Mitchell, William
Perry, Matthew C.
Pershing, John J.

U.S. presidents:

Adams, John
Adams, John
Quincy
Arthur, Chester A.
Buchanan, James
Cleveland, Grover
Fillmore, Millard
Garfield, James A.
Grant, Ulysses S.
Harrison,
Benjamin

Harrison, William
Henry
Hayes,
Rutherford B.
Jackson, Andrew
Jefferson, Thomas
Johnson, Andrew
Lincoln, Abraham
McKinley,
William

Madison, James
Monroe, James
Pierce, Franklin
Polk, James K.
Roosevelt,
Theodore

Taft, William
Howard
Taylor, Zachary
Tyler, John
Van Buren,
Martin
Washington,
George

U.S. social reformers and religious leaders:

Garvey, Marcus
Grimké, Sarah and
Angelina
La Follette,
Robert M.
Noyes, John
Humphrey
Truth, Sojourner
Washington,
Booker T.
Woodhull,
Victoria
Wright, Frances
Young, Brigham
*U.S. statesmen and
political figures—
Civil War and
Reconstruction:*
Bates, Edward
Blair, Francis
Preston, Jr.
Boutwell, George
Sewall
Brownlow,
William G.

Chase, Salmon P.	Vance, Zebulon B.	Paine, Thomas	<i>U.S. Supreme Court</i>
Clay, Henry	Welles, Gideon	Pendleton,	<i>justices:</i>
Crittenden,	<i>U.S. statesmen and</i>	Edmund	Brandeis, Louis
John J.	<i>political figures—</i>	Revere, Paul	Field, Stephen J.
Davis, Henry	<i>Federalist period:</i>	Rush, Benjamin	Harlan, John
Winter	Burr, Aaron	Wilkinson, James	Marshall
Davis, Jefferson	Clinton, Dewitt	<i>U.S. statesmen and</i>	Holmes, Oliver
Douglas,	Dayton, Jonathan	<i>political figures—</i>	Wendell
Stephen A.	Hamilton,	<i>other:</i>	Jay, John
Mason, James	Alexander	Altgeld, John Peter	Marshall, John
Murray	Pinckney, Charles	Benton, Thomas	Matthews, Stanley
Owen,	<i>U.S. statesmen and</i>	Hart	Miller, Samuel
Robert Dale	<i>political figures—</i>	Bryan, William	Freeman
Revels, Hiram R.	<i>Revolutionary War:</i>	Jennings	Story, Joseph
Seward,	Adams, John	Hay, John	Taney, Roger
William H.	Adams, Samuel	Houston, Sam	Brooke
Sherman, John	Franklin,	Lansing, Robert	Waite, Morrison
Stanton, Edwin M.	Benjamin	Lodge, Henry	Remick
Stevens, Thaddeus	Henry, Patrick	Cabot	White, Edward
Sumner, Charles	Mason, George	Root, Elihu	Douglas
Vallandigham,	Otis, James	Webster, Daniel	
Clement L.			

INDEX: See entries under all of the terms above

Section 966. Development of the Latin-American and Caribbean Nations to c. 1920

A. The Latin-American independence movement (1790–1825)

1. Background of the Latin-American wars of independence
 - a. Discontent among Indians, Creoles, and mestizos: the influence of the Enlightenment, the U.S. War of Independence, and the French Revolution
 - b. Influence of Toussaint-Louverture's successful slave revolt (1791–94); war with the French (1802–03) and the establishment of Haiti (1804)
 - c. Spanish involvement in European wars: the Peninsular War in Spain (1808–14), Napoleon's seizure of the Spanish throne and Creole support of Ferdinand VII
2. The Spanish South American War of Independence (1810–25), the establishment of the independent Empire of Brazil (1822)
 - a. The struggle for independence in New Granada
 - i. Initial phases of the revolt under Miranda and Bolívar (1811–14), military setbacks (1815)
 - ii. Final expulsion of the Spanish from Venezuela, Colombia, Ecuador, and Panama (1821); establishment of the Republic of Gran Colombia (1821–29)
 - b. Establishment of the United Provinces of the Río de la Plata (1813) at Buenos Aires; division of provinces into states of Paraguay, Buenos Aires, and Uruguay (1828)
 - c. San Martín's military support of the Chilean independence movement under O'Higgins (1817–18), the liberation of Peru (1821)
 - d. San Martín's withdrawal and assumption of control by Simón Bolívar, final defeat of Spanish troops (1824), Upper Peru's emergence as independent state of Bolivia (1825) under Sucre
 - e. The Portuguese government in exile in Brazil (1808–22); reforms of King John VI (1816–22), establishment of the independent Empire of Brazil under Pedro I (1822)
3. The Mexican War of Independence (1810–21): Hidalgo's revolt (1810–11), social and economic reforms under Morelos (1811–15), Iturbide's leadership (1820–21)

B. Mexico from independence (1821) through the end of the Revolution (1917)

1. Mexico from 1821 to 1855

- a. The independent Mexican Empire under Iturbide (1821–23), Santa Anna and the establishment of the Mexican Republic (1824), the constitution of 1824, Centralist–Federalist struggles
 - b. Santa Anna’s military career and intermittent terms as president (1833 to 1855): the Alamo (1836); war with U.S. (1846–48) over Texas, New Mexico, and California
2. Mexico from 1855 to 1876
 - a. Juárez and La Reforma: social and economic reforms of the 1857 constitution, anticlericalism, the civil war (1857–60)
 - b. French intervention (1862) and Emperor Maximilian’s puppet rule (1864–67): attempted liberal reforms; loss of conservative support; French withdrawal, defeat of imperial forces, and Maximilian’s execution (1867)
 - c. Restoration of the republic under Juárez’ leadership (1867–72), educational and economic reforms, Lerdo’s presidency (1872–76), further separation of church and state
 3. The Porfirio Díaz dictatorship (1876–1911)
 - a. Díaz’ economic and social policies: maintenance of public order and suppression of dissent, economic development through foreign investment, reconciliation with church, middle-class control of land
 - b. Emergence of radical and liberal political clubs (c. 1900); internal unrest; labour strikes; Madero’s unsuccessful challenge to Díaz’ reelection (1909); armed revolt, Díaz’ resignation, and Madero’s election (1911)
 4. The Mexican Revolutionary period (1910–17): Huerta’s coup and Madero’s execution (1913); Carranza’s loose alliance with Pancho Villa, Zapata, and Obregón; civil war; the constitution of 1917; Carranza’s election (1917)
- C. Central America and the Caribbean to c. 1920
1. The Central American republics to c. 1920
 - a. Independence from Spain (1821), participation in Mexican Empire (1822–23), federation of United Provinces of Central America (1823), armed conflict between Conservatives and Liberals, collapse of the federation (1838)
 - b. Guatemala from 1838 to 1920: Carrera’s Conservative dictatorship (1838–65), social and economic reforms of Barrios (1873–85) and subsequent Liberal regimes to 1898, Estrada Cabrera’s administration (1898–1920)
 - c. Honduras from 1838 to 1920: Conservative domination to the 1870s, Aurelio Soto’s Liberal regime (1876), return of Conservative control (1885), U.S. investments and military intervention (1912)
 - d. El Salvador to 1930: establishment of the republic (1841), Liberal–Conservative conflicts to 1885, coffee economy, political stability (1899–1930)
 - e. Nicaragua from 1838 to 1920: Liberal–Conservative conflicts, foreign intervention in the 1850s, stable Conservative governments (1857–93), economic growth, Zelaya’s Liberal regime (1893–1909), U.S. military intervention from 1910
 - f. Costa Rica from 1838 to 1920: the coffee economy and social stability, Guardia dictatorship (1870–82) and the 1871 constitution, orderly presidential succession after 1890, Río San Juan dispute with Nicaragua
 - g. Panama to 1920: union with Gran Colombia (1821–1903), civil war, U.S. intervention and establishment of Republic of Panama (1903), building of Panama Canal (1904–14), U.S. control of Canal Zone
 - h. British colonial and U.S. economic interests in, and conflicts over, the Central American region; e.g., in British Honduras
 2. The island states of the Caribbean (c. 1800–1930)
 - a. Haiti to 1934: independence in 1804, civil war between the blacks and mulattoes, black hegemony under Christophe (later Henri I, 1806–20), ascendancy of mulattoes under Boyer (1820–43), political instability (1843–1915), U.S. military occupation (1915–34)
 - b. The Dominican Republic to 1930: the struggle for independence (to 1844), despotic regimes (1844–1916), U.S. armed intervention (1916–30)
 - c. Cuba from 1790 to 1934
 - i. 19th-century social and economic developments: growth of the sugar industry, the abolition of slavery (1886)

- ii. Spanish suppression of Cuban liberation movement in the Ten Years' War (1868–78), economic relations with United States, the Cuban War of Independence from Spain (1895–98)
 - iii. Cuba as a U.S. protectorate until 1934; military occupation (1899–1901), Republic of Cuba (1902), later U.S. occupation (1906–09), dictatorships and the sugar industry
 - d. The remaining European insular and mainland possessions in the Caribbean region from *c.* 1810 to *c.* 1920
- D. The successor states of Gran Colombia to *c.* 1930
 - 1. Venezuela from 1810 to 1935
 - a. Venezuelan independence movement (1810–30), national development under Páez (1830–48), Conservative Party rule
 - b. Monagas family regime (1848–58) and turmoil between Liberal and Conservative parties to 1870, regime of Guzmán Blanco (1870–88)
 - c. Political instability to 1892, Crespo's regime (1892–96), the Castro (1899–1908) and Gómez (1908–35) dictatorships
 - 2. Colombia from 1819 to 1930
 - a. Independence (1819), participation in Gran Colombia to 1830, power struggle between Conservative and Liberal parties (1840–80), social reforms, anticlericalism
 - b. Political instability and civil wars (1880s and 1899–1903), loss of Panama (1903), development of coffee industry (1909–28)
- E. The Indian nations of the Andes to *c.* 1930
 - 1. Ecuador from 1822 to 1925
 - a. Participation in Gran Colombia (1822–30), independent republic (1830), dictatorial regimes to 1845, political instability (1845–60)
 - b. Clericalism in García Moreno's dictatorship (1860–75), Liberal ascendancy after 1875, Alfaro's administrations (1897–1911), social problems, depression in the 1920s
 - 2. Peru from 1824 to 1930
 - a. Establishment of republic (1824), power struggle among caudillos (1824–41), temporary union with Bolivia (1836–39), orderly government under Castilla (1845–51 and 1855–62)
 - b. Spanish military invasion (1864–69), Pardo's civilian government (1872–76) and economic crises, War of the Pacific (1879–84) and loss of territory to Chile, establishment of Peruvian Corporation (1889)
 - c. Economic and social reforms of Piérola's administration (1895–1908), conflict between Democratic and Civilian parties, Leguía's administrations (1908–12 and 1919–30) and economic development, formation of the Aprista Movement
 - 3. Bolivia from 1809 to 1930
 - a. Participation in Latin American wars of independence (1810–25), Bolivian independence (1825), Sucre's presidency (1826–28), economic decline
 - b. Dictatorship of Santa Cruz (1829–39), temporary union with Peru (1836–39), silver-mining boom, War of the Pacific (1879–84) and territorial loss to Chile
 - c. Conservative Party rule (1880–99), economic growth, the Federal Revolution (1899), Montes' leadership in Liberal Party rule (1899–1920), growth of tin-mining industry, Republican Party coup (1920), economic decline
- F. Chile from 1810 to 1920
 - 1. Chile from the 1810 establishment of the republic to 1860
 - a. The provisional government (1810–12), return of Spanish rule (1812), defeat of Spanish troops by combined Chilean–Argentinian army (1817)
 - b. Bernardo O'Higgins as head of state (1817–23); liberal reforms and conservative opposition, O'Higgins' abdication (1823), political instability (1823–30)
 - c. The conservative hegemony (1830–61): the 1833 constitution; political stability and conservative governments under Portales, Ovalle, Prieto, Bulnes, and Montt; economic prosperity; growth of liberal faction

2. The widening of liberal influence and the growth of political splinter groups (1861–91)
 - a. The “Liberal Republic” under Pérez (1861–71) and the liberal–conservative alliance: cultural and economic ties with Great Britain, political conflict over church–state relations (1872)
 - b. The War of the Pacific (1879–84) and threatened European intervention: annexation of saltpetre-mining provinces from Peru and Bolivia, civil war and Balmaceda’s abdication (1891)
 3. The parliamentary republic (1891–1920): era of legislative supremacy; growth of middle and lower classes; formation of Democratic (1887), Radical (1888), and Socialist (1901 and 1912) parties
- G. The successor states of the Río de la Plata (excluding Bolivia) to c. 1920
1. Argentina to 1930
 - a. Efforts toward reconstruction (1820–29), confederation under Rosas and ascendancy of Buenos Aires (1829–52)
 - i. Dominance of Buenos Aires: interprovincial rivalries, presidency of Rivadavia (1826–27)
 - ii. The Rosas government (1829–52): domestic politics and foreign policies
 - b. Period of national consolidation (1852–80), conservative regimes (1880–1916)
 - i. The constitution of 1853 and civil wars (1853–60), government under Mitre (1862–68) and his successors
 - ii. Economic development during Roca’s administration (1880–86), economic crisis of 1890
 - iii. The rise of radicalism: growth of social unrest, electoral reform of 1912
 - c. The Radical regimes (1916–30): Irigoyen’s presidency (1916–22), continued Radical rule in the 1920s, growth of foreign influence in the economy, military coup (1930)
 2. The Uruguayan struggle for independence and national unity (1811–1929)
 - a. Independence from Spain (1811) and participation in United Provinces of the Río de la Plata (1813–28), establishment of independent Uruguay (1828)
 - b. Civil war (1839–51) between Colorado and Blanco political parties, participation in war against Paraguay (1865–70), military rule (1875–90)
 - c. Civilian rule and continued political crises and insurrections (1890–1904), Peace of Acequá (1904) and return to orderly government, social and economic reforms, economic boom during World War I
 3. Paraguay from 1810 to 1924
 - a. Independence from Spain (1811), struggle with Buenos Aires for autonomy, establishment of independent Paraguay (1813)
 - b. Isolationism during Rodríguez Francia’s dictatorship (1814–40), encouragement of foreign trade during Carlos Antonio López’ dictatorship (1841–62)
 - c. Francisco Solano López’ regime (1862–70): loss of territory after war with Brazil and Argentina (1864–70), political instability after 1870
- H. Brazil from the establishment of the empire to the fall of the First Republic (1822–1930)
1. The independent Empire of Brazil (1822–89)
 - a. The empire under Pedro I (1822–31): the constitution of 1824, Pedro’s abdication (1831), internal disunity during the regency (1831–40)
 - b. The empire under Pedro II (1840–89): intervention in Uruguayan affairs and war with Paraguay (1864–70); cessation of slave trade (1853), gradual emancipation, and abolition of slavery (1888)
 2. Brazil during the First Republic (1889–1930)
 - a. The constitution of 1891 and social reforms, military dictatorships (1891–94), civilian governments (1894–1914)
 - b. Brazilian participation in World War I, postwar prosperity to 1922, economic problems during the 1920s, increasing political role of the military, civil disorders leading to the revolution of 1930

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the development of the Latin-American and Caribbean nations to c. 1920

Argentina	Colombia	Mexico	South America
Bolivia	Ecuador	Mexico City	Suriname
Brazil	Guyana	North America	Uruguay
Buenos Aires	Havana	Paraguay	Venezuela
Caracas	Latin America,	Peru	West Indies, The
Central America	The History of	Rio de Janeiro	
Chile	Lima	São Paulo	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>Central America and the Caribbean:</i>	Chapultepec	<i>South America:</i>	Pacific, War of the
Canal Zone	Chilpancingo,	Acto Adicional	Paraguayan War
Cuban	Congress of	of 1834	Pavón, Battle of
Independence	científico	Ayacucho,	Peruvian-Bolivian
Movement	Contreras,	Battle of	Confederation
Hay-Bunau-Varilla	Battle of	Bidlack Treaty	Pipiolo and
Treaty	Gadsden Purchase	Boyacá, Battle of	Pelucón
Maine, destruction	Grito de Dolores	Bryan-Chamorro	Rio Branco Law
of the	Guadalupe	Treaty	Talambo affair
Platt Amendment	Hidalgo,	Carabobo,	Thousand Days,
Santiago, Battle of	Treaty of	Battle of	The War of a
Spanish-	Iguala Plan	Cepeda, battles of	Tucumán,
American War	Indigenismo	Chacabuco,	Congress of
United Provinces	Mexican	Battle of	Water Witch
of Central	Revolution	Civilista	incident
America	Mexican War	estancia	
<i>Mexico:</i>	Palo Alto, Battle of	gaucho	
Buena Vista,	Pastry War	Gran Colombia	
Battle of	Puebla, Battle of	Guayaquil	
Celaya, Battle of	Reforma, La	Conference	
Cerro Gordo,	Rurales	Itata and	
Battle of	San Jacinto,	Baltimore	
	Battle of	incidents	

Biographies

<i>Central America and the Caribbean:</i>	Guerrero, Vicente	Artigas, José	O'Higgins,
Barrios, Justo	Hidalgo y Costilla,	Gervasio	Bernardo
Rufino	Miguel	Batlle y Ordóñez,	Pedro I
Dessalines,	Huerta, Victoriano	José	Pedro II
Jean-Jacques	Iturbide,	Bolívar, Simón	Reyes, Rafael
Estrada Cabrera,	Agustín de	Carrera, José	Rivadavia,
Manuel	Juárez, Benito	Miguel	Bernardino
Estrada Palma,	Madero, Francisco	Fonseca, Manuel	Rosas, Juan
Tomás	Maximilian	Deodoro da	Manuel de
Martí, José Julián	Morelos, José	Guzmán Blanco,	San Martín,
Morazán,	María	Antonio	José de
Francisco	Santa Anna,	Haya de la Torre,	Silva Xavier,
Toussaint-Louverture	Antonio López de	Víctor Raúl	Joaquim José da
Zelaya, José Santos	Villa, Pancho	López, Francisco	Sucre, Antonio
<i>Mexico:</i>	Zapata, Emiliano	Solano	José de
Carranza,	<i>South America:</i>	Miranda,	Uriburu,
Venustiano	Andrada e Silva,	Francisco de	José Félix
Díaz, Porfirio	José Bonifácio de	Mitre, Bartolomé	Urquiza, Justo
		Moreno, Mariano	José de

INDEX: See entries under all of the terms above

Section 967. Australia and Oceania to c. 1920

- A. The character and historical development of the diverse peoples of Oceania and the effects of colonization
1. The historical sources and historiographic problems
 2. Geography, ethnography, and prehistory of Australia, Melanesia, Micronesia, and Polynesia (including New Zealand)
 3. European exploration and colonial settlement: missionaries, trading societies, and colonial government
- B. Australia to 1920
1. Early European exploration by sea and land
 2. British colonization of New South Wales in 1788, expansion and development of self-government (1830–60), economic growth and the federation movement (1860–1901), the establishment of the commonwealth in 1901, social tensions, cultural developments
 3. Early years of the commonwealth: establishment of a White Australia immigration policy, Labor Party reforms, industrial growth, cooperation with Britain in World War I
 4. Relations with the Aboriginal population
- C. New Zealand to 1928
1. The extension of British control over, and annexation of, North and South Islands (1838–41)
 2. Relations between the indigenous Maori people and the British: encroachments and ensuing conflicts
 3. Establishment of self-government (1852): economic development and immigration
 4. Politics and foreign relations (1890–1928): Liberal and Reform Party governments, radical politics, the Labour Party, cooperation with Britain in World War I

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with Australia and Oceania to c. 1920

Australia
 Melbourne
 New Zealand
 Pacific Islands
 Sydney
 United States of America: *Hawaii*

MICROPAEDIA: Selected entries of reference information

General subjects

<i>Australia:</i>	Immigration	United Australia	New Zealand
ANZAC	Restriction Act	Party	Political Reform
Australian	Kanaka	Van Diemen's	League
Colonies	Lambing Flat	Land	Waitangi,
Government Act	Riots	White Australia	Treaty of
Australian Labor	Liberal Party of	Policy	Young Maori
Party	Australia	<i>New Zealand:</i>	Party
Australian	National Party	ANZAC	<i>other:</i>
Patriotic	New South Wales	Hauhau	Lapita culture
Association	Corps	Maori	Melanesia
Black War	Port Phillip	Representation	Micronesia
blackbirding	Association	Act	Polynesia
bushranger	Port Phillip	New Zealand	
Castle Hill Rising	District	Company	
Emancipist	Rum Rebellion	New Zealand	
Eureka Stockade	squatter	Labour Party	
Exclusive			

Biographies

<i>Australia:</i>	Parkes, Sir Henry	<i>other:</i>	Mitchell, Sir
Arthur, Sir George,	Phillip, Arthur	Bougainville,	Thomas
1st Baronet	Sturt, Charles	Louis-Antoine de	Livingstone
Barton, Sir	Torrens, Sir	Clunies-Ross	Oxley, John
Edmund	Robert Richard	family	Tasman, Abel
Bligh, William	Wentworth, W.C.	Cook, James	Janszoon
Deakin, Alfred	<i>New Zealand:</i>	Dumont d'Urville,	Wakefield,
Forrest, Sir John	Kingi, Wiremu	Jules-Sébastien-César	Edward Gibbon
Hughes, William	Massey, William	Flinders, Matthew	Weld, Sir
Morris	Ferguson	Kamehameha I	Frederick
Macarthur, John	Pomare, Sir Maui	Kamehameha IV	Aloysius
Macquarie,	Seddon, Richard		
Lachlan	John		

INDEX: See entries under all of the terms above

Section 968. South Asia Under the Influence of European Imperialism from c. 1500 to c. 1920
A. European activity in India (1498–c. 1760)

1. Portuguese commercial relations with India from 1498: establishment of the colony of Goa, decline of Portuguese hegemony and rise of British and Dutch influence
2. Dutch trading posts and conflicts with the British
3. The British and French in India
 - a. Establishment and growth of British settlements and trading posts (1600–1740): the East India Company, relations with indigenous peoples
 - b. Development of French trading companies from 1674: Anglo-French rivalry (1740–63) and establishment of British hegemony
 - c. The British seizure of Calcutta (1757) and Clive's establishment of British control over the local Bengal ruler (1757–60)

B. Extension of British power (1760–1858)

1. Growth of the political power of the British East India Company and attempts by the British crown to regulate its affairs
 - a. Securing of British supremacy in Bengal
 - b. Warren Hastings (1774–85) and the transition of the status of the company from revenue farmer to a ruling power in India
 - c. Wars with the Marāṭhās and Mysore at the end of the 18th century
 - d. Expansion and consolidation of British control over various Indian states during administrations of Lord Wellesley (1798–1805), Lord Minto (1807–13), and Lord Hastings (1813–23)
 - e. The organization and determination of administrative policy: Cornwallis and the transition toward British administrative procedures
 - f. Completion of British annexation of, or domination over, the Afghan, Sikh, and Lower Burmese kingdoms in the 1840s and 1850s
2. The political, legal, economic, social, and cultural effects of the first century of British influence
3. The cause, outbreak, suppression, and effects of the Indian Mutiny (1857–59): the British crown's assumption of total responsibility for the government of India

C. British imperial power (1858–1920)

1. Climax of the raj: social and economic policies, government organization, the influence of the viceroys
2. British foreign policy in India: conflicts with Russia over the northwest frontier, the incorporation of Burma (1886), the Second Afghan War (1878–80) and the creation of the North-West Frontier Province (1901), the Third Afghan War (1919)

3. Beginning of Indian nationalism in the late 19th century and the British response: formation of the Indian National Congress (1885), policies of Lord Curzon (1899–1905), partition of Bengal, founding of the nationalist Muslim League, the Indian Councils Act of 1909
 4. World War I and its aftermath: India's contribution to the war effort, anti-British activity, the Amritsar massacre, the Government of India Act (1919), Hindu–Muslim relations, the emergence of Mahatma Gandhi and the adoption of his noncooperation policy
- D. Ceylon under foreign rulers from c. 1505 to 1920
1. Portuguese political and commercial activities in Ceylon (1505–1658): conflict with the Kandyan kingdom
 2. Dutch rule in Ceylon (1658–1796) and its influence on the political, economic, judicial, and administrative systems; commercial enterprises and missionary attempts
 3. The British in Ceylon from 1796: unification and early administration, the reforms of 1833, the transition from a subsistence to a commercial economy, the beginnings of constitutional government, nationalist unrest during World War I
- E. Tibet and Nepal from c. 1750 to c. 1920
1. Decline of Chinese influence in Tibet: administration and culture under the Manchus
 2. Nepal's territorial expansion under the Shah rulers, decline of Shah family and rise of Thapa and Rana families, accommodation with the British to preserve Nepal's independence

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with South Asia under the influence of European imperialism from c. 1500 to c. 1920

Asia
Calcutta
India
Nepal
Sri Lanka

MICROPAEDIA: Selected entries of reference information

General subjects

<i>colonial administration and policy:</i>	<i>historic events:</i>	Saint George, Fort	Purandhar, Treaty of
Afrīdī	Amritsar, Massacre of	William, Fort	Surji-arjungaon, Treaty of
Bengal, Partition of	Baksar, Battle of	<i>nationalist groups and movements:</i>	Wadgaon, Convention of
Colebrook-Cameron Commission	Barrackpore Mutiny	Ghadr	
Cornwallis Code	Black Hole of Calcutta	Indian Association	
Durand Line	Carnatic Wars	Indian National Congress	
East India Company	Fīroz Shāh, Battle of	Muslim League	
Government of India Act	Gujrat, Battle of	Noncooperation Movement	
lapse, doctrine of	Indian Mutiny	Servants of India Society	
McMahon Line	Marāthā Wars	<i>treaties:</i>	
maḥalwārī system	Miāni, Battle of	Amritsar, Treaty of	
Sadr Dīwānī 'Adlāt	Mysore Wars	Banaras, Treaties of	
Thesavalamai	Sikh Wars	Bassein, Treaty of	
tombo	Sobraon, Battle of	Lucknow Pact	
zamindar	Vellore Mutiny	Malvana, Convention of	
	<i>historic states and sites:</i>		
	Cis-Sutlej states		
	Kandy		
	Saint David, Fort		

Biographies*Britons:*

Auckland, George	Fitch, Ralph	Minto, Gilbert	Holkar dynasty
Eden, earl of	Frere, Sir Bartle	Elliot-Murray-	Lajpat Rai, Lala
Bentinck, Lord	Hastings, Francis	Kynynmound, 1st	Mir Ja'far
William	Rawdon-Hastings,	earl of	Ram Singh
Canning, Charles	1st marquess of	Minto,	Roy, Ram Mohun
John Canning,	Hastings, Warren	Gilbert John	Sankaran Nair,
Earl	Hume, Allan	Elliot-Murray-	Sir Chettur
Chelmsford,	Octavian	Kynynmound,	Sapru, Sir Tej
Frederic John	Lansdowne, Henry	4th earl of	Bahadur
Napier Thesiger,	Charles Keith	Napier, Robert	Sastri, Srinivasa
1st Viscount	Petty-Fitzmaurice,	Napier, 1st Baron	Shāh 'Ālam II
Clive, Robert, 1st	5th marquess of	Outram, Sir James	Tilak, Bal
Baron Clive of	Lawrence,	Ripon, George	Gangadhar
Plassey	Sir Henry	Frederick Samuel	<i>other:</i>
Coote, Sir Eyre	Montgomery	Robinson, 1st	Albuquerque,
Curzon, George	Lawrence, John	marquess of	Afonso de, the
Nathaniel	Laird Mair	Wellesley, Richard	Great
Curzon,	Lawrence, 1st	Colley Wellesley,	Dupleix,
Marquess	Baron	Marquess	Joseph-François
Dalhousie,	Lytton, Robert	Younghusband, Sir	Gama, Vasco da
James Andrew	Bulwer-Lytton,	Francis Edward	Jung Bahadur
Broun Ramsay,	1st earl of	<i>Indians:</i>	La Bourdonnais,
Marquess and	Mayo, Richard	Banerjea, Sir	Bertrand-François
10th earl of	Southwell	Surendranath	Mahé, comte de
Ellenborough,	Bourke, 6th	Dalip Singh	
Edward Law,	earl of	Das, Chitta Ranjan	
earl of	Metcalfe,	Dogra dynasty	
Elphinstone,	Charles T.	Gandhi,	
Mountstuart	Metcalfe, Baron	Mohandas	
		Karamchand	

INDEX: See entries under all of the terms above

Section 969. Southeast Asia Under the Influence of European Imperialism to c. 1920

- A. The states and European colonies of mainland Southeast Asia from c. 1600 to c. 1920
 1. Myanmar (Burma) and Malaya from c. 1600 to c. 1920: the advent of British rule
 - a. Myanmar from c. 1600 to c. 1920
 - i. Renewed expansionism and wars with the Mons, Thais, and Chinese under the Alaungpaya dynasty from 1752: the First and Second Anglo-Burmese Wars (1824–26, 1852), traditional administration in Myanmar
 - ii. The Third Anglo-Burmese War (1885) and annexation to British India (1886), effects of British colonialism: destruction of traditional church-state relationship, impoverishment of the population
 - b. Malaya from c. 1630 to c. 1920: loss of autonomy through Dutch and British intrusions
 - i. Dutch intervention in the Malay states and seizure of Malacca (1641), immigration of Minangkabau from Sumatra and Buginese from Celebes (mid-17th–18th century)
 - ii. British incursions into Malaya in the late 18th century, steady immigration of Chinese throughout the 19th century and resulting social unrest, British intervention and assumption of power from sultanates of Malaya from the 1870s
 2. Indochina and the development of French rule from c. 1516
 - a. Portuguese and French missionary involvement in Vietnam and Vietnamese reaction (1516–1858), French intervention in Indochina and territorial acquisition of Cochinchina and Cambodia (1858–63)
 - b. Period of colonization (1873–93); establishment of French protectorates in Annam, Tonkin, and Laos; French administration in Indochina

3. Siam from *c.* 1620 to *c.* 1910
 - a. Trade relations with China and other Asian countries, influence of Theravāda Buddhism, Dutch and French intrusions and establishment of trade in the 1660s
 - b. Invasion by Myanmar (1767) and end of Ayutthayan kingdom domination; political reunification and establishment of Chakkri dynasty (1782); social, cultural, and legal development in the early 19th century; Chinese immigration; expansion of trade with the U.S. and with European countries; reign of Mongkut (1851–68)
 - c. Political, social, and economic reforms in the reign of Chulalongkorn (1868–1910): Anglo-French activity in Southeast Asia and acquisition of Siamese territory (1893–1909)
 4. Laos from *c.* 1600: establishment of separate kingdoms of Luang Prabang and Vientiane in 1707, Siamese domination from 1778, establishment of French protectorate in 1893
- B. The states and European colonies of the Indonesian Archipelago and the Philippines from *c.* 1500 to *c.* 1920
1. The Portuguese and the Spanish in Southeast Asia
 - a. Portuguese naval and commercial activities, domination of the Strait of Malacca, and rivalry with the Spanish in the Spice Islands; collapse of Portuguese commercial empire with the defeat by the Dutch (1641)
 - b. The Philippines to *c.* 1920
 - i. The people and culture of the Philippines prior to the arrival of the Spanish
 - ii. Spanish control of the Philippines (1571–1898): government administration and influence of the Roman Catholic Church, land policy and overseas trade, rise of nationalism in the 19th century
 - iii. The Philippine Revolution of 1896–98, U.S. support in ousting the Spanish, subsequent U.S. takeover and administration to *c.* 1920
 2. The Dutch and other European powers in Indonesia from *c.* 1600 to *c.* 1920
 - a. The Dutch East India Company (1602–1799): Coen's establishment of Dutch commercial supremacy, company rule in Java, decline and abolition of the company
 - b. The French and British in Java (1806–15), Dutch rule in the 19th century
 - i. The Culture System (*Cultuur-stelsel*) and its deleterious effects on Java (1830–70): the Liberal Policy
 - ii. The Ethical Policy and the rise of nationalism: social and economic benefits, formation of nationalist organizations

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with Southeast Asia under the influence of European Imperialism to *c.* 1920

Asia	Manila
Indonesia	Philippines
Jakarta	Southeast Asia

MICROPAEDIA: Selected entries of reference information

General subjects

<i>Indonesian</i>	Muhammadiyah	Annam	Perak War
<i>Archipelago:</i>	Padri War	Barrackpore	Saigon, Treaty of
Achinese War	Peranakan	Mutiny	Selangor Civil War
Amboina	Perhimpunan	Bowring Treaty	Sino-French War
Massacre	Indonesia	Cochinchina	Straits Settlements
Budi Utomo	priyayi	Hai San	Tonkin
Buginese	Sarekat Islām	Hludaw	<i>Philippine Islands:</i>
Culture System	Volksraad	Indochina	barangay
Dutch East Indies	<i>mainland Southeast</i>	Naning War	Cavite Mutiny
Ethical Policy	<i>Asia:</i>	Pangkor	Friar Lands
Gianti Agreement	Anglo-Burmese	Engagement	Question
Mataram	Wars		

Manila Bay, Battle of Manila galleon	Philippine- American War Philippine Revolution	Spanish-American War Spooner Amendment	
Biographies			
<i>Indochina:</i>	Dewantoro, Ki	Bonifacio, Andres	Coen, Jan
Anu, Chao	Hadjar	Burgos, José	Pieterszoon
Chan II	Dipo Negoro,	Mabini, Apolinario	Dewey, George
Chanthakuman	Pangeran	Osmeña Sergio	Dupré, Marie-Jules
Cuong De	Imam Bondjol	Quezon, Manuel	Dupuis, Jean
De Tham	Iskandar Muda	Rizal, José	Garnier, Francis
Deo Van Tri	Kartini, Raden	<i>Siam and Malaya:</i>	Legazpi, Miguel
Duy Tan	Adjeng	Chakkri dynasty	Lôpes de
Gia Long	Tjokroaminoto,	Chulalongkorn	Pavie, Auguste
Later Le dynasty	Omar Said	Damrong	Phaulkon,
Le Van Duyet	Wahidin	Rajanubhab	Constantine
Minh Mang	Sudirohusodo,	Devawongse	Phayre, Sir
Nguyen dynasty	Mas Ngabehi	Varsprakar,	Arthur Purves
Norodom	<i>Myanmar:</i>	Prince	Pigneau de
Oun Kham	Alaungpaya	Idris ibn Raja	Béhaime,
Pétrus Ky	Alaungpaya	Iskandar, Sultan	Pierre-Joseph-
Phan Boi Chau	dynasty	Mongkut	Georges
Phan Chau Trinh	Bagyidaw	Narai	Poivre, Pierre
Phan Thanh Gian	Bandula, Maha	Phetracha	Raffles,
Siribunyanan	Bodawpaya	Rama I	Sir Stamford
Tay Son brothers	Hsinbyushin	Vajiravudh	Rhodes,
<i>Indonesian</i>	Mindon	<i>other:</i>	Alexandre de
<i>Archipelago:</i>	Nanada Bayin	Bonard,	Rigault de
Agung	Pagan	Louis-Adolphe	Genouilly,
Dachlan, Kijai	Toungoo dynasty	Brooke Raj	Charles
Hadji Ahmad	<i>Philippine Islands:</i>	Clifford, Sir Hugh	
	Aguinaldo, Emilio	Charles	

INDEX: See entries under all of the terms above

Section 96/10. China from 1839 Until the Onset of Revolution (to c. 1911), and Japan from the Meiji Restoration to c. 1910

A. China under the late Ch'ing: the challenges of rebellion and Western penetration

1. The Western challenge (1839–60) and the collapse of the tributary system: rebellion and the reestablishment of the Ch'ing government
 - a. Problems created by the opium trade: British demands for trade advantages and diplomatic parity culminating in the Opium War (1839–42)
 - i. The Opium War and its aftermath: granting of commercial privileges to Western powers
 - ii. Reactions to foreign trade gains: antforeign movements concentrated at Canton
 - b. Popular uprisings of the Taiping and Nien and rebellions in western China, the effects of the rebellions
2. Contending forces of westernization and Chinese tradition from c. 1850
 - a. The "self-strengthening" movement: its effect on foreign relations and on domestic life
 - i. Western attempts at treaty revision and the chilling of Sino-Russian relations, hostility toward Christian missionaries
 - ii. Industrialization for self-strengthening: mining and the weapons industry, malpractice and corruption in business
 - b. Increasing foreign encroachments (1870–95): loss of Central Asian territories, problems resulting from Chinese hesitancy to engage in regular diplomatic relations, Korea and the Sino-Japanese War (1894–95)

- c. The reform movement of K'ang Yu-wei, the conservative reaction, and the Boxer Rebellion (1900) as expressions of anti-foreign feelings: Western seizure of Peking (1900) and further Ch'ing concessions, U.S. Open Door policy
 - d. Reformist and revolutionist movements at the end of the dynasty: Ch'ing reforms after 1901, the Republican movement and the 1911 Revolution
 - i. Sun Yat-sen and the United League: constitutional movements after 1905
 - ii. Peasant uprisings and the 1911 Revolution
- B. The modernization of Japan and its emergence as a world power (1868–c. 1910)**
- 1. The Meiji Restoration and the process of modernization
 - a. The fall of the Tokugawa, leadership and initial policies of the new government, samurai opposition and government countermeasures
 - b. Beginning of Japanese modernization: abolition of feudalism; fiscal and economic policies; growth of *zaibatsu* (cartels); development of national loyalties; religious, educational, and cultural policies
 - c. Politics in Meiji Japan: creation of political parties, oligarchic control and gradual development of representative institutions
 - 2. Foreign relations in Imperial Japan: dispute with China over Korea, success in the Russo-Japanese War (1904–05), annexation of Korea (1910), economic expansion in China

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with China from 1839 until the onset of revolution (to c. 1911), and Japan from the Meiji Restoration to c. 1910

Asia	Japan	Shanghai	Tokyo-Yokohama
Canton	Korea	Taiwan	Metropolitan
China	Nanking	Tientsin	Area
Hong Kong	Peking		

MICROPAEDIA: Selected entries of reference information

General subjects

<i>China—domestic affairs:</i>	<i>China—international relations:</i>	Meiji Restoration	Tsushima, Battle of
Chinese Revolution	Boxer Rebellion	Paulownia Sun, Order of the zaibatsu	<i>other:</i> capitulation
Ch'ing dynasty	Chinese Eastern Railway	<i>Japan—international relations:</i>	Shimonoseki, Treaty of
Ch'ing-liu tang cohort	Kuldja, Treaty of Lay-Osborn flotilla	Anglo-Japanese Alliance	Sino-Japanese War (1894–95)
Five-Power Constitution	Open Door policy	Gentlemen's Agreement	South Manchurian Railway
Hundred Days of Reform	Opium Wars	Lansing-Ishii Agreement	treaty port
Kiangnan Arsenal	Sino-French War	Portsmouth, Treaty of	Unequal Treaty
likin	Tientsin Massacre	Root-Takahira Agreement	
Nien Rebellion	<i>Japan—domestic affairs:</i>	Russo-Japanese War	
Taiping Rebellion	Charter Oath		
Three Principles of the People	genro		
T'ung-wen kuan	Kaishintō		
	kazoku		

Biographies

<i>China:</i>	Li Hung-chang	Tso Tsung t'ang	Fukuzawa Yukichi
Chang Chih-tung	Liang Ch'i-ch'ao	Tuan Ch'i-jui	Gotō Shōjirō,
Chang Ping-lin	Lin Tse-hsü	T'ung-chih	Hakushaku
Ch'i-ying	Sheng Hsüan-huai	Tz'u-hsi	Inoue Kaoru,
Huang Hsing	Soong family	Yang Hsiu-ch'ing	Kōshaku
Hung Hsiu-ch'üan	Sun Yat-sen	<i>Japan:</i>	Itagaki Taisuke,
K'ang Yu-wei	Sung Chiao-jen	Abe Isoo	Count
Kuang-hsü	Ts'ai Yüan-p'ei	Etō Shimpei	Itō Hirobumi,
Kung Ch'in-wang	Tseng Kuo-fan	Fujita Tōko	Kōshaku

Iwakura Tomomi	Meiji	Yamagata	Ward, Frederick
Katō Hiroyuki,	Ōkubo Toshimichi	Aritomo,	Townsend
Danshaku	Ōkuma Shigenobu,	Kōshaku	Youngblood, Sir
Katsura Tarō	Kōshaku	<i>other:</i>	Francis Edward
Kido Takayoshi	Ozaki Yukio	Fenollosa,	
Kōtoku Shūsui	Saigō Takamori	Ernest F.	
Kuroda Kiyotaka,	Saionji Kimmochi	Hearn, Lafcadio	
Count	Sanjō Sanetomi,	Lay, Horatio	
Maebara Issei	Koshaku	Nelson	
Matsudaira	Shibusawa Eiichi,	Macartney,	
Yoshinaga	Shishaku	George	
Matsukata	Shimazu Hisamitsu,	Macartney,	
Masayoshi,	Koshaku	Earl	
Koshaku			

INDEX: See entries under all of the terms above

Section 96/11. Southwest Asia and North Africa (c. 1800–1920), and Sub-Saharan Africa (1885–c. 1920) Under the Influence of European Imperialism: the Early Colonial Period

- A. The Ottoman Empire from 1807 to 1920: European intervention and the continuation of westernization
 1. The empire under Mahmud II: internal reforms and centralization, the Greek revolt (1821–32), the Egyptian revolt (1831–41), Russian intrusions in Turkey
 2. Reaction, revolt, and further disintegration until World War I
 - a. The era of the Tanzimat reforms (1839–76)
 - b. Crisis of 1875–78 and the loss of Romania, Serbia, Montenegro, and most of Bulgaria; the constitution of 1876
 - c. The growth of Turkish nationalism in the reign of Abdülhamid II (1876–1909) and dissolution of the empire, domination by Germany in World War I
- B. Egypt, the Maghrib, and the Arabian Peninsula: the development of Arab nationalism and Zionism
 1. The emergence of modern Egypt (1798–1922)
 - a. Egypt under French (1798–1801) and British (1801–03) occupation, centralized administration of Muḥammad ‘Ali and his successors (1805–82), construction of Suez Canal (1858–69), European financial and military intervention
 - b. Egypt under British rule (1882–1922): reforms by Baring’s (later 1st Earl Cromer) administration (1883–1907), revival of nationalism, World War I and independence (1922)
 2. The Maghrib from 1830 to c. 1930: European penetration into Algeria, Tunisia, Libya, and Morocco
 - a. Algeria from 1830 to 1920: the French conquest (1830–71) and colonial settlements, national resistance movement under Abdelkader, suppression of the Muslim population
 - b. Tunisia from 1830 to c. 1930: French influence to 1881 and status as a French protectorate from 1881
 - c. Morocco from 1830 to 1920: growth of French, Spanish, and British influence and decline of the traditional government; establishment of French and Spanish zones and protectorates (1912)
 - d. Libya (Tripolitania and Cyrenaica) from c. 1834 to 1920: subjection to direct Turkish rule (1835), growth of Italian influence resulting in conquest (1911–12)
 3. Arab nationalism from c. 1850 to 1920, emergence of Zionism as a factor in Middle Eastern affairs
 - a. Origins, growth, and early accomplishments of Arab nationalism; British encouragement in World War I; the postwar settlement
 - b. Origins of the Zionist movement and Jewish immigration to Palestine after 1880, World War I developments and the beginning of conflict between Zionists and Arab nationalists

C. Iran under the Qājār dynasty from 1779 to 1925, Afghanistan from 1809 to 1921

1. Iran: the reign of Āghā Moḥammad Khān and the subsequent European penetration of Iran by the British and Russians, overthrow of the Qājār dynasty (1925)
2. Afghanistan: the Bārakzay dynasty, conflicts with the British government of India, British recognition of Afghan independence (1921)

D. Sub-Saharan Africa from c. 1885 to c. 1920

1. The decline in the slave trade; European commercial, missionary, and exploratory activities in the 19th century; the imperialistic scramble for African colonies; the Berlin West Africa Conference (1884–85) and the European partition of Africa
2. The establishment of European colonies in West Africa in the late 19th century
 - a. French, British, and German rivalry: takeover of the Gold Coast, Senegal, Togo, the Cameroons, Dahomey, and the Ivory Coast
 - b. Problems in establishing effective colonial regimes: military problems, control of the territories, reliance on Africans and development of indirect rule
3. Northeast Africa: foreign influences and national movements
 - a. The Mahdist movement in the Sudan (1881–98) and the Anglo-Egyptian Condominium from 1899
 - b. The consolidation of central governmental power in Ethiopia: Tewodros II (1855–68), Yohannes IV (1872–89), and Menilek II (1889–1913); struggles against Egypt, the Sudan, and Italy
4. East Africa and Madagascar: German, British, French, and Italian conquests and establishment of colonies; relations with indigenous peoples
5. European penetration into Central Africa during the 19th century and establishment of permanent colonies
 - a. British explorations under Livingstone and Stanley: attempts to explore the interior
 - b. King Leopold II's colonial enterprise in the Congo: establishment of the Belgian Congo (Congo Free State) and Belgium's Congo policies until World War I
 - c. The French colonies and colonial administration until World War II
6. The scramble for southern Africa, the British–Boer conflict and the establishment of the Union of South Africa (1910), curtailment of economic and political rights of Africans and Asians, the Botha (1910–19) and Smuts (1919–24) governments and National Party opposition under Hertzog

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with Southwest Asia and North Africa (c. 1800–1920), and sub-Saharan Africa (1885–c. 1920) under the influence of European imperialism: the early colonial period

Afghanistan	Eastern Africa	North Africa	Transcaucasia
Africa	Egypt	Palestine	Turkey and
Arabia	Iran	Southern Africa	Ancient Anatolia
Asia	Israel	Sudan, The	Western Africa
Central Africa	Lebanon	Syria	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>Arabian peninsula:</i>	<i>Egypt and the Nilotic</i>	Wafd	<i>Ottoman Empire:</i>
'Abdali sultanate	<i>Sudan:</i>	<i>North Africa:</i>	Armenian
Āl Bū Sa'īd	Anglo-Egyptian	Algeciras	massacres
dynasty	Condominium	Conference	Bulgarian Horrors
Dir'iyah, Battle	Fashoda Incident	Ḥusaynid dynasty	Çanak, Treaty of
of ad-	Khartoum,	Italo-Turkish War	capitulation
Mulaydah, Battle	Siege of	Moroccan crises	Constantinople
of al-	Mahdist	Tripolitan War	Agreement
Qu'aiti sultanate	Omdurman,	Young Tunisians	
Wahhābī	Battle of		

- Defense of Rights, Associations for the Edirne, Treaty of Greco-Turkish wars Greek Independence, War of Halepa, Pact of Hünkâr İskelesi, Treaty of Italo-Turkish War Mudros, Armistice of Navarino, Battle of Ottoman Empire Pan-Turanianism Pan-Turkism
- Pleven, Siege of Rumelia Saint-Jean-de-Maurienne, Agreement of San Stefano, Treaty of Serbo-Turkish War Sèvres, Treaty of Straits Question Tanzimat Young Ottomans Young Turks
- sub-Saharan Africa:*
 Adowa, Battle of Afrikaner Bond Belgian Congo Berlin West Africa Conference
- British East Africa British South Africa Company British West Africa Buganda Congo Free State German East Africa Moyen-Congo Mozambique Conventions National Party of South Africa Somaliland South Africa Act South African War Togoland Tukolor empire Ucciali, Treaty of
- uitlander Vereeniging, Peace of Wadai Zanzibar Treaty
- other:*
 Durand Line King-Crane Commission Mizrahi Zionism
- Biographies
- Afghanistan:*
 ‘Abdor Raḥmān Khān Dōst Moḥammad Khān Ḥabībollāh Khān Shāh Shoḡā’ Shīr ‘Alī Khān
- Egypt:*
 Cromer, Evelyn Baring, 1st Earl of Ismā‘īl Pasha Kāmīl, Muṣṭafā Muḥammad ‘Alī Nubar Pasha Sa‘īd Pasha ‘Urābī Pasha
- Iran:*
 Khaẓ‘al Khan Nāṣer od-Dīn Shāh Qājār dynasty Taqī Khān
- Ottoman Empire:*
 Abdülhamīd II Abdülmeccid I Enver Paşa Mahmud II
- Mehmed V Mehmed VI Midhat Paşa Reşid Paşa, Mustafa Selim III Şevket Paşa, Mahmud
- sub-Saharan Africa:*
 Botha, Louis Brazza, Pierre-Paul-François-Camille Savorgnan de Chilembwe, John De la Rey, Jacobus Hercules Goldie, Sir George Gungunhana Hofmeyr, Jan Jameson, Sir Leander Starr, Baronet Kagwa, Sir Apolo Kruger, Paul
- Loch (of Drylaw), Henry Brougham Loch, 1st Baron Lugard, F.D. Maxamed Cabdulle Xasan Menilek II Milner (of Saint James’s and Cape Town), Alfred Milner, Viscount Msiri Rābiḥ as-Zubayr Rhodes, Cecil Roberts, Joseph Jenkins Robinson, Sir Hercules Samory Smuts, Jan Stanley, Sir Henry Morton Steyn, Marthinus Theunis
- Tippu Tib Wet, Christiana Rudolf de Yohannes IV
- Sudan:*
 ‘Abd Allāh Gordon, Charles George Kitchener, Horatio Herbert Kitchener, 1st Earl Mahdī, al-Osman Dinga
- other:*
 Abdelkader Ibrahim Pasha Jamāl ad-Dīn al-Afghāni Lawrence, T.E.

INDEX: See entries under all of the terms above

Division VII. The World Since 1920

[For Part Nine headnote see page 343.]

The first of the eight sections in Division VII, reflecting the increasing internationalization since 1920, broadly treats major developments in contemporary world history. The remaining seven sections deal separately with the histories, since 1920, of the several regions of the world.

Section 971. International Movements, Diplomacy, and War Since 1920 443

972. Europe Since *c.* 1920 447

973. The United States and Canada Since 1920 453

974. Latin-American and Caribbean Nations Since *c.* 1920 457

975. East Asia: China in Revolution, the Era of Japanese Hegemony, and the Influence of the United States in the 20th Century 461

976. South and Southeast Asia: the Late Colonial Period and the Emergence of New Nations Since 1920 464

977. Australia and Oceania Since 1920 468

978. Southwest Asia and Africa: the Late Colonial Period and the Emergence of New Nations in the 20th Century 469

Section 971. International Movements, Diplomacy, and War Since 1920**A. The period between the World Wars (1920–39)****1. Immediate postwar problems (1920–24)**

- a. Failure of attempts to establish socialist and new democratic governments in Europe: dictatorships in the new nations of central and eastern Europe
- b. Diplomacy after the Paris Peace Conference (1919–20): establishment of the League of Nations; U.S., Soviet, and German diplomatic isolation; crises concerning enforcement of the peace settlement

2. The temporary amelioration of international relations by the Locarno (1925) and Kellogg-Briand (1928) agreements, European recovery and the rapprochement with Germany**3. International affairs in the 1930s**

- a. The upsurge of strife in Asia: civil conflict in China and the Japanese seizure of Manchuria (1931–32), rise of the militarists in Japan and the Greater East Asia Co-prosperity Sphere
- b. The Popular Front and the Spanish Civil War (1936–39): unchecked Italian aggression against Ethiopia (1935–36), failure of the League of Nations and other diplomatic attempts (*e.g.*, the Munich agreement) to avert war
- c. The European colonial empires and client states: increased demands for self-determination among subject peoples, realignment of colonial powers

4. Economic developments in the postwar period (1920–39)

- a. Increased government control (1920–29): reconstruction, social welfare, and inflation
- b. Economic and political impact of the Great Depression of the 1930s: collapse of the world market and responses by various governments
- c. The establishment of Nazi Germany and economic recovery based on rearmament, Germany's alignment with Italy and Japan, the New Deal policy in the U.S., War Communism and the New Economic Policy in the Soviet Union

B. World War II (1939–45)**1. German conquest of Poland (1939) and France (1940); the German-Soviet Nonaggression Pact (1939) and subsequent German invasion of the Soviet Union (1941); the Battle of Britain (1940–41) and the war in North Africa (1940–43)****2. The war in Asia and the Pacific (1937–45)**

- a. Further Japanese aggression in China from 1937: the clash between U.S. and Japanese interests in the Pacific, the attack on Pearl Harbor (1941) and U.S. entry into the war
- b. Japanese conquests in the western Pacific and Southeast Asia (1941–42); the Allied counteroffensive from 1942 and Japanese defeat (1945)

3. The war in Europe and North Africa (1942–45)

- a. Beginning of U.S. active participation (1942), Allied progress against the Axis Powers in North Africa and Europe
- b. Collapse of the German Eastern Front (1944) and Soviet conquest of eastern Europe (1944–45), Allied invasions of Italy (1943) and France (1944) and the defeat of Germany (1945)
4. The leadership, industrial strength, strategic plans and goals, and tactical and logistical procedures of the Axis Powers
5. Allied wartime leadership and diplomacy: the Atlantic Charter; industrial strength, strategic plans and goals, and tactical and logistical procedures
6. The burgeoning of military technology; *e.g.*, developments in communications devices, naval ships and aircraft, ground weapons and missiles, atomic bombs

C. International relations

1. International relations before and during World War II
 - a. The Eurocentric world and its collapse
 - b. Ideologies in World War II
 - i. The Nazi-Soviet pact
 - ii. Roosevelt, Churchill, and the Atlantic Charter
 - iii. Soviet expansion, Stalin and the Nazis, annexations
2. The postwar years (1945–57)
 - a. The end of the war and the early United Nations (UN)
 - i. The atomic and hydrogen bombs
 - ii. Truman's fundamental principles
 - iii. The UN as a Western organization
 - b. Reconstruction and European political instability
 - c. The beginnings of the Cold War
 - i. Consolidation of Soviet power in eastern Europe: the Iron Curtain
 - ii. The Cold War as *Realpolitik* and as ideology
 - iii. The confrontation in Germany: the Berlin blockade
 - iv. The formation of the North Atlantic Treaty Organization (NATO)
 - d. East, South, and Southeast Asia, 1945–57
 - i. The colonial territories of Asia
 - ii. Civil war in China and communist rule
 - iii. The Korean War: its meaning, course, and consequences
 - iv. The transformation of the American role in Southeast Asia
 - e. The Middle East (1945–57)
 - i. The U.S. in the Middle East
 - ii. The Iranian and Turkish cases
 - iii. Palestine: Israel and the Arabs
 - iv. Nasser and the Suez crisis
 - f. The continuing Cold War
 - i. The U.S. policy of containment
 - ii. The late Truman administration
 - iii. The Eisenhower years and McCarthyism
 - iv. De-Stalinization in the Soviet Union
 - v. Unrest among the satellites
 - vi. NATO and European economic recovery
 - vii. Soviet responses
 - viii. The problem of nuclear energy: the balance of terror, France as a nuclear power

- ix. The Austrian treaty and the German problem
- 3. The period since 1957
 - a. The Great Powers and the world
 - i. Postwar economic growth: U.S. economic dominance
 - ii. Decolonization
 - iii. The Soviet Union and “national liberation”
 - iv. The new states: nonalignment and domestic problems, aid programs
 - v. The Third World as a zone of conflict in the Cold War
 - vi. Latin America in the Cold War: Fidel Castro
 - vii. The Berlin Wall and the Cuban Missile Crisis: consequences
 - viii. Sino-Soviet relations: the consequences of their rift
 - ix. Peaceful coexistence and détente
 - x. Resolution of the German problem, the two Germanys
 - xi. The Helsinki conference (1973)
 - xii. Arms buildup and deterioration of superpower relations
 - xiii. Disintegration of the Soviet Union and the end of the Cold War
 - b. The lesser powers
 - i. Peace in postwar Europe
 - ii. Integration movements in western Europe
 - iii. Eastern Europe under the Soviet variety of imperialism
 - iv. The new Europe after the collapse of the Iron Curtain; Eastern Europe’s struggle for economic and political integration with the West, movements toward democracy and free markets, renewed ethnic conflicts
 - c. Areas of conflict
 - i. Southeast Asia: the Indochina War
 - ii. The Middle East: the Arab-Israeli wars, the new role of petroleum, the Iranian revolution, the Persian Gulf War
 - iii. Sub-Saharan Africa: superpower involvement, civil warfare

D. Economic developments from 1940

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with international affairs since 1920

European History and Culture	United Nations
International Relations, 20th-Century	World Wars, The

MICROPAEDIA: Selected entries of reference information

General subjects

<i>between the World Wars:</i>	Kellogg–Briand Pact	Memel dispute	<i>since 1945:</i>
Anschluss	Lausanne, Treaty of	Mukden Incident	African Unity, Organization of
Anti-Comintern Pact	Lausanne Conference (1932)	Munich agreement	Alliance for Progress
Dawes Plan	Little Entente	Nations, League of	American States, Organization of
Fiume question	Locarno, Pact of	Polish Corridor	Antarctic Treaty
German-Soviet Nonaggression Pact	London Naval Conference	Russo-Polish War	Arab-Israeli wars
Great Depression	Maginot Line mandate	San Remo, Conference of	Arab League
Italo-Ethiopian War		Spanish Civil War	Bandung Conference
		Sudetenland	Berlin blockade and airlift
		Vilnius dispute	
		Washington Conference	
		Young Plan	

- Central Treaty Organization
 CERN
 Cold War
 Colombo Plan
 Cuban Missile Crisis
 Economic Cooperation and Development, Organisation for
 Eisenhower Doctrine
 Eurocommunism
 Europe, Council of
 European Coal and Steel Community
 European Community
 European Court of Justice
 European Defense Community
 European Free Trade Association
 European Parliament
 European Union
 General Agreement on Tariffs and Trade
 Geneva Accords
 Helsinki Accords
 Indochina wars
 International Bank for Economic Cooperation
 International Finance Corporation
 International Investment Bank
 International Monetary Fund
 iron curtain
 Korean War
 Maoism
 Marshall Plan
 Mutual Economic Assistance, Council for
 North Atlantic Treaty Organization
 Nuclear Test-Ban Treaty
 Nürnberg Trials
 Outer Space Treaty
 Palestine Liberation Organization
 Persian Gulf War
 Petroleum Exporting Countries, Organization of
 San Francisco Conference
 Security and Cooperation in Europe, Conference on
 Southeast Asia Treaty Organization
 Southern African Development Coordination Conference
 Stalinism
 Strategic Arms Limitation Talks
 Strategic Arms Reduction Talks
 terrorism
 Truman Doctrine
 U-2 Affair
 United Nations
 Vietnam War
 Warsaw Treaty Organization
 Western European Union
World War II:
 Alamein, battles of
 el-Atlantic, Battle of the
 Atlantic Charter
 Bataan Death March
 Bretton Woods Conference
 Britain, Battle of
 Bulge, Battle of the
 Cairo conferences
 Casablanca Conference
 Coral Sea, Battle of the
 Dumbarton Oaks Conference
 Free French
 Guadalcanal, Battle of
 Holocaust
 Kursk, Battle of
 lend-lease
 Leningrad, Siege of
 Leyte Gulf, Battle of
 Manhattan Project
 Midway, Battle of
 Normandy Invasion
 Pearl Harbor Attack
 Philippine Sea, Battle of the
 Potsdam Conference
 Quebec Conferences
 resistance
 Stalingrad, Battle of
 Tehrān Conference
 Ultra
 Wake Island, Battle of
 Warsaw Ghetto Uprising
 Warsaw Uprising
 World War II
 Yalta Conference

Biographies

- Adenauer, Konrad
 Ben-Gurion, David
 Brezhnev, Leonid
 Ilich
 Chamberlain, Neville
 Chou En-lai
 Churchill, Sir Winston
 Dulles, John
 Foster
 Eisenhower, Dwight D.
 Franco, Francisco
 Gandhi, Mohandas
 Karamchand
 Gaulle, Charles de
 Gromyko, Andrey
 Andreyevich
 Hammarskjöld, Dag
 Hitler, Adolf
 Ho Chi Minh
 Kennedy, John F.
 Khrushchev, Nikita
 Marshall, George C.
 Montgomery, Bernard Law
 Montgomery, 1st Viscount
 Mussolini, Benito
 Nasser, Gamal
 Abdel
 Nehru, Jawaharlal
 Perón, Juan
 Roosevelt, Franklin D.
 Schuman, Robert
 Spaak, Paul-Henri
 Stalin, Joseph
 Sun Yat-sen
 Truman, Harry S.
 Wilson, Woodrow

INDEX: See entries under all of the terms above

Section 972. Europe Since c. 1920**A. The nations of western Europe since c. 1920****1. Great Britain and Ireland****a. Developments in Great Britain**

- i. Economic depression and labour unrest in the interwar period: formation of the first Labour government under MacDonal (1924), Baldwin's government (1924–29) and the General Strike of 1926, the National Government (1931–39)
- ii. British colonial and Commonwealth relations (1920–39): division of Ireland (1922), the Indian problem
- iii. Interwar foreign policy (1931–39), Churchill's government (1940–45) and Britain's stand against the Axis Powers in World War II
- iv. The Labour government (1945–51) and the welfare state, role in NATO and relationship to the European Economic Community (Common Market), the Conservative government (1951–64), disintegration of the British Empire, Labour government (1964–70), Conservative government (1970–74), Labour government (1974–79), entrance into the Common Market (1973), Conservative government under Thatcher (1979–90) and denationalization of state-owned enterprises, Falklands war with Argentina (1982), Conservative government of Major (1990–97), Labour government of Blair (elected 1997), European Community/European Union issues

b. Developments in Ireland since c. 1920

- i. Division of Ireland and establishment of the Irish Free State and Northern Ireland (1922), the Cosgrave and De Valera governments, entrance into the Common Market (1973), death of De Valera (1975), Jack Lynch as prime minister (1966–73 and 1977–79), the governments of Haughey, FitzGerald, Reynolds, and Bruton
- ii. Northern Ireland since 1922: growing antagonism between Roman Catholics and Protestants, economic stagnation, continuing violence, negotiations between republicans and British government

2. France since 1920**a. From 1920 to the end of World War II**

- i. Developments in the interwar period: internal financial crises and German reparations, collective security, the Great Depression, political instability and conflicts between right and left in the 1930s
- ii. Social, cultural, and economic developments under the Third Republic
- iii. World War II: defeat by Germany (1940) and the Vichy government; de Gaulle, the Free French, and Resistance movements; French participation in the Allied victory (1944–45)

b. The postwar period

- i. The Fourth Republic (1946–58): constitution of the Fourth Republic; the realignment of parties; colonial independence movements; the French Indochina War, the Algerian War, and the crisis of 1958; de Gaulle's return to power
- ii. The Fifth Republic: settlement of the Algerian question, independence of the French African colonies, Common Market, the student revolt of 1968, de Gaulle's retirement and continued rule by the Gaullist coalition, government of Valéry Giscard d'Estaing, election of François Mitterrand and socialist government in 1981, cohabitation government (1986–88), reelection of Mitterrand in 1988, election of the neo-Gaullist Jacques Chirac (1995)

3. Germany since 1920**a. From 1920 to the end of World War II**

- i. The Weimar Republic (1919–33): the Weimar Constitution, reaction to the Treaty of Versailles and reparations payments, opposition from the left and the right, attempts to stabilize the republic and reestablish Germany's international position, the rise to power of National Socialists (Nazis) and the end of the republic
- ii. The Third Reich (1933–45): the Nazi revolution and establishment (1933–39) of the totalitarian police state by Hitler; persecution of the Jews; rearmament, expansion in eastern Europe, and formation of Axis alliance; World War II conquests throughout Europe; defeat by Allies (1945)

- b. The postwar period
 - i. Germany after World War II (1945–49): occupation by the Allies, partition between west and east zones
 - ii. Formation of the Federal Republic of Germany and the leadership of Konrad Adenauer, role in NATO, economic recovery, continued Christian Democratic Union rule under Erhard and Kiesinger, Social Democratic chancellors Willy Brandt and Helmut Schmidt, success of *Ostpolitik*, return to power of Christian Democrats under Helmut Kohl (1982)
 - iii. The German Democratic Republic: the Ulbricht government, the Berlin Wall, economic hardship, political repression, the flight of the East Germans to the West, the beginning of rapprochement with the West, collective leadership under Erich Honecker (1971), formal relations between the two Germanys (1972), admission to UN (1973), fall of the communist regime (1990)
 - iv. Reunification of Germany (1990), reelection of Kohl (1990 and 1994)
- 4. Italy since 1920
 - a. The Fascist era
 - i. The postwar cabinets, foreign relations and the Fiume affair, the Fascist Party's rise to power (1922), Mussolini and the Fascist dictatorship
 - ii. Rapprochement with Germany, conquest of Ethiopia, effects of the Great Depression, Italian participation in World War II, the fall of Mussolini
 - b. Postwar Italy: the politics of the republic, the De Gasperi era (1945–53), ministerial instability, economic recovery, struggle against terrorism in the late 1970s and early 1980s, parliamentary shift to the centre-left, declining strength of the Christian Democrats, first Socialist premier (1983), political and constitutional crises in the 1990s
- 5. Spain and Portugal
 - a. Spain since 1920
 - i. The military government of Primo de Rivera and establishment of the republic: the Civil War, German and Italian intervention, and Franco's victory; Spain's neutralism in World War II
 - ii. Rapprochement with the NATO powers in the postwar era: the Franco regime
 - iii. Last years of the Franco regime, government under King Juan Carlos, constitution of 1978, Basque separatism, moves toward regional self-government, development of closer ties with western Europe
 - b. Portugal: military revolt (1926), the Salazar regime (1928–68), the constitution of 1933, neutralism in World War II, the effort to maintain the Portuguese colonial empire in the 1950s and 1960s, revolution of 1974, end of colonial involvement, constitution of 1976, minority and coalition governments
- 6. Scandinavia since c. 1900
 - a. Denmark since c. 1900
 - i. Foreign policy, World War I, and economic effects of the war; the Great Depression; German occupation
 - ii. The postwar period: 1953 constitution; military, economic, and social policies; coalition governments
 - b. Sweden since c. 1900
 - i. Political reforms and defense policies prior to World War I, neutrality during the war
 - ii. Politics in the interwar period: economic reforms and foreign policy, neutrality in World War II
 - iii. Social and political reforms and establishment of the welfare state, neutralist foreign policy, new constitution (1975), defeat (1976) and return to power (1982) of the Social Democrats, second defeat (1991) of the Social Democrats and formation of nonsocialist coalition government
 - c. Norway since c. 1900
 - i. Separation from Sweden (1905); World War I, the Great Depression, and gradual economic recovery; foreign policy and German occupation during World War II
 - ii. Political and social developments in the postwar period, foreign policy, economic effects of North Sea petroleum discoveries

d. Finland and Iceland since c. 1900

- i. Finland: liberation from Russia (1918), parliamentary government, agrarian reform, growth of political parties, language problems, foreign policy and activities during World War II, domestic and foreign policies in the postwar period, presidency of Urho Kekkonen (1956–81), neutrality and relations with the Soviet Union, economic recession and recovery since 1991
- ii. Iceland: political developments (in union with Denmark) in the interwar period, aid to the Allies in World War II, establishment as an independent republic (1944), foreign relations, economic dependence on fishing, “cod wars” with Britain (1975–76)

7. The Low Countries since 1920: Belgium, The Netherlands, and Luxembourg in the interwar period; German occupation in World War II; postwar loss of colonial possessions and integration in the European Economic Community; Benelux membership in NATO; Dutch industrialization and development of North Sea gas; Walloon-Fleming division in Belgium and federalization along communal lines

8. Switzerland since 1920: Swiss neutrality in World War II, immigration and economic policies, dependence on alien workers and resulting tension, postwar neutrality policy

B. Eastern and central Europe

1. The states of eastern Europe

a. The Soviet Union from the establishment of the communist state (1917) to the end of World War II

- i. The governments of 1917; the October Revolution and establishment of the Soviet government; Civil War, War Communism, and the New Economic Policy; the struggle for succession after Lenin’s death (1924) and the rise of Stalin
- ii. Foreign policy, society, and culture under the New Economic Policy; purges and consolidation of Stalinism, Soviet foreign policy in the 1930s
- iii. World War II: consolidation in eastern Europe, the German offensive (1941) and the Battle of Stalingrad, Soviet advance into Europe, resurgent nationalism and strengthening of the regime, Soviet military and political position in 1945

b. The postwar period in the Soviet Union

- i. Economic recovery after the war: Stalin’s monopoly of power until his death (1953), Cold War relations with the U.S. and other countries, deterioration of relations with the People’s Republic of China
- ii. De-Stalinization and the Khrushchev era (1957–64): ideological disputes with China, economic problems
- iii. The Brezhnev-Kosygin era (1964–82) and collective leadership: agricultural problems and achievements in industrial production, foreign policy and space exploration, continued censorship and discontent among intellectuals
- iv. Short rule of Andropov (1982–84) and Chernenko (1984–85), efforts to alleviate economic stagnation, deterioration of relations with the U.S.
- v. Succession of Gorbachev (1985), introduction of *glasnost* and *perestroika*; economic crisis and plans for a market economy; moves toward independence by Soviet republics and resurgence of ethnic tensions; failure of hard-line communist coup and dissolution of the Union of Soviet Socialist Republics (1991)

c. Russia, Ukraine, and Belarus since 1991; the Commonwealth of Independent States

d. Transcaucasia: Georgia, Azerbaijan, and Armenia under Soviet rule (from 1920), full independence after collapse of Soviet Union (1991), ethnic unrest

2. The states of central Europe

a. Austria since 1918

- i. Establishment of the First Republic (1918), economic reconstruction and political strife, association with Italy, authoritarian rule of the Dollfuss and Schuschnigg governments, the *Anschluss* (annexation by Germany) and participation in World War II
- ii. The Second Republic: independence in 1945, Allied occupation to 1955, restoration of sovereignty and establishment as a neutral state (1955), relative economic and political stability, controversy surrounding presidency of Waldheim (1986), coalition government, questions concerning Austrian neutrality

- b. Hungary since 1918
 - i. Establishment of the republic (1918); Béla Kun's "soviet republic"; loss of Transylvania, Slovakia, and Croatia by the Treaty of Trianon (1920); the Horthy regency (1920–44); financial crisis and the rise of the radical right; reacquisition of Slovakian territory in partnership with Germany; restoration of the Trianon frontiers (1947)
 - ii. Establishment of the People's Republic (1949); the reaction against Soviet domination in the Revolution of 1956, suppression of the revolt, the Kádár regime, introduction of the New Economic Mechanism (1968)
 - iii. Deterioration of the economy in the 1980s, establishment of opposition parties, voluntary abandonment of political monopoly by the communists, proclamation of the Republic of Hungary (1989), movement toward a market economy
- c. Czechoslovakia since 1914
 - i. The struggle for independence under Tomáš Masaryk, establishment of the republic (1918), consolidation of internal affairs
 - ii. Discontent among Sudeten German and Slovak minorities; attempts at rapprochement with Germany, the Munich agreement (1938) and German occupation (1938–39); liberation by the Soviet Union (1945); communist rule from 1948
 - iii. Developments since 1948: the People's Republic (1948–60), collectivization of land and adjustments to the Soviet pattern; attempts at liberalization and reform ("Prague Spring") under Dubček (1968), invasion by five Warsaw Pact countries, return to orthodox communist rule and repression of political dissent; emergence of the dissident Charter 77 movement (1977); antigovernment demonstrations, resignation of communist government, election to presidency of dissident Václav Havel (1989); dissolution of Czechoslovak federation and creation of Czech and Slovak republics
- d. Poland since 1918
 - i. Establishment of the Second Polish Republic (1918), the "Polish Corridor," Russo-Polish War of 1919–20, the Piłsudski regime, social and economic problems, German invasion and joint German-Soviet partition (1939), permanent loss of territory to the Soviet Union and annexation of German territory (1945)
 - ii. Postwar developments under communist rule: conflict with the Roman Catholic Church, agricultural and industrial growth, the 1956 uprising, the Gomułka and Gierek governments, labour unrest and the formation of Solidarity, the Kania and Jaruzelski governments, imposition of martial law (1981–83) and suppression of Solidarity, relations with the Roman Catholic Church under John Paul II
 - iii. Renewal of negotiations with Solidarity, political and economic reform and landslide victory of Solidarity candidate Lech Wałęsa (1989); defeat of Wałęsa (1995)
- e. The establishment (1918) of Latvia, Estonia, and Lithuania as independent states following the breakup of the Russian Empire; political and economic development in the interwar period; incorporation into the Soviet Union (1940); German occupation (1941–44); collectivization and industrialization in the postwar period; full independence (1991)
- 3. The Balkans: Greece, Yugoslavia, Bulgaria, Romania, and Albania since c. 1920
 - a. The Balkans from c. 1920 to c. 1945
 - i. Settlement of the borders of Balkan states (1919–26), continued dislocation of nationality groups, civil unrest, growth of peasant political parties and communism, land reform and industrialization, police repression and political instability
 - ii. German invasion and Axis occupation (1941–45): resistance movements and communist leadership of the Partisans
 - b. Postwar developments in the Balkans
 - i. Greece: civil war and the defeat of communist forces (1946–49), military dictatorship (1967–74), return to civilian rule and repudiation of the monarchy (1974), leftist government under Papandreu (1981–89), entry into the European Economic Community (1981), election of conservative government under Mitsotakis (1990), return of Papandreu (1993–96)
 - ii. Establishment of communist governments in Yugoslavia, Albania, Romania, and Bulgaria; Yugoslav break with the Soviet Union (1948), establishment of collective presidency after the death of Tito (1980); Albanian alignment with the Soviet Union (1948–61) and China (1961–78); independent Romanian foreign policy under Ceaușescu's rule (1965–89); Bulgaria's firm alliance with the Soviet bloc; Yugoslavian unrest

- iii. Political changes since the late 1980s: political disintegration of Yugoslavia and emergence of separatist and ethnic conflicts in the region; popular revolt against Communist regime in Romania (1989); multiparty parliamentary elections in Romania (1990), Bulgaria (1990), and Albania (1992), escalation of hostilities among Serbs, Croats, and Bosnians and intervention of the UN and Western Allies

C. The arts and intellectual life in Europe since 1920: increasing concern with the problems of alienation and despair, the importance of popular culture

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and biographies dealing with Europe since c. 1920

Amsterdam	Edinburgh	Kiev	Rome
Antwerp	European History	Lenin	Russia
Athens	and Culture	Lisbon	Saint Petersburg
Austria	Finland	London	Spain
Balkan States	Florence	Luxembourg	Stalin
Baltic States	France	Madrid	Sweden
Barcelona	Geneva	Malta	Switzerland
Belarus	Germany	Manchester	Ukraine
Belgium	Greece	Marseille	Union of Soviet
Berlin	Hamburg	Milan	Socialist
Brussels	Hitler	Moscow	Republics
Budapest	Hungary	Naples	United Kingdom
Churchill	Iceland	Netherlands, The	Venice
Cologne	International	Norway	Vienna
Czech and Slovak	Relations,	Paris	Warsaw
Republics	20th-Century	Poland	
Denmark	Ireland	Portugal	
Dublin	Italy	Prague	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>France:</i>	Christian Social	National Socialism	Democratic Party
Action Française	Union	Nazi Party	of the Left
Bloc National	concentration	Nürnberg Rally	Italian Popular
Foreign Legion	camp	Nürnberg trials	Party
Free French	Dawes Plan	Oder–Neisse Line	Italian Socialist
French	Drang nach Osten	Odessa	Party
Communist Party	East Prussia	Polish Corridor	Italo-Ethiopian
Gauches,	extermination	Red Army Faction	War
Cartel des	camp	Reichstag fire	Lateran Treaty
Maginot Line	Free Democratic	SA	Rome,
Popular	Party	Social Democratic	March on
Republican	Freikorps	Party of Germany	<i>Poland:</i>
Movement	führer	SS	Auschwitz
Radical-Socialist	German National	Sudetenland	Curzon Line
Party	People's Party	Wannsee	Katyn Massacre
Rally for the	German-Soviet	Conference	Korfanty Line
Republic	Nonaggression	Young Plan	Oder–Neisse Line
Republican Party	Pact	<i>Ireland:</i>	Polish Corridor
Stavisky affair	Gestapo	Black and Tan	Poznań Riots
Vichy France	Hitler Youth	Fianna Fáil	Russo-Polish War
<i>Germany:</i>	Holocaust	Fine Gael	Solidarity
Anschluss	IG Farben	Home Rule	Vilnius dispute
Baby Yar	July Plot	Irish Republican	Warsaw Ghetto
Beer Hall Putsch	Kristallnacht	Army	Uprising
Berlin blockade	Lausanne	Labour Party	Warsaw Uprising
and airlift	Conference	Sinn Féin	
Christian	Mein Kampf	<i>Italy:</i>	
Democratic	Memel dispute	Blackshirt	
Union	Munich agreement	Fiume question	

- Russia and the U.S.S.R.:*
 Afghan War
 April Theses
 Bolshevik
 Brest-Litovsk, treaties of
 Chernobyl accident
 Cold War
 collectivization
 Cominform
 Communist Party of the Soviet Union
 Democratic Centralist
 Doctors' Plot
 German-Soviet Nonaggression Pact
 Gosplan
 Gulag
 July Days
 Karakhan Manifesto
 KGB
 kolkhoz
 Kronshtadt Rebellion
- Biographies*
Balkans:
 Alexander I (Yugoslavia)
 Alia, Ramiz
 Boris III
 Constantine II (Greece)
 George II (Greece)
 Hoxha, Enver
 Metaxas, Ioannis
 Papagos, Alexandros
 Papandreou, Andreas
 Papandreou, Georgios
 Tito, Josip Broz
 Zhivkov, Todor
 Zog I
Czechoslovakia:
 Beneš, Edvard
 Dubček, Alexander
 Gottwald, Klement
 Havel, Václav
 Husak, Gustav
 Masaryk, Jan
 Masaryk, Tomáš
 Zápotocký, Antonín
France:
 Beaufré, André
 Bidault, Georges
 Blum, Léon
- kulak
 Left Communist
 Leningrad Affair
 Leninism
 Lenin's Testament
 New Economic Policy
 purge trials
 Russian Civil War
 Russian Revolution of 1917
 Russo-Finnish War
 Russo-Polish War
 samizdat
 soviet
 sovkhoz
 Stalinism
 Strategic Arms Limitation Talks
 Trotskyism
 Twentieth Congress of the Communist Party of the Soviet Union
 War Communism
 Warsaw Pact
- Workers' Opposition
Spain:
 Civil Guard
 ETA
 Falange
 International Brigades
 Rif War
 Spanish Civil War
 Spanish Socialist Workers' Party
United Kingdom:
 Britain, Battle of
 Conservative Party
 general strike
 Labour Party
 Liberal Party
 Munich agreement
 Plaid Cymru
 Scottish National Party
 Social Democratic Party
 Ulster Defence Association
- Ulster Volunteer Force
 Westminster, Statute of
other:
 Anti-Fascist Council for the National Liberation of Yugoslavia
 Arrow Cross Party
 Balkans
 Baltic states
 Bulgarian Agrarian National Union
 Chetnik
 Commonwealth of Independent States
 Czechoslovakia
 EAM-ELAS
 EDES
 Iron Guard
 Serbs, Croats, and Slovenes, Kingdom of
 Ustaša
 Zveno Group
- Briand, Aristide
 Chaban-Delmas, Jacques
 Coty, René
 Couve de Murville, Maurice
 Daladier, Édouard
 Debré, Michel
 Decoux, Jean
 Doumergue, Gaston
 Faure, Edgar
 Gaule, Charles de
 Giscard d'Estaing, Valéry
 Lattre de Tassigny, Jean de
 Laval, Pierre
 Mendès-France, Pierre
 Millerand, Alexandre
 Mitterrand, François
 Mollet, Guy
 Monnet, Jean
 Painlevé, Paul
 Pétain, Philippe
 Pleven, René
 Poincaré, Raymond
 Pompidou, Georges
- Poujade, Pierre
 Reynaud, Paul
 Salan, Raoul
 Schuman, Robert
 Soustelle, Jacques
 Tardieu, André
 Thorez, Maurice
Germany and Austria:
 Adenauer, Konrad
 Brandt, Willy
 Brüning, Heinrich
 Dollfuss, Engelbert
 Ebert, Friedrich
 Eichmann, Adolf
 Erhard, Ludwig
 Goebbels, Joseph
 Göring, Hermann
 Guderian, Heinz
 Hess, Rudolf
 Himmler, Heinrich
 Hindenburg, Paul von
 Hitler, Adolf
 Honecker, Erich
 Hugenberg, Alfred
 Kapp, Wolfgang
 Kesselring, Albert
 Kiesinger, Kurt
 Georg
 Kohl, Helmut
 Ludendorff, Erich
 Papen, Franz von
- Rathenau, Walther
 Ribbentrop, Joachim von
 Röhm, Ernst
 Rommel, Erwin
 Rosenberg, Alfred
 Rundstedt, Gerd von
 Schacht, Hjalmar
 Schleicher, Kurt von
 Schmidt, Helmut
 Schuschnigg, Kurt von
 Seyss-Inquart, Arthur
 Speer, Albert
 Strasser, Gregor, and Strasser, Otto
 Strauss, Franz
 Josef
 Stresemann, Gustav
 Ulbricht, Walter
Hungary:
 Bethlen, István,
 Count
 Horthy, Miklós
 Kádár, János
 Nagy, Imre
 Rákosi, Mátyás
Ireland:
 Cosgrave, Liam

- Cosgrave, William
Thomas
- Costello, John A.
de Valera, Eamon
FitzGerald, Garret
Griffith, Arthur
Haughey, Charles
James
Lemass, Sean F.
Lynch, John
- Italy:*
Andreotti, Giulio
Badoglio, Pietro
Berlinguer, Enrico
Ciano, Galeazzo
De Gasperi, Alcide
Moro, Aldo
Mussolini, Benito
Togliatti, Palmiro
Umberto II
Victor
Emmanuel III
- Low Countries:*
Albert II
(Belgium)
Baudouin I
Bernhard (The
Netherlands)
Juliana
Leopold III
Spaak, Paul-Henri
Wilhelmina (The
Netherlands)
- Poland:*
Gierek, Edward
Gomułka,
Władysław
Jaruzelski,
Wojciech Witold
Piłsudski, Józef
Sikorski,
Władysław
Wałęsa, Lech
- Russia, Ukraine, and
the former U.S.S.R.:*
Andropov, Yury
Vladimirovich
Beria, Lavrenty
Pavlovich
- Brezhnev, Leonid
Ilich
- Bukharin, Nikolay
Ivanovich
- Bulganin, Nikolay
Aleksandrovich
- Chernenko,
Konstantin
Ustinovich
- Dzerzhinsky,
Feliks
Edmundovich
- Gorbachev,
Mikhail
- Gromyko, Andrey
Andreyevich
- Kaganovich, Lazar
Moiseyevich
- Kamenev, Lev
Borisovich
- Khrushchev,
Nikita
- Kosygin, Aleksey
Nikolayevich
- Kravchuk, Leonid
Makarovich
- Lenin, Vladimir
Ilich
- Litvinov, Maksim
Maksimovich
- Molotov,
Vyacheslav
Mikhaylovich
- Ordzhonikidze,
Grigory
Konstantinovich
- Rykov, Aleksey
Ivanovich
- Shevardnadze,
Eduard
- Stalin, Joseph
- Suslov, Mikhail
Andreyevich
- Trotsky, Leon
- Voroshilov,
Kliment
Yefremovich
- Vyshinsky,
Andrey
Yanuaryevich
- Yeltsin, Boris
Nikolayevich
- Yezhov, Nikolay
Ivanovich
- Zhukov, Georgy
Konstantinovich
- Zinoviyev, Grigory
- Scandinavia and
Baltic states:*
Bernadotte, Folke,
Greve
Erlander, Tage
Hammarskjöld,
Dag
Hansson,
Per Albin
Kekkonen, Urho
Kaleva
Palme, Olof
Quisling, Vidkun
Smetona, Antanas
Ulmanis, Kārlis
Wallenberg,
Raoul
- Spain and Portugal:*
Alfonso XIII
Azaña y Díaz,
Manuel
Franco, Francisco
Gil Robles, José
María
Juan Carlos
Primo de Rivera,
Miguel
Salazar, António
de Oliveira
- United Kingdom:*
Attlee, Clement
Baldwin, Stanley
Beaverbrook,
Sir Maxwell
Aitken, 1st Baron
Benn, Tony
Bevan, Aneurin
Bevin, Ernest
Birkenhead,
Frederick Edwin
Smith, 1st earl of
Blair, Tony
Callaghan, James
- Chamberlain,
Neville
Charles, Prince of
Wales
Churchill, Sir
Winston
Curzon, George
Nathaniel
Curzon, marquess
Douglas-Home,
Sir Alec
Eden, Anthony
Edward VIII
Elizabeth II
George V
George VI
Halifax, Edward
Frederick Lindley
Wood, 1st earl of
Heath, Edward
Henderson, Arthur
Hoare, Sir Samuel
Kinnock, Neil
Law, Bonar
Linlithgow, Victor
Alexander John
Hope, 2nd
marquess of
Lloyd George,
David
MacDonald,
Ramsay
Macmillan, Harold
Major, John
Montgomery,
Bernard Law
Montgomery, 1st
Viscount
Mountbatten, Louis
Mountbatten, 1st
Earl
Nicolson, Sir
Harold
Samuel, Herbert
Louis Samuel, 1st
Viscount
Strachey, John
Thatcher,
Margaret
Wilson, Harold

INDEX: See entries under all of the terms above

Section 973. The United States and Canada Since 1920

A. The United States since 1920

1. The post-World War I Republican administrations

- a. Politics and economics under Harding and Coolidge (1921–29): favouritism toward big business, restriction of immigration, “Coolidge prosperity”
- b. Social conditions in the 1920s: prohibition, growth of organized crime, and the jazz age

- c. Hoover's administration (1929–33) and the Great Depression: the stock market crash, domestic and international repercussions, Hoover's attempts to effect economic recovery
2. The effects of the New Deal and World War II: the presidency of Franklin D. Roosevelt (1933–45)
 - a. Comprehensive New Deal measures for economic recovery, relief, and reform
 - b. Reform measures of the second New Deal
 - i. Judicial invalidation of New Deal legislation: power struggle between Supreme Court and President
 - ii. Labour legislation and union activity: strengthening of the Democratic coalition
 - c. Foreign policy between the World Wars: isolationism and neutrality, opposition to Japanese expansionism in Asia and economic sanctions against Japan, lend-lease aid to Britain (1940–41), the "Good Neighbor Policy" in Latin America
 - d. The U.S. in World War II: wartime mobilization, regulation of production and manpower, the role of U.S. forces in defeating the Axis powers in Europe and the Pacific, U.S. military occupation of Japan and participation with the Allies in occupation of Germany
3. The beginning of the Cold War: the U.S. from the end of World War II to 1961
 - a. The Truman administration (1945–53)
 - i. Foreign policy aimed at the containment of Communism: the Truman Doctrine and the Marshall Plan, the Point Four Program, the creation of NATO, U.S. support of Nationalist China
 - ii. Programs of the Fair Deal: the conversion to a peacetime economy, labour disputes and inflation, the Taft–Hartley Act (1947), social and economic legislation
 - iii. McCarthyism and the "Red Scare"
 - iv. The Korean War (1950–53): wartime mobilization of the U.S. economy, peace and bilateral security treaties with Japan (1951)
 - v. Maintenance of a large postwar military establishment: collaboration of science and industry
 - b. The Eisenhower administrations (1953–61)
 - i. Intensification of the civil rights movement and innovative decisions of the Warren court, passage of the Civil Rights acts of 1957 and 1960
 - ii. Foreign policy during the Eisenhower years: sponsorship of military coups in Iran (1953) and Guatemala (1954), the Suez crisis (1956), U.S. entry into the space race (1958), intervention in Lebanon (1958), continued support of Nationalist China, the U-2 affair
 - iii. Social and economic problems: recessions (1953–54 and 1957–58), growing racial unrest, unemployment, labour strikes and the Landrum–Griffin Act (1959)
4. The U.S. in the late 20th century: continuation of East–West hostilities, détente, the end of the Cold War
 - a. The Kennedy administration (1961–63): the Cuban missile crisis (1962), the Nuclear Test-Ban Treaty (1963), military aid to South Vietnam, the assassination of John F. Kennedy
 - b. The Johnson administrations (1963–69)
 - i. Civil Rights Act of 1964, Medicare and other social welfare legislation, inflation and increased governmental economic activity
 - ii. Increasing alienation among the youth and minority groups: protests in cities and on campuses, the assassinations of Robert F. Kennedy and Martin Luther King, Jr. (1968), the anti-Vietnam War movement
 - iii. Foreign policy: Gulf of Tonkin Resolution (1964) and subsequent expansion of U.S. involvement in the Vietnam War, invasion of the Dominican Republic (1965–66), commencement of Paris peace talks (1968), military and economic aid to Middle Eastern and Latin-American countries
 - c. The Nixon administrations (1969–74)
 - i. Foreign policy: the continuing Vietnam War and the Paris peace talks, the invasion of Cambodia (1970), rapprochement with the People's Republic of China, Vietnam War cease-fire agreement (1973)

- ii. Inflation, high unemployment, and temporary price and wage controls; cabinet reorganization; antiwar demonstrations
 - iii. The Watergate scandal, the resignation (1973) of Vice President Spiro T. Agnew and appointment of Gerald R. Ford, the resignation (1974) of Nixon
 - d. The Ford administration (1974–77): presidential pardon of Nixon (1974), détente with the Soviet Union, conclusion of the Vietnam War (1975), continuing Strategic Arms Limitation Talks (SALT), celebration of the bicentennial of the Declaration of Independence (1976)
 - e. The Carter administration (1977–81): foreign policy emphasis on human rights, Camp David Accords between Egypt and Israel (1978), Panama Canal treaties (1977), Iranian hostage crisis; attempts to alleviate the energy crisis and to reform electoral, welfare, and Social Security bureaucracies; poor relations between president and Congress
 - f. The Reagan administrations (1981–89)
 - i. Increased military spending, cuts in social welfare programs, reduction and simplification of personal income tax rates, rapid growth of federal deficit, Supreme Court shift to the right, Iran-Contra Affair
 - ii. Anticommunist foreign policy stance, sponsorship of Contra insurgency in Nicaragua and support for government forces in Salvadoran civil war from 1981, invasion of Grenada (1983), initial decline in U.S.-Soviet relations and improvement during Gorbachev era from 1985
 - 5. The U.S. from the end of the Cold War (c. 1989)
 - a. The Bush administration (1989–93): continuation of conservative economic policies, the “war on drugs,” savings and loan institutions crisis, invasion of Panama (1989), Persian Gulf War (1991), economic recession
 - b. The Clinton administration (1993–): ratification of North American Free Trade Agreement (1993), economic recovery
- B. Canada since 1920**
- 1. Canada between the World Wars
 - a. The Liberal government under King (1921–30): Commonwealth relations, nationalism and the return to isolationism
 - b. The Great Depression and relief measures of the Conservative government (1930–35): return of Liberal government (1935); foreign trade, welfare legislation, financial reforms, minor political parties
 - 2. Canadian participation in World War II: mobilization of manpower and production, development of armed forces
 - 3. Canada since 1945
 - a. Postwar foreign policy: North American continentalism and collective security: participation in NATO, the UN, and the Korean War; leading role in UN peacekeeping efforts; U.S.-Canadian economic relations and free-trade agreement
 - b. Involvement in British Commonwealth affairs: relations with Third World nations
 - c. Franco-Canadian relations and French separatism in Quebec: conflicts between French- and English-speaking Canadians
 - d. Postwar prosperity: expansion of manufacturing and mining industries; economic nationalism; relations with Indians, Eskimo, and Métis
 - e. Internal politics since 1945: Liberal Party control (1945–57), the Progressive Conservative coalition (1957–63), Liberal government after 1963 and the Trudeau years (1968–79, 1980–84), patriation of Canada’s constitution (1982), election of Progressive Conservative government and the Mulroney administration (1984–93), return of Liberals to power under Jean Chrétien (1993)

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and a biography dealing with the United States and Canada since 1920

Arctic, The
Canada
North America

Roosevelt, Franklin D.
United States of America

MICROPAEDIA: Selected entries of reference information; see also Sections 965 and 971

General subjects*Canada:*

Canada Act
Co-operative
Commonwealth
Federation
Liberal Party of
Canada
New Democratic
Party
Parti Québécois
Progressive
Conservative
Party of Canada
Social Credit Party

*U.S. domestic affairs
and social programs:*

Adkins v.
Children's
Hospital
Agricultural
Adjustment
Administration
American Civil
Liberties Union
black nationalism
Black Panther
Party
Bonus Army
bootlegging

Brain Trust
Brown v. Board
of Education of
Topeka
Christian Front
Civil Rights Act
Civil Rights
Movement
Civilian
Conservation
Corps
Democratic Party
Dixiecrat
Fair Deal
Farmer-Labor
Party
Hoover
Commission
Indian
Reorganization
Act
Landrum-Griffin
Act
Liberal Party
National Recovery
Administration
New Deal
Nisei
Ohio Gang

Peace Corps
Progressive Party
Public Works
Administration
Republican Party
Sacco-Vanzetti
case
Scopes Trial
Scottsboro case
Social Security Act
Stock Market
Crash of 1929
Taft-Hartley Act
Teapot Dome
Scandal
Tennessee Valley
Authority
Three Mile Island
Wagner Act
Warren
Commission
Watergate Scandal
Works Progress
Administration

U.S. foreign relations:

America First
Committee
Bay of Pigs
invasion

Cold War
Cuban missile
crisis
Eisenhower
Doctrine
Good Neighbor
Policy
Gulf of Tonkin
Resolution
Intermediate-Range
Nuclear Forces
Treaty
Korean War
lend-lease
Marshall Plan
Nuclear Test-Ban
Treaty
Pentagon Papers
Pueblo Incident
Strategic Arms
Limitation Talks
Truman Doctrine
Vietnam War

other:

German-American
Bund
John Birch Society
Manhattan Project

Biographies*Canadians:*

Bennett, Richard
Bedford Bennett,
Viscount
Campbell, Kim
Diefenbaker,
John G.
King, W.L.
Mackenzie
Lesage, Jean
Mulroney, Brian
Saint Laurent,
Louis
Trudeau, Pierre
Elliott

*U.S. government and
diplomatic figures:*

Acheson, Dean
Borah, William E.
Bundy, McGeorge
Byrnes, James F.
Curley, James M.
Daugherty, Harry
Micajah
Dawes, Charles G.
Dirksen, Everett
McKinley
Dulles, John
Foster
Farley, James A.

Foster, William Z.
Fulbright, J.
William
Garner, John
Nance
Hobby, Oveta
Culp
Hoover, J. Edgar
Hopkins, Harry L.
Hull, Cordell
Humphrey,
Hubert H.
Hurley, Patrick J.
Ickes, Harold L.
Jones, Jesse H.
Kellogg, Frank B.
Kennan, George F.
Kennedy,
Robert F.
Kissinger,
Henry A.
Long, Huey
McCarthy,
Eugene J.
McCarthy,
Joseph R.
McGovern,
George S.
McNamara,
Robert S.

Mansfield,
Michael J.
Moley, Raymond
Morgenthau,
Henry, Jr.
Moses, Robert
Norris, George W.
Perkins, Frances
Rayburn, Sam
Rockefeller,
Nelson Aldrich
Smith, Alfred E.
Stevenson,
Adlai E.
Stimson, Henry L.
Taft, Robert A.
Vance, Cyrus
Vandenberg,
Arthur H.
Wagner, Robert F.
Walker, James J.
Wallace, George C.
Wallace, Henry A.
Weaver, Robert C.
Willkie,
Wendell L.
*U.S. jurists and
lawyers:*
Black, Hugo
Brandeis, Louis

Brennan, William
J., Jr.
Burger, Warren E.
Cardozo, Benjamin
Nathan
Darrow, Clarence
Dewey, Thomas E.
Douglas,
William O.
Fortas, Abe
Frankfurter, Felix
Goldberg,
Arthur J.
Hand, Learned
Holmes, Oliver
Wendell, Jr.
Hughes, Charles
Evans
Marshall,
Thurgood
O'Connor,
Sandra Day
Stone, Harlan
Fiske
Vinson, Fred M.
Warren, Earl
U.S. military leaders:
Bradley, Omar N.
Buckner, Simon
Bolivar, Jr.

Carlson, Evans	Mitscher, Marc A.	Clinton, William J.	<i>U.S. social and</i>
Clark, Mark	Nimitz, Chester W.	Coolidge, Calvin	<i>religious figures:</i>
Clay, Lucius D.	Patton, George S.	Eisenhower,	Addams, Jane
Doolittle,	Rickover,	Dwight D.	Du Bois, W.E.B.
James H.	Hyman G.	Ford, Gerald R.	King, Martin
Eichelberger,	Ridgway,	Harding,	Luther, Jr.
Robert L.	Matthew B.	Warren G.	Malcolm X
Halsey, William	Smith, Walter	Hoover, Herbert	Rankin, Jeannette
F., Jr.	Bedell	Johnson,	Roosevelt, Eleanor
Leahy, William D.	Spatz, Carl	Lyndon B.	Sanger, Margaret
LeMay, Curtis E.	Stilwell, Joseph W.	Kennedy, John F.	Thomas, Norman
MacArthur,	Taylor, Maxwell	Nixon, Richard M.	<i>other:</i>
Douglas	Davenport	Reagan,	Hiss, Alger
McAuliffe,	Wainwright,	Ronald W.	Oswald, Lee
Anthony C.	Jonathan M.	Roosevelt,	Harvey
Marshall,	<i>U.S. presidents:</i>	Franklin D.	Rosenberg, Julius
George C.	Bush, George	Truman, Harry S.	and Ethel
Mitchell, William	Carter, Jimmy		

INDEX: See entries under all of the terms above

Section 974. Latin-American and Caribbean Nations Since c. 1920

A. Mexico since 1920

1. Obregón's coup and Carranza's execution (1920), reforms during the regimes of Obregón (1920–24) and Calles (1924–28), rule by Calles' National Revolutionary Party (1928–34)
2. Cárdenas' Six-Year Plan (1934–40): social and economic reforms, reorganization of the National Revolutionary Party, expropriation of foreign petroleum industry (1938), election of Ávila Camacho (1940)
3. Mexico during World War II: economic and military cooperation with the United States, wartime industrialization
4. Mexico since 1945
 - a. Political, economic, and social developments: dominance of the Institutional Revolutionary Party (PRI); woman suffrage (1958); industrialization and urbanization; emergence as a major oil and gas producer; oil boom of the 1970s and debt crisis of the early 1980s; economic crises and reforms in the 1980s and early 1990s; revolt of the Zapatista National Liberation Army in Chiapas state, assassination of PRI presidential candidate Luis Donaldo Colosio and election of Ernesto Zedillo Ponce de León (1994), currency devaluation (1995) and severe recession, economic recovery
 - b. Relations with the U.S. and other countries: tensions over illegal immigration to the U.S., influx of Central American refugees and efforts at peacemaking in the region, foreign trade and the North American Free Trade Agreement (1992)

B. Central America and the Caribbean since c. 1920

1. The Central American republics since c. 1920
 - a. Guatemala since 1920
 - i. Successive presidential governments in the 1920s, Ubico's dictatorship (1931–44), social reforms of Arévalo's regime (1945–51)
 - ii. Land-redistribution schemes of the Arbenz regime (1951–54) and expropriation of United Fruit Company holdings (1952), U.S.-sponsored military coup (1954), cancellation of land reform and suppression of labor and peasant unions under Castillo Armas (1954–57), succession of military-dominated governments, growth of rural guerrilla insurgencies from 1962, civilian administration of Méndez Montenegro (1966–70), increased repression under Arana Osorio (1970–74)
 - iii. Formation of the Guatemalan National Revolutionary Unity (UNRG; 1981) and increased guerrilla activity; large-scale "scorched-earth" counterinsurgency campaigns under Lucas García (1978–81), Ríos Montt (1982–83), and Mejía Victores (1983–85); return of civilian government under Cerezo Arévalo (1986); intermittent government-UNRG peace negotiations from 1987 and peace accord (1996); constitutional reforms (1993–94)

- b. Honduras since 1920: political unrest in the 1920s; Carías Andino's dictatorship (1932–49); administrations of Gálvez (1949–54), Lozano Díaz (1954–56), Villeda Morales (1957–63), and successive military governments; return to civilian rule in 1982; involvement in regional conflicts
 - c. El Salvador since 1920: military dictatorships to 1944, interim governments (1945–48), junta rule and PRUD domination (1948–60), continued military government thereafter, civil war from the 1970s and U.S. involvement, civilian presidency of Duarte (1984–89) and election of Cristiani (1989), accord (1992) ending long period of guerrilla warfare
 - d. Nicaragua since 1920: continued U.S. military intervention until 1933, Sacasa's regime (1933–36), Somoza family's dominance (1937–79), popular uprising and Sandinista rule (1979–90), U.S. sponsorship of Contra insurgency (1980s), presidential elections of Sandinista leader Ortega (1984) and opposition leader Chamorro (1990)
 - e. Costa Rica since 1920: border disputes with Panama until 1941, orderly presidential succession, industrialization and urbanization, economic problems of the early 1980s, regional peace efforts of Arias Sánchez (1986–90)
 - f. Panama since 1920: unstable local politics and U.S. intervention, economic development, National Guard rule under Omar Torrijos (1968–78), the Panama Canal treaties with the U.S. (1977), U.S. invasion of Panama and overthrow and arrest of de facto ruler Noriega
 - g. Belize since 1920: progress toward independence, government of George Price, achievement of independence in 1981
2. The island states of the Caribbean since the end of U.S. occupation
 - a. Haiti since 1934: internal struggle for power (1934–57); dictatorial presidency of François Duvalier (1957–71) and political terror of the Tontons Macoutes, succession by Duvalier's son, Jean-Claude (1971), popular unrest and exile of Jean-Claude (1986); successive military governments and continued repression; election of Jean-Bertrand Aristide in 1990 and military coup (1991); occupation by U.S. troops and restoration of civilian government (1994)
 - b. Dominican Republic since 1930: Trujillo's dictatorship (1930–61) and assassination (1961), reformist government of Bosch and military coup (1963), popular revolution and U.S. military intervention (1965–66), conservative regimes of Balaguer (1966–78), cautious reforms under Guzmán Fernández (1978–82) and Jorge Blanco (1982–86), Balaguer's return (1986–94) and disputed reelection (1994)
 - c. Cuba since 1934
 - i. Fulgencio Batista's dictatorships (1933–44; 1952–59), growth of the military and middle classes, foreign control of the economy and widespread rural poverty
 - ii. The Cuban Revolution of 1959: Fidel Castro's program for Cuban Socialism
 - iii. Cuba under Castro: nationalization of foreign-owned property, alignment with the Soviet bloc, attempts to foment revolution in other Latin-American states in the 1960s, improvements in education and medical care, extensive civilian foreign-assistance missions, military involvement in Africa and renewed support of leftist movements in Central America, collapse of the Soviet bloc and ensuing political isolation and economic hardship
 - iv. Relations with the U.S.: nationalization of U.S.-owned property and U.S. trade embargo from 1960, emigration of Cubans to the U.S., the Bay of Pigs invasion (1961), the Cuban missile crisis (1962), second wave of emigration at Mariel (1981), confrontation with U.S. troops at Grenada (1983), broadcasts of Radio Martí from 1985, tightening of trade embargo (1992) and third wave of emigration (1994)
 - d. The new nations of the Caribbean region: Antigua and Barbuda, The Bahamas, Barbados, Dominica, Grenada, Jamaica, St. Christopher and Nevis, St. Lucia, St. Vincent and the Grenadines, Trinidad and Tobago; efforts toward development and regional cooperation; U.S. involvement in the region; U.S. invasion of Grenada (1983)
 - e. U.S. and European territories and possessions in the Caribbean region: Puerto Rico and the Virgin Islands, Bermuda and other British insular possessions, French Guiana and French insular possessions, Netherlands Antilles
- C. Venezuela and Colombia since c. 1930
 1. Venezuela since 1935
 - a. Abortive attempts at democratic government amid renewed military dictatorships (1935–58), inception of civilian rule, economic reforms of the Democratic Action (AD) party, political stabilization and economic development under governments of the AD and the Social Christian Party (COPEI) in the 1960s

- b. Oil-based economic boom in the 1970s, nationalization of the oil industry (1976), declining oil revenues and economic stagnation and foreign-debt crises from the late 1970s, efforts at industrial diversification and austerity measures provoking civil unrest, election of National Convergence (CN) candidate Caldera Rodríguez (1993), continued economic difficulties

2. Colombia since 1930

- a. Liberal Party rule (1930–46): social and land reforms during the López administrations (1934–38 and 1942–45)
- b. Reemergence of Conservative rule under Ospina Pérez (1946–50), La Violencia era of widespread civil unrest and political violence (1948–62), military dictatorship of Rojas Pinilla (1953–57), formation of National Front coalition of Conservatives and Liberals (1957)
- c. Uneven economic development under Lleras Restrepo (1966–70) and Pastrana Borrero (1970–74), dissolution of the National Front (1974), increasing political violence by left-wing guerrillas and the military’s “dirty war” from the late 1970s, growth of drug trafficking and associated corruption, Conservative administration of Betancur Cuartas (1982–86), short-lived peace agreements with guerrilla groups amid continued violence (1980s and early 1990s), increasing drug-related terrorism and government efforts to subdue drug cartels

D. Ecuador, Peru, and Bolivia since c. 1930

1. Ecuador since 1925

- a. Economic development and participation in World War II, loss of territory to Peru (1942)
- b. Various administrations of Velasco Ibarra and other presidents and military coups after 1945, constitution of 1979 and return to civilian rule, economic and social effects of the exploitation of petroleum after 1972

2. Peru since 1930

- a. The overthrow of Leguía (1930); Sánchez Cerro’s administration (1931–33); the Aprista uprising and Sánchez Cerro’s assassination; Benavides’ administration (1933–39), social reforms, and the outlawing of the Apristas
- b. Prado’s first administration (1939–45); wartime cooperation with the U.S. and economic prosperity, legalization and re-outlawing of the Apristas during Bustamante’s administration (1945–48), Odría’s military dictatorship (1948–56) and suppression of Apristas
- c. Re-legalization of Apristas and economic prosperity during Prado’s second term (1956–62), military seizure of power (1962), social reforms of Belaúnde Terry’s administration (1963–68), military takeover in 1968, restoration of civilian rule (1980) and return of Belaúnde as president, economic difficulties of the early 1980s, rise of Sendero Luminoso guerrillas, left-of-centre government under García Pérez (1985–90), election (1990) and reelection (1995) of Fujimori

3. Bolivia since 1930

- a. The revolt of 1930, Salamanca’s presidency (1930–36), the effect of the Great Depression on the mining industry, the Chaco War (1932–35) and loss of territory to Paraguay
- b. Military coup (1936), rise of MNR and PIR political parties, 1943 military coup and the Villaroel dictatorship (1943–46), political instability to 1951, military junta (1951–52)
- c. The Bolivian National Revolution (1952), nationalization of the tin industry, electoral and land reforms, Paz Estenssoro’s administrations (1952–56 and 1960–64), U.S. economic aid, civil disorders, alternating military and civilian governments in the 1960s and 1970s, return to civilian rule under Siles Zuazo (1982), foreign debt and other economic problems, effects of drug trafficking, return of Paz Estenssoro as president (1985–89), relative political stability in the late 1980s and early 1990s, civil unrest in the mid-1990s

E. Chile since 1920

1. Chile from 1920 to 1938

- a. The presidency of Alessandri Palma (1920–24, 1925), military coup (1924), return to civilian rule (1925), constitution of 1925, political instability, military dictatorship under Ibáñez del Campo (1927–31)
- b. Economic crises during the 1930s: brief return to civilian rule under Montero Rodríguez, military coup and 100-day rule of Socialist Republic, Alessandri Palma’s second administration (1932–38)

2. Chile from 1938 to 1952: the era of the Radical Party presidencies
 - a. The administrations of Cerda (1938–41) and Ríos (1942–46): agrarian reforms, Chilean neutrality until 1942, economic prosperity
 - b. González Videla's administration (1946–52): strengthened economic ties with the U.S., return of Conservative Party influence
 3. Chilean politics since 1952
 - a. Ibáñez del Campo's administration (1952–58) and strong presidential leadership, administration of Alessandri Rodríguez (1958–64), social and economic problems, proliferation of leftist political parties and realignment of conservative parties
 - b. Frei's administration (1964–70) and nationalization of the economy, Allende's Marxist administration (1970–73), military coup (1973) and military rule under Pinochet (1973–90), political repression, continued economic difficulties, presidential election of Aylwin (1990)
- F. Argentina, Uruguay, and Paraguay since c. 1930
1. Argentina since 1930
 - a. The conservative restoration (1930–43): economic ties with Great Britain, electoral fraud and violence in the 1930s, neutrality in World War II
 - b. The Perón era (1943–55): his rise to and fall from power, economic policies
 - c. Argentina since 1955: attempts to restore constitutionalism, military dictatorships, civil wars and Peronista resurgence, return (1973) and death (1974) of Perón, military coup (1976), excesses and economic failures of military rule, invasion of the Falkland Islands and defeat by Britain (1982), return to civilian rule under Alfonsín (1983), foreign-debt problems, election (1989) and reelection (1995) of Peronist Carlos Saúl Menem
 2. Uruguay since 1929
 - a. The Great Depression, dictatorship of Gabriel Terra (1933–38), election of Alfredo Baldomir (1938), Uruguayan neutrality in World War II, economic boom and political reforms
 - b. Post-World War II developments: the constitution of 1951 and the plural executive, recession (1954–58), 1958 election of Nationalists (Blancos), return of Colorado Party and return to presidential system (1966), Tupamaro guerrilla insurgency, dismissal of Congress (1973) and assumption of effective control by the military, severe recession of the early 1980s, restoration of civilian government (1985) and amnesty for the military
 3. Paraguay since 1924
 - a. The Great Depression, victory over Bolivia in Chaco War (1932–35), Allied alignment in World War II
 - b. Political instability and economic retardation: Stroessner's dictatorship from 1954 to his overthrow in 1989, democratic reforms and new constitution of 1992
- G. Brazil since 1930: the Second Republic
1. The Getúlio Vargas dictatorship (1930–45): the revolution of 1930, the constitutions of 1934 and 1937, Vargas' consolidation of power (1937), social and economic legislation, Allied participation in World War II, Vargas' forced resignation (1945)
 2. Political, social, and economic developments in Brazil since 1945
 - a. Election of Eurico Gaspar Dutra (1945) and the constitution of 1946, reelection of Vargas (1950), Vargas' forced resignation and suicide (1954), economic development and inflation in the 1950s
 - b. Election of Jânio Quadros as president (1960), Quadros' resignation (1961), parliamentary experiment and figurehead presidency of João Goulart (1961–63), 1963 plebiscite giving Goulart full presidential powers, social and economic unrest and nationalization of oil refineries, revolution and exile of Goulart and the beginning of military rule (1964)
 - c. Presidency of Castelo Branco (1964–67): legislative restrictions on civil liberties and political rights, suspension of existing political parties and creation of artificial two-party system, enhancement of executive power, the constitution of 1967
 - d. Presidencies of Costa e Silva, Médici, Geisel, and Figueiredo after 1967: continued repression amid increasing opposition to military rule, end of artificial two-party system and formation of new parties (1979), gains by opposition parties in 1982 elections, inflation and foreign-debt problems from the early 1980s

- e. Return to civilian rule with presidency of José Sarney (1985–90), liberalized constitution of 1988, presidential election of Collor de Mello (1989), Collor's impeachment and resignation (1992), presidential election of Cardoso (1994)

H. Development of Latin-American literature, music, and visual arts in the 20th century: the intermingling of European, Indian, and African cultures

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with Latin-American and Caribbean nations since c. 1920

Argentina	Colombia	Lima	São Paulo
Bolivia	Ecuador	Mexico	South America
Brazil	Guyana	Mexico City	Suriname
Buenos Aires	Havana	Paraguay	Uruguay
Central America	Latin America,	Peru	Venezuela
Chile	The History of	Rio de Janeiro	West Indies

MICROPAEDIA: Selected entries of reference information

General subjects

<i>Central America and the Caribbean:</i>	Communist Party of Cuba	<i>Mexico:</i>	Estado Novo
Bay of Pigs invasion	Cuban missile crisis	Indigenismo	Falkland Islands War
Canal Zone	Sandinista	Institutional Revolutionary Party	Peronist
Central American Common Market	26th of July Movement	Sinarquism	Rio de Janeiro, Protocol of Shining Path
	West Indies	<i>South America:</i>	Tupamaro
		Chaco War	

Biographies

<i>Central America and the Caribbean:</i>	Noriega, Manuel	López Mateos, Adolfo	Menem, Carlos Saúl
Arias Sánchez, Oscar	Somoza family	Obregón, Álvaro	Perón, Eva
Batista, Fulgencio	Torrijos, Omar	<i>South America:</i>	Perón, Juan
Bosch, Juan	Trujillo, Rafael	Allende, Salvador	Rojas Pinilla, Gustavo
Castro, Fidel	Ubico, Jorge	Belaúnde Terry, Fernando	Vargas, Getúlio
Duvalier, François	<i>Mexico:</i>	Frei, Eduardo	
Guevara, Che	Alemán, Miguel	Haya de la Torre, Víctor Raúl	
Guzmán	Calles, Plutarco	Ibáñez del Campo, Carlos	
Fernández, Antonio	Elías		
	Cárdenas, Lázaro		
	Echeverría		
	Álvarez, Luis		

INDEX: See entries under all of the terms above

Section 975. East Asia: China in Revolution, the Era of Japanese Hegemony, and the Influence of the United States in the 20th Century

A. China since 1912

1. The development of the republic (1912–20)

a. Early power struggles: Chinese involvement in World War I

- i. Japanese gains in the early part of the war, Yüan Shih-k'ai's attempts to become emperor
- ii. Conflict over entry into the war, formation of a rival southern government, changes brought about by the war

b. Modernization and the growth of nationalism: the new intelligentsia, riots and protests

2. The interwar years (1920–37)

- a. The beginnings of a national revolution: the Kuomintang, the Chinese Communist Party, cooperation between the two parties

- b. Reactions to warlords and foreigners: militarism in China, the continued presence of foreign interests, reorganization of the Kuomintang
 - c. Struggles within the two-party coalition
 - i. Outbreak of clashes with foreigners, Kuomintang opposition to the radicals
 - ii. The Northern Expedition: peasant uprisings leading to the expulsion of the Communists from the Kuomintang, Communist movement into the hills and plains of central China
 - d. The Nationalist government from 1928 to 1937: Chiang Kai-shek's attempts to eliminate the Communists
 - i. Improvements in infrastructure and education in the cities, decline of the rural economy, economic competition with the Japanese in Manchuria
 - ii. Renewal of Japanese aggression, war between the Communists and Nationalists, the Long March, formation of the United Front against Japan
3. The war against Japan (1937–45)
 - a. Communist-Nationalist cooperation in the early stages of the war, renewed conflict between the two groups
 - b. International alliance against Japan: U.S. military aid, internal conflicts, the crisis of 1944 and Nationalist deterioration, Communist growth and international efforts to prevent civil war
 4. The development of Kuomintang and Chinese Communist ideologies
 - a. Origins and background of modern ideologies: social and political conditions, China's ideological heritage
 - b. The political ideas of Sun Yat-sen: nationalism, democracy, and livelihood
 - c. The political ideas of Chiang Kai-shek: idealization of Chinese tradition
 - d. The development of Maoist ideology: the role of peasants, the "people's war," the border regions
 5. Emergence of the People's Republic of China
 - a. The Civil War (1945–49): the race for territory, Communist successes and ultimate victory
 - b. Economic reforms and reforms in the traditional Chinese social structure (1949–57)
 - i. Reconstruction and consolidation of power (1949–52): participation in the Korean War, agrarian reform
 - ii. The transition to socialism (1953–57): rural collectivization, urban nationalization
 - c. The period of the Great Leap Forward and the transition to the Cultural Revolution
 - i. New directions in national policy (1958–61): literature and arts for the masses, rural communes
 - ii. Readjustment and reaction (1961–65): restoration of order, China as a nuclear power
 - iii. The Great Proletarian Cultural Revolution (1966–76): attacks on cultural leaders and party members, resistance to Peking
 - iv. Mao's "Reconstruction" (1969–71): the Chinese challenge to Soviet Communism, the Ninth Congress of the Chinese Communist Party (April 1969)
 - d. International relations: UN representation (1971), rapprochement with the U.S. and Japan (1972), friction with the Soviet Union, U.S. diplomatic relations with China (1979), increased cultural and economic contacts overseas, Hong Kong agreement with Great Britain (1984), trade and human-rights disputes with the U.S. in the 1990s
 - e. Internal affairs: factional struggles of the early 1970s, deaths of Zhou Enlai (January 1976) and Mao Zedong (September 1976), ascendancy of Deng Xiaoping and purge of Maoist Gang of Four, new party and national constitutions (1982), changes in economic structure and introduction of economic incentives, forcible repression of pro-democracy movement (1989), social changes resulting from rapid economic growth, death of Deng and restoration of Chinese rule in Hong Kong (1997)
 6. The Nationalist government in Taiwan since 1949: initial repression and consolidation; leadership of Chiang Kai-shek until his death; alliance with the U.S. and economic growth; loss of UN representation (1971); Taiwanese separatism; loss of diplomatic support from most nations, including U.S. (1979); end of martial law (1987) and gradual democratization

B. Japan since c. 1910

1. Japan's political, economic, and social developments in the early 20th century
 - a. Constitutional government: party politics, participation by bureaucrats and business elites
 - b. Social and economic changes: attempts to organize labour, cultural trends, growth of educated classes
2. The rise and fall of Imperial Japan (c. 1920–45)
 - a. The rise of the militarists, growth of antigovernment sentiment, the seizure of initiative in foreign policy by the military, the outbreak of war with China (1937), Axis leanings
 - b. Japan's proclamation of the Greater East Asia Co-prosperity Sphere (1938), official alignment with the Axis Powers (1940), and deterioration of relations with the other Western powers: Tōjō's cabinet and outbreak of war with the U.S. (1941)
 - c. Initial Japanese successes in Southeast Asia and the South Pacific, the Allied counterattack culminating in the fire and atomic bombing of Japanese cities, Japan's unconditional surrender (1945)
 - d. Postwar Japan: political reform, economic and social changes, international relations and cultural developments
 - i. Japan under U.S. military occupation (1945–52): democratization of Japanese society; constitutional, land, and labour reforms; increased rights for women
 - ii. International relations and politics; loss of Korea and other territories, relations with China and the U.S., radical political movements in the 1960s, politics of moderation
 - iii. Restoration of Japanese independence (1952): great economic growth, admission to the UN (1956), return of the Bonins and Ryukyus, Japan as a major world trader, economic tensions with U.S. and the European Community, rapprochement with China (1978), overtures toward Southeast Asia and Korea, long dominance of Liberal-Democratic Party and intra-party factionalism, government-corruption scandals, coalition governments since 1993

C. Korea since 1910

1. Japanese rule (1910–45): military control, the March 1st independence movement and formation of a provisional Korean government in exile (1919), resistance movements and the end of Japanese rule
2. Korea since 1945
 - a. Division into South and North Korea (1948): U.S. and Soviet military aid to and disputes over the two Korean republics
 - b. North Korean invasion (1950) of South Korea and the Korean War (1950–53): U.S. and UN intervention, Chinese participation, armistice (1953)
 - c. South Korea since the armistice: the regimes of Syngman Rhee (1948–60) and Park Chung Hee (1961–79), the assassination of Park and military coup (1979), the Kwangju uprising and its violent suppression (1980), the regime of Chun Doo Hwan (1980–88), economic growth and development, constitutional reforms and direct presidential elections of Roe Tae Woo (1987) and Kim Young Sam (1992)
 - d. North Korea since the armistice: consolidation of Communist government power under Kim Il-sung, relations with the Soviet Union and the People's Republic of China, military and industrial growth, death of Kim Il-sung (1994)

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and a biography dealing with East Asia: China in revolution, the era of Japanese hegemony, and the influence of the United States in the 20th century

Asia	Japan	Nanking	Tientsin
Canton	Korea	Peking	Tokyo-Yokohama
China	Mao Zedong	Shanghai	Metropolitan
Hong Kong	Mongolia	Taiwan	Area

MICROPAEDIA: Selected entries of reference information; see also Sections 96/10 and 971

General subjects

<i>China:</i>	May Thirtieth Incident	kamikaze	Singanhoe
Chinese Communist Party	Nationalist Party	Keidanren	38th parallel
Cultural Revolution	Open Door policy	Liberal-Democratic Party	<i>Sino-Japanese relations:</i>
Eighth Route Army	Red Guards	Minseitō	Lytton Commission
Gang of Four	Sian Incident	Rikken Seiyūkai	Marco Polo Bridge Incident
Great Leap Forward	Sun-Joffe Manifesto	State Shintō	Mukden Incident
Karakhan Manifesto	Three Principles of the People	Twenty-one Demands	Nanking Massacre
Kiangsi Soviet	warlord	zaibatsu	Shantung question
Long March	<i>Japan:</i>	<i>Korea:</i>	Sino-Japanese War (1937-45)
Maoism	Clean Government Party	Korean Provisional Government	Twenty-one Demands
May Fourth Movement	Democratic Socialist Party	Korean War	United Front
	Japan Communist Party	March First Movement	
		Pueblo Incident	

Biographies

<i>China:</i>	Soong, T.V.	Inukai Tsuyoshi	Yamamoto
Chang Kuo-t'ao	Soong	Ishibashi Tanzan	Gonnohyōe
Chang Ping-lin	Ch'ing-ling	Katō Takaaki	Yamamoto
Chen Boda	Sun Yat-sen	Kawakami Hajime	Isoroku
Chen Duxiu	Ts'ai Yüan-p'ei	Kishi Nobusuke	Yoshida Shigeru
Chiang Ching-kuo	Tuan Ch'i-jui	Konoe Fumimaro	Yoshino Sakuzō
Chiang Kai-shek	Wang Ching-wei	Miki Takeo	<i>Korea:</i>
Deng Xiaoping	Yüan Shih-k'ai	Minobe Tatsukichi	Chun Doo Hwan
Feng Yü-hsiang	Zhao Ziyang	Miyazawa Kiichi	Kim Chong Il
Guo Moruo	Zhou Enlai	Nagano Osami	Kim Dae Jung
Hu Han-min	Zhu De	Nosaka Sanzō	Kim Il-sung
Hu Shih	<i>Japan:</i>	Ōkawa Shūmei	Kim Young Sam
Hu Yaobang	Akihito	Ōkuma Shigenobu	Park Chung Hee
Hua Guofeng	Araki Sadao	Satō Eisaku	Rhee, Syngman
Jiang Qing	D'Aquino, Iva	Shidehara Kijūrō	Roh Tae Woo
Kang Sheng	Toguri	Taishō	<i>other:</i>
Kuo T'ai-ch'i	Hamaguchi Osachi	Tanaka Giichi	Hurley, Patrick J.
Li Dazhao	Hatoyama Ichirō	Tanaka Kakuei	MacArthur,
Lin Biao	Hirohito	Tōjō Hideki	Douglas
Liu Shaoqi	Hosokawa	Ugaki	Reischauer,
Mao Zedong	Morihiro	Kazushige	Edwin O.
Qu Qiubai	Ikeda Hayato	Yamagata Aritomo	Stilwell, Joseph W.

INDEX: See entries under all of the terms above

Section 976. South and Southeast Asia: the Late Colonial Period and the Emergence of New Nations Since 1920**A. India, Pakistan, Bangladesh, Sri Lanka, Tibet, and Nepal since 1920****1. India c. 1920 to 1947**

- a. Intensified agitation for Indian independence and Gandhi's *satyāgraha* movement of nonviolent resistance; Round Table Conference (1930-32), British offers of constitutional reform, the Government of India Act (1935)
- b. Increased strength of the Muslim League, movement for a separate Muslim state (Pakistan), the political and economic effects of World War II, partition and independence (1947)

2. India since 1947

- a. Domestic affairs: establishment of a parliamentary system and reorganization of the states under Nehru and the Congress Party (1947-64); administrations of Lal Bahadur Shastri

- (1964–66), Indira Gandhi (1966–77, 1980–84), and Morarji Desai (1977–79); continued communal unrest; suppression of Sikh extremists in Punjab and assassination of Indira Gandhi (1984); administrations of Rajiv Gandhi (1984–89), V.P. Singh (1989–90), and Chandra Shekhar (1990–91); assassination of Rajiv Gandhi (1991); election of P.V. Narasimha Rao (1991)
- b. Foreign policy: Nehru's policy of nonalignment, conflicts with Pakistan over Kashmir (1947–49 and 1965–66) and over East Pakistan (Bangladesh) in 1971, border conflict with China and Chinese incursion (1962), Indian peace-keeping troops in Sri Lanka (1987–1990)
3. Pakistan since 1947
 - a. National consolidation (1947–51) under Mohammed Ali Jinnah and Liaquat Ali Khan, economic and political instability
 - b. Military government of Ayub Khan (1958–69); economic and political reforms; border conflict with India; administration of Yahya Khan (1969–71); civil war between East and West Pakistan, secession of East Pakistan (since 1971, Bangladesh); administrations of Zulfikar Ali Bhutto (1971–77), Mohammad Zia-ul-Haq (1977–88), Benazir Bhutto (1988–90, 1993–96), and Nawaz Sharif (1990–93, 1997–)
 4. Bangladesh since 1971: emergence of nation, government of Mujibur Rahman (1972–75), adoption of presidential form of government (1975), martial-law administrations of Zia ur-Rahman (1975–81) and Hossain Mohammad Ershad (1982–90), election of Begum Khaleda Zia ur-Rahman as prime minister and return to parliamentary system (1991)
 5. Ceylon since 1920 (after 1972, Sri Lanka)
 - a. Nationalism and demands for constitutional reform (1920–31), the 1931 constitution and the granting of universal franchise
 - b. Dominion status (1947); parliamentary rule by United National Party (1947–56, 1960, 1965–70, and 1977–78) and by Sri Lanka Freedom Party (1956–60, 1960–65, and 1970–77); the constitution of 1972 and the establishment of a presidential system in the constitution of 1978; presidency of J.R. Jayawardene (1978–89) and succession by Ranasinghe Premadasa (1989); insurgent campaign for an independent Tamil state and protracted civil war; assassination of Premadasa (1993); election of Chandrika Kumaratunga (1994)
 6. Tibet since 1920: defense of frontier against China; Chinese invasion (1950) and the reestablishment of Chinese hegemony, complete Chinese government control after 1959; suppression of violent protests against Chinese rule (1987)
 7. Nepal since 1920: British withdrawal (1947) and revival of Nepalese royal control under Tribhuvan (1951–55), Mahendra (1955–72), and Birendra (crowned 1975); nationwide political unrest (1990) and the establishment of a constitutional monarchy (1990)
- B. Mainland Southeast Asia since 1920
1. Myanmar (Burma) since 1920
 - a. Emergence of Burmese nationalism and the British response (1920–37), limited constitutional government (1937–42), the Japanese occupation (1942–45)
 - b. Postwar independence of Burma (1948) under U Nu, adoption of leftist-neutralist position, internal conflict and military government under U Ne Win (1962–81), continued economic problems, socialist state and new constitution (1974), minority insurgencies, military coup (1988), adoption of the name Myanmar (1989), victory of National League for Democracy in multiparty elections (1990), continued military repression
 2. Malaya (Malaysia) and Singapore since 1920
 - a. Malaya and Singapore from 1920 to 1965: British economic policies in Malaya, Japanese occupation (1942–45), British return to power (1945) and progress toward self-government, suppression of Communist insurgents (1948–60), creation of Federation of Malaya (1948) and reestablishment as Malaysia (1963), Singapore's withdrawal (1965) and creation of independent Republic of Singapore
 - b. Malaysia since 1965: dominance of United Malays National Organization, communal tension and nationwide state of emergency (1969–70), introduction of New Economic Policy (1971), industrialization and exploitation of timber and oil resources, resignation of Prime Minister Datuk Hussein Onn and succession by Mahathir bin Muhammed (1981), the New Development Policy (1991)
 - c. Singapore since 1965: People's Action Party (PAP) regime of Lee Kuan Yew (1965–90), rapid economic growth and sustained prosperity, authoritarian style of government and lack of effective political opposition, resignation of Lee and succession by PAP member Goh Chok Tong (1990)

3. Thailand since 1920
 - a. Post-World War I escape from unequal treaties, problems of kingship and repression, the coup d'état of 1932 and the establishment of constitutional monarchy, militaristic and pro-Japanese nationalism, the Japanese occupation during World War II
 - b. Loss of wartime gains and political instability, military domination (1947–68, 1971–73, and 1976–92), border incursions from Cambodia and influx of refugees; constitutional reforms and return to civilian government (1992)
 4. Indochina since 1920: emergence of independent states and continued strife
 - a. French administration of Vietnam, Cambodia, and Laos: Vietnamese nationalist movements and formation of the Indochina Communist Party (1930), Japanese occupation in World War II, postwar French administration in southern Vietnam and Cambodia
 - b. Ho Chi Minh's government in northern Vietnam and the French attempt to reconquer the north (1946–54), the Geneva Accords and legal temporary division of Vietnam (1954), French withdrawal and limited U.S. intervention
 - c. Vietnam from 1955 to 1975
 - i. North Vietnam: industrialization, relations with other communist and other Asian countries, war with South Vietnam, U.S. military intervention, cease-fire agreement (1973), conquest of South Vietnam (1975)
 - ii. South Vietnam: civil war and formation of National Liberation Front (1960), U.S. military intervention, cease-fire agreement (1973), end of regime of Nguyen Van Thieu, conquest by North Vietnam (1975)
 - d. Socialist Republic of Vietnam: establishment of united Vietnamese government (July 2, 1976), political and economic problems, invasion (1978) and occupation of Cambodia, exodus of ethnic Chinese refugees and border war with China (1979), withdrawal from Cambodia (1989), economic reforms in the 1980s and early 1990s, improved relations with Asian and Western nations, economic growth
 - e. Laos since 1950: civil war to 1954, Geneva Conference (1954) and creation of Laos as a neutral state, domestic instability and continued civil war between Pathet Lao and rightists, military involvement of the U.S. and North Vietnam, Pathet Lao victory and the Lao People's Democratic Republic (from 1975), domination by Vietnam in the 1980s, first parliamentary elections (1989) and new constitution of 1991
 - f. Cambodia since independence (1953): Sihanouk's domestic politics and severing of relations with the U.S. (1965); deposition of Sihanouk (1970) and Lon Nol and pro-Western realignment; capture of Phnom Penh by communist Khmer Rouge forces (1975); establishment of Democratic Kampuchea (1976); brutal collectivization and resettlement campaign and political persecution, resulting in large-scale deaths; invasion of Cambodia by Vietnamese forces and establishment of Vietnamese-dominated regime (1978–79); formation of coalition government-in-exile (1982), return of Sihanouk and the monarchy (1993)
- C. Indonesia and the Philippines
1. Indonesia since 1920
 - a. Dutch administration of Indonesia from 1920 to independence in 1949
 - i. Dutch suppression of nationalist and communist revolts in the 1920s and 1930s, accommodation with moderate nationalist parties, Japanese occupation in World War II
 - ii. Sukarno's proclamation of Indonesian independence (1945), Dutch attempt to regain control and UN intervention, formal granting of independence in 1949
 - b. Constitutional democracy (1950) and Guided Democracy (1957–65) under Sukarno; military coup (1965), mass executions of communists and Sukarno's loss of influence; administration of Suharto (from 1966); invasion and occupation of East Timor (since 1975); massive depopulation of East Timor due to starvation and military action; economic effects of the oil boom
 2. The Philippines since 1920
 - a. Economic and social policies of U.S. administration in the 1920s and 1930s, growth of nationalist political parties, establishment as a commonwealth (1935), Japanese occupation (1941–45), return of U.S. control and commonwealth status
 - b. Establishment of the Republic of the Philippines (1946), political developments under successive presidents, U.S.-Philippine relations, administration of Ferdinand E. Marcos (1965–86), communist and Muslim insurgencies, rule under martial law (1972–81), assassination of Benigno Aquino (1983) and resulting unrest, exile of Marcos (1986), administration of Corazon Aquino (1986–1992), election of Fidel Ramos (1992)

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and a biography dealing with South and Southeast Asia: the late colonial period and the emergence of new nations since 1920

Asia	Delhi	Indonesia	Philippines
Bangkok	Gandhi	Jakarta	Southeast Asia
Bangladesh	Hong Kong	Manila	Sri Lanka
Bombay	India	Nepal	
Calcutta		Pakistan	

MICROPAEDIA: Selected entries of reference information; see also Sections 968, 969, and 971

General subjects

<i>Indian subcontinent:</i>	Rowlatt Acts	Viet Cong	Hare-Hawes-
Delhi Pact	Servants of India	Viet Minh	Cutting Act
Donoughmore	Society	Viet Nam Quoc	Hukbalahap
Commission	Sinhala Maha	Dan Dang	Rebellion
dyarchy	Sabha	Vietnam War	Tydings-
Government of	Sinhala Only Bill	<i>Indonesia:</i>	McDuffie Act
India Acts	Tashkent	Hague Agreement	<i>other:</i>
hartal	Agreement	Linggadjati	Burma Road
Indian National	<i>Indochina:</i>	Agreement	Malayan People's
Congress	Dien Bien Phu,	Pancasila	Anti-Japanese
Lee Commission	Battle of	Peranakan	Army
Muslim League	Hoa Hao	Renville	Promoters
Non-cooperation	Indochina	Agreement	Revolution
Movement	Khmer Rouge	Sarekat Islām	Stilwell Road
Poona Pact	National	Sutardjo Petition	Straits Settlements
Red Shirt	Liberation Front	Volksraad	
Movement	Pathet Lao	<i>Philippines:</i>	
Round Table	seventeenth	Bell Trade Act	
Conference	parallel		

Biographies

<i>Indian subcontinent:</i>	Naidu, Sarojini	Nguyen Huu Tho	Nu, U
Abdullah, Sheikh	Narayan, Jaya	Nguyen Van Thieu	Phibunsongkham,
Muhammad	Prakash	Norodom	Luang
Ayub Khan,	Nehru, Jawaharlal	Sihanouk	Pridi Phanomyong
Mohammad	Nehru, Motilal	Phan Boi Chau	San, Saya
Bandaranaike,	Osman Ali	Phetsarath	Sarit Thanarat
S.W.R.D.	Pandit, Vijaya	Ratanavongsa,	Saw, U
Bhutto, Benazir	Lakshmi	Prince	Thanom
Bhutto,	Patel, Vallabhbhai	Pol Pot	Kittikachorn
Zulfikar Ali	Jhaverbhai	Souphanouvong	Thant, U
Bose, Subhas	Prasad, Rajendra	Souvanna Phouma	<i>Philippines:</i>
Chandra	Rao, P.V.	Truong Chinh	Aguinaldo, Emilio
Desai, Morarji	Narasimha	Vo Nguyen Giap	Aquino, Benigno
Fateh Singh, Sant	Sankaran Nair, Sir	<i>Indonesia:</i>	Simeon, Jr.
Gandhi, Indira	Chettur	Hatta, Mohammad	Aquino, Corazon
Gandhi, Mohandas	Sastri, Srinivasa	Malik, Adam	Garcia, Carlos
Karamchand	Tara Singh	Sjahrir, Sutan	Polestico
Gandhi, Rajiv	Yahya Khan, Agha	Suharto	Macapagal,
Ghaffar Khan,	Mohammad	Sukarno	Diosdado
Abdul	<i>Indochina:</i>	Tan Malaka,	Magsaysay,
Giri, Varahagiri	Bao Dai	Ibrahim Datuk	Ramon
Venkata	Chu Van Tan	<i>Myanmar and</i>	Marcos,
Jinnah,	Cuong De	<i>Thailand:</i>	Ferdinand E.
Mohammed Ali	Ho Chi Minh	Aung San	Quezon, Manuel
Kamaraj,	Huynh Tan Phat	Aung San Suu Kyi	Quirino, Elpidio
Kumaraswami	Katay Don	Ba Maw	Ramos, Fidel
Liaquat Ali Kahn	Sasorith	Khuang	Recto, Claro Mayo
Menon, V.K.	Ngo Dinh Diem	Aphaiwong	Roxas, Manuel
Krishna	Nguyen Cao Ky	Ne Win, U	

<i>other:</i>	Brooke	Linlithgow, Victor	Nūr al-Hilmī,
Birendra Bir	Decoux, Jean	Alexander John	Burhanuddin bin
Bikram Shah	Lee Kuan Yew	Hope, 2nd	Muhammad
Dev		marquess of	Tan Cheng Lock

INDEX: See entries under all of the terms above

Section 977. Australia and Oceania Since 1920

- A. International developments in the Pacific and the disposition of the dependent territories in Oceania since 1920
1. The post-World War I situation of the occupying powers in Oceania: the League of Nations mandate system
 2. World War II in the Pacific: the rise and fall of Japanese power, effects of the war on indigenous peoples
 3. Post-World War II reorganization: economic and social effects of UN trusteeship administrations, movements toward autonomy among the indigenous peoples, independent island states, dissolution of Trust Territory of the Pacific Islands (1986)
- B. Australia since 1920
1. Developments to 1945: decline of the Labor Party and the Nationalist-Country coalition, industrial and rural development, the Great Depression, formation of the United Australia Party and Lyons' administrations (1931–39), military role in World War II, effects of the war on the economy
 2. Political and economic developments from 1945: Labor government of Chifley (1945–49), growing prosperity and educational development under Liberal-Country coalition of Menzies (1949–66), Liberal-Country rule under Gorton (1968–71) and McMahon (1971–72), expansion of social services and development of Aboriginal and women's programs under Labor government of Whitlam (1972–75), constitutional crisis and dismissal of Whitlam (1975), Liberal-National Country coalition of Fraser (1975–83), return of Labor government under Hawke (1983–91) and Keating (1991–96), coalition under Howard (from 1996), deregulation of the economy and privatization of state-owned enterprises, Aboriginal land-claims legislation (1993)
 3. International relations from 1945: participation in regional security alliances and military involvement in the Korean and Vietnam wars, recognition of China (1972) and North Vietnam (1973), independence of Papua New Guinea (1975), strengthening of economic and political ties to Asian and Pacific nations, opposition to French nuclear testing in the South Pacific
 4. Social developments from 1945: growing urban affluence, Aboriginal-rights issues, demographic and cultural changes resulting from large-scale European and Asian immigration, feminism and the women's movement, the environmental movement
- C. New Zealand since c. 1920
1. Developments to 1945: United (Liberal)–Reform coalition governments, the Great Depression, Labour Party victory (1935) and social welfare programs, participation with Allies in World War II
 2. New Zealand since 1945: National and Labour governments, increased participation in Pacific and Asian affairs, Maori nationalism, cuts in social welfare programs

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with Australia and Oceania since 1920

Australia	Pacific Islands
Melbourne	Sydney
New Zealand	United States of America: Hawaii

MICROPAEDIA: Selected entries of reference information; see also Section 967

General subjects

Australian Democrats	New Zealand National Party
Australian Labor Party	

Biographies

<i>Australia:</i>	Hawke, Robert	<i>New Zealand:</i>	Lange, David
Bruce, Stanley	Howard, John	Bolger, James	Muldoon, Robert
Melbourne Bruce,	Winston	Brendan	Nash, Sir Walter
Viscount	Keating, Paul	Forbes, George	Ngata, Sir Apirana
Chifley, Joseph	Lyons, Joseph	William	Turupa
Benedict	Aloysius	Fraser, Peter	Savage, Michael
Curtin, John	Menzies, Sir	Holland, Sir	Joseph
Fraser, Malcolm	Robert Gordon	Sidney	
Gorton, Sir John	Page, Sir Earle	Holyoake, Sir	
Grey	Whitlam, Gough	Keith Jacka	

INDEX: See entries under all of the terms above

Section 978. Southwest Asia and Africa: the Late Colonial Period and the Emergence of New Nations in the 20th Century
A. Turkey since 1919 and Cyprus since 1920

1. The war for independence (1919–23) and the development of the Turkish nation under the leadership of Mustafa Kemal Atatürk
2. Atatürk's one-party government: secularization, social and economic reforms
3. Turkey since 1938: World War II and the postwar period, the republic since 1961
 - a. Wartime neutrality until alignment (1945) with the Allies: postwar problems with the Soviet Union, political developments
 - b. Turkey under the Democrats (1950–60): economic growth and political repression, the army coup (1960)
 - c. New constitution (1961) and government under the Republican Peasants' and Justice parties, period of martial law (1971–73), military coup (1980) and return to civilian government (1983), urbanization and industrialization, economic growth, mixed relations with East and West and with the Arab world, increasing violence of Kurdish separatist guerrillas and government counterinsurgency campaigns from the early 1990s
4. Cyprus since 1920: British administration to 1960, the Republic of Cyprus, political disunity over the question of union with Greece, Turkish invasion (1974) and division of island, unilateral declaration of Turkish Republic of Northern Cyprus (1983)

B. Development of the Arab states and Israel in Southwest Asia and Egypt

1. The Arab lands of Southwest Asia under the mandate system
 - a. Lebanon and Syria under the French mandate (1920–41): Arab demands for independence, the Druze revolt in Syria (1925–27), establishment of the Lebanese Republic (1926) and internal crises, the Franco-Syrian Treaty (1936), Allied occupation in World War II, Syrian and Lebanese independence
 - b. Iraq from 1918 to 1945: British occupation and mandate, independence (1932), political unrest and the role of the military, World War II and British intervention (1939–45)
 - c. Palestine and Transjordan under the British mandate (1920–48): the Balfour Declaration and the acceleration of Jewish settlement and conflicts with the Arabs, the Arab revolt (1936–39) and the Peel Commission, the Biltmore Resolution (1942), the partition of Palestine and the emergence of Israel (1948) and Jordan (1946)
2. Egypt from 1922 to 1945: Wafd-led opposition to the continued British presence, politics in the early reign of Farouk I, participation in World War II
3. The Arab states in the Fertile Crescent, Egypt, and Israel since 1945
 - a. Lebanon: the multireligious political system, the Khuri regime (1943–52), the presidency of Chamoun and the 1958 crisis, later regimes and the civil war of 1975–76, Syrian military intervention (1976) and subsequent occupation of central and eastern territories, Syrian predominance in Lebanese affairs, the Israeli invasion of 1982 and establishment of Israeli-occupied "security zone" (1983), renewed civil war, de facto division into spheres of influence, government of national unity (1984), continuing civil disorder, cross-border raids by Hezbollah guerrillas and Israeli forces from the early 1990s

- b. Syria: political instability in the postwar decade, temporary union with Egypt (1958–61), the secessionist regime (1961–63), the Ba‘thist coup of 1963, conflicts with Israel, role in the Lebanese civil wars, relations with Palestine Liberation Organization, domestic unrest
 - c. The Arab League (1945), the partition of Palestine, and the establishment of Israel (1948) and Jordan (1946)
 - i. The establishment of Israel (1948) and resultant conflicts with the Arabs: immigration and politics, foreign aid and economic development, renewed hostilities with the Arab states in the Suez War (1956), the Six-Day War (1967) and the diplomatic stalemate, the war of October 1973, role in the Lebanese civil war, treaty with Egypt (1979), invasion of Lebanon (1982) and withdrawal (1985), Palestinian *intifada* (from 1987), expansion of Jewish settlements in occupied territory and massive immigration of Soviet Jews, peace talks with Palestinians and Arab states (from 1992), extension of self-government to Palestinians in West Bank and Gaza Strip (from 1995)
 - ii. Economic and political problems in Jordan under King Hussein: annexation of the West Bank (1950), ambivalent foreign policy, formation of the Palestine Liberation Organization (1964), Israeli annexations (1967), Jordan’s expulsion of the PLO (1971), renunciation of claims and ties to West Bank (1988), peace treaty with Israel (1994)
 - d. Iraq: postwar reconstruction and social upheavals (1945–58), the revolution of 1958, politics under the republic, military coups (1963–68), oil and the economy, the Ba‘th revolution of 1968, the Kurdish question, Iran-Iraq war (1980–88 [officially ended 1990]), invasion of Kuwait (1990) and defeat in Persian Gulf war (1991)
 - e. Radicalization of Egyptian politics in the last years of Farouk’s reign, the Egyptian revolution (1952) and Nasser’s rise to power, the Suez crises (1956), the Six-Day War (1967), Sādāt’s presidency (1970–81), and assassination (1981), Mubārak’s presidency, rise of Islāmic fundamentalism
4. The Arabian Peninsula since c. 1920: the political, economic, and social effects of the discovery of oil and the resultant influx of wealth; British and other great-power influences
- a. Emergence of the Kingdom of Saudi Arabia under Ibn Sa‘ūd (1924); oil discoveries and exploitation; the government under Fayṣal (1964–75), Khālīd (1975–82), and Fahd; increasing control of oil resources; rise as a dominant Arab power; participation in Persian Gulf War (1991)
 - b. The other Arabian states: Bahrain and Qatar, Kuwait, Oman, the United Arab Emirates, Yemen (Aden), Yemen (San‘ā); Yemeni wars and union negotiations; formation of Gulf Cooperation Council (1981), unification of Yemen (1990) and subsequent civil war (1994), Iraqi invasion of Kuwait and ensuing Persian Gulf War (1990–91)
- C. Iran, Afghanistan, and Central Asia since c. 1920
1. Iran since 1925
 - a. The regime of Reza Shah (1925–41): economic and social reforms, relations with Germany and invasion by Allies during World War II
 - b. The regime of Mohammad Reza Pahlavi (1941–79), premiership of Mohammad Mosaddeq (1951–53) and nationalization of oil resources (1951), ouster of Mosaddeq by U.S.-sponsored military coup (1953) and consolidation of power by Reza Pahlavi, land reform (from 1962), expansion of economy from petroleum revenues
 - c. Revolution of 1978–79, establishment of the Islāmic Republic (1979) under Ruhollah Khomeini, political and religious persecution and suppression of Western influence in the early republican regime, support of Muslim fundamentalist movements, Iran-Iraq war (1980–88 [officially ended 1990])
 2. Afghanistan since independence (1921): civil disorders, attempts at reform, and economic improvements; constitutional revisions; Soviet invasion of 1979 and guerrilla resistance; Soviet withdrawal, establishment of provisional Islāmic republic, continued unrest
 3. The Central Asian republics of Kazakstan, Uzbekistan, Kyrgyzstan, Tajikistan, and Turkmenistan: Soviet rule from 1917 and independence after collapse of Soviet Union (1991)
- D. North Africa since 1920
1. The final decades of European rule
 - a. French colonial policies, the French protectorate and the Spanish Zone in Morocco, the administration of Algeria and the Algerian War of Independence, Tunisian nationalist movements
 - b. Libya under the domination of the Fascist Italian government (1922–42)

2. Establishment of independent states in the Maghrib
 - a. Postwar British and French occupation of Libya, independence (1951), establishment of the republic and emergence of Qaddafi (1969), disruptive role in world affairs, treaty of union with Morocco (1984) abrogated in 1986
 - b. The emergence of independent Tunisia (1956): formation of republic (1957), Tunisia under Bourguiba's presidency (1957–87); rise of Islāmic fundamentalists from the mid-1980s
 - c. The emergence of independent Morocco (1956): government under Muhammad V (d. 1961) and Hassan II, the Spanish Zone and its reduction to Ceuta and Melilla, dispute over Spanish (now Western) Sahara, treaty of union with Libya (1984–86)
 - d. The Algerian War of Independence (1954–62), French evacuation, and the emergence of independent Algeria (1962): government under Ben Bella (overthrown 1965), Boumedienne (1965–78), and Bendjedid (1979–92); adoption of socialist and Islāmic National Charter (1976); support for the Polisario Front in Western Sahara; growing influence of Islamic fundamentalism; military takeover (1992)
 - e. Mauritania and Spanish (Western) Sahara: independent Mauritania (from 1960), Polisario revolt in Western Sahara from the mid-1970s, division of Western Sahara between Mauritania and Morocco and Moroccan takeover of Mauritanian zone (1979)
- E. The maturation of the European colonial system and the nationalist movements in sub-Saharan Africa since 1920
 1. Completion of effective occupation by the European powers: the post-World War I division of former German colonies among other colonial powers, the mandate system
 2. Administrative policies and attitudes of each colonial power: economic development, effects of colonialism on the societies and institutions of the African peoples
 3. World War II and postwar changes in colonial policies: decline of the colonial system and rise of African nationalist parties, establishment of independent African countries from 1957, the Organization of African Unity from 1963, the assertiveness of white-settled Africa
 4. West Africa since *c.* 1920
 - a. Colonial rule from *c.* 1920 until independence, independent Liberia's economic ties to the U.S.
 - i. Economic developments in French West Africa: Senegal, French Guinea, the Ivory Coast, French Sudan, Upper Volta
 - ii. Economic developments in British colonies: The Gambia, Sierra Leone, Gold Coast, Nigeria
 - b. Decolonization and independence
 - i. Emergence of African leaders: rise of a new class of educated Africans
 - ii. Formation of African independence movements, independence for all the former colonies between 1957 and 1975, the countries of Western Africa after independence, problems of economic development, political instability, military coups and emergence of one-party states
 5. Ethiopia and the Nilotic Sudan since *c.* 1917
 - a. Ethiopia and Eritrea since 1917: internal division and the rise of Haile Selassie, the Italian conquest (1936), Eritrea under Italian rule, federation (1952) and union (1962) with Ethiopia, establishment of military government and abolition of the monarchy (1974), death of Haile Selassie (1975), Eritrean revolt and Somali invasion of the Ogaden, development of Socialist state under Mengistu, fall of Mengistu regime (1991), Eritrean independence (1993)
 - b. The Anglo-Egyptian Sudan: growth of national consciousness and creation of the independent republic (1956), military coup (1958) and the Abbud government (1958–64), revolt in the southern provinces, return to civilian rule, government of Nimeiri (1969–85) and temporary resolution of the southern problem, renewed war in the south following introduction of Islāmic law (1983) and administrative decentralization, military coups (1985 and 1989) and continued civil war
 6. East Africa and Madagascar since *c.* 1920
 - a. The European colonies in East Africa from *c.* 1920 to the beginning of independence (1960)
 - i. The colonial economics: growth of export trade (cotton, cloves, coffee), extension of the railroads
 - ii. Somalia as an Italian trust territory (1950), problems in British Somaliland

- iii. Crises of colonial rule in the 1950s: Mau Mau resistance in Kenya; independence movements in Uganda, Tanganyika, and Zanzibar
 - b. Developments since independence
 - i. Somalia: independence (1960), internal tensions and territorial disputes, conflict with Ethiopia, military takeover (1969) and regime of Siyad Barre, break with the Soviet Union (1977), war with Ethiopia (1977–78) and continued unrest in the Ogaden, influx of refugees, overthrow of Siyad (1991), clan-based civil war, famine and multinational intervention in the early 1990s
 - ii. Economic cooperation among the formerly British East African nations: the East African Community and its end (1977)
 - iii. Tanzania (formerly Tanganyika and Zanzibar): revolt against Arab control in Zanzibar (1964), Nyerere and introduction of *ujamaa* socialism, tension with Uganda and invasion in support of revolt against Amin (1979), economic difficulties and subsequent reforms beginning in the late 1980s
 - iv. Uganda: independence (1962) and economic growth, the Obote and Amin governments, reign of terror and economic decline, deposition of Amin (1979), reinstatement (1980) and overthrow (1985) of Obote, government of Museveni from 1986, constitution of 1995
 - v. Kenya: independence (1963) and presidency of Kenyatta (1964–78), death of Kenyatta and succession of arap Moi (1978), establishment of one-party state (1982–1992)
 - c. Madagascar: the French administration, independence (1960) and subsequent domestic politics and foreign relations
- 7. Central Africa after World War II: the intensification of nationalist movements and the acquisition of independence by the former European colonies
 - a. The emergence of French and Belgian colonies as republics: internal divisions and the fate of the republics
 - i. The Democratic Republic of the Congo (Republic of Zaire since 1971): the Congolese nationalist movement and independence (1960), secession of Katanga province and UN intervention (1960–64), regime of Mobutu Sese Seko (1965–97)
 - ii. Central African Republic: independence (1960); regimes of Bokassa (1965–79), Dacko (1979–81), and Kolingba (1981–93); presidential election of Patassé (1993)
 - iii. Republic of the Congo: independence (1960), ethnic rivalries, domestic politics and foreign relations
 - iv. Gabon: independence (1960), subsequent domestic politics and foreign relations
 - v. Burundi and Rwanda: independence (1962), warfare between Tutsi and Hutu
 - b. Republic of Equatorial Guinea: the Spanish administration, independence (1968), repressive regime of Macías Nguema, military coup (1979)
- 8. Southern Africa since c. 1920
 - a. Southern Africa from c. 1920 to c. 1945
 - i. Political and economic developments in white-settler-controlled Union of South Africa: the Hertzog administration (1924–33) and the Hertzog–Smuts coalition (1933–39), political disunity and Allied participation in World War II
 - ii. White-settler control of Southern Rhodesia: relations with Northern Rhodesia and Nyasaland and economic, social, and political discrimination against black Africans; Portuguese rule in Angola and Mozambique
 - iii. Indian, Coloured, and black African responses to discrimination: growth of local political organizations, separatist church movements, and mass nationalist movements
 - b. Southern Africa since 1945: political developments in white-controlled colonies and nations, emergence of black nations
 - i. Republic of South Africa (formerly the Union of South Africa): Afrikaner National Party administrations from 1948, government-sanctioned apartheid, establishment of Bantu Homelands (1959), antiapartheid movements and growing international isolation, Soweto riots (1976), constitutional reforms (1983), increasing political dissent, legalization of African National Congress (1990), repeal of major apartheid laws, establishment of black majority rule with victory of African National Congress in first all-race elections (1994)

- ii. Namibia (formerly known as South West Africa): international and internal resistance to South African rule, revocation of UN mandate (1966) and international efforts toward independence, independence of Namibia (1990)
- iii. Botswana, Lesotho, and Swaziland: British administration of the High Commission Territories, independence (1966, 1968), subsequent relations with South Africa
- iv. British Central Africa: postwar economic development in Northern Rhodesia, Southern Rhodesia, and Nyasaland; the Federation of Rhodesia and Nyasaland (1953–63); rise of black nationalist movements; independence of Zambia and Malaŵi (1964), governments of Kaunda (1964–91) in Zambia and Banda (1964–94) in Malaŵi
- v. Zimbabwe (formerly Southern Rhodesia): Rhodesian Front governments of Ian Smith (1964–79), the Unilateral Declaration of Independence (UDI; 1965), civil war, establishment of Zimbabwe (1980), rule of Mugabe from 1980
- vi. Developments in the Portuguese colonies of Angola and Mozambique: economic advances, nationalist movements, and independence in the mid-1970s; civil war in Angola and intervention by South African and Cuban troops, prolonged guerrilla warfare in Angola and Mozambique in the 1980s; Mozambique-South Africa nonaggression pact (1984); short-lived peace agreements in Angola and withdrawal of Cuban troops (1991); multiparty Angolan elections (1992) and resumption of conflict; end of guerrilla war in Mozambique (1992)

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and a biography dealing with Southwest Asia and Africa: the late colonial period and the emergence of new nations in the 20th century

Afghanistan	Cyprus	Jordan	Syria
Africa	Eastern Africa	Lebanon	Transcaucasia
Arabia	Egypt	North Africa	Turkey and
Asia	Iran	Palestine	Ancient Anatolia
Atatürk	Iraq	Southern Africa	Western Africa
Central Africa	Israel	Sudan, The	

MICROPAEDIA: Selected entries of reference information; see also Section 96/11

General subjects

<i>central Africa:</i>	Camp David	United Arab	Lausanne,
Belgian Congo	Accords	Republic	Treaty of
Moyen-Congo	Druze revolt	Wafd	Moscow,
Ruanda-Urundi	Fatah	Zionism	Treaty of
Rwanda	Gaza	<i>North Africa:</i>	<i>southern Africa:</i>
<i>eastern Africa:</i>	Gaza Strip	Algerian Reformist	African National
Buganda	Haganah	Ulama,	Congress
German East	Hāshimite	Association of	apartheid
Africa	Ikhwān	Cyrenaica	banning
Italian East Africa	Iran-Iraq War	Democratic	Frelimo
Mau Mau	Irgun Zvai Leumi	Constitutional	National Party of
Somaliland	Israel Labour Party	Rally	South Africa
<i>Ethiopia and the</i>	Jewish Agency	Destour	New Republic
<i>Nilotic Sudan:</i>	Likud	National Action	Party
Anglo-Egyptian	Mapam	Bloc	Pan-Africanist
Condominium	Muslim	National	Congress of
Italian East Africa	Brotherhood	Liberation Front	Azania
Italo-Ethiopian War	Palestine	Polisario	Progressive Federal
Mahdist	Palestine	Rif War	Party
<i>Middle East:</i>	Liberation	Tripolitania	Rhodesia and
Anglo-Egyptian	Organization	<i>Ottoman Empire and</i>	Nyasaland,
Treaty	Peel Commission	<i>Turkey:</i>	Federation of
Arab Legion	Sinai Peninsula	Ankara, Treaty of	South African
Balfour	Stern Gang	Greco-Turkish	Party
Declaration	Suez Crisis	Wars	
Ba'ath Party			

South West Africa People's Organization United Party	<i>western Africa:</i> Biafra British West Africa	French West Africa Mali Federation Togoland	<i>other:</i> EOKA
<u>Biographies</u>			
<i>central Africa:</i>			
Boganda,	Nahhās Pasha,	Qāsim, 'Abd	Bayar, Celāl
Barthélemy	Muṣṭafā an-	al-Karīm	Çakmak, Fevzi
Bokassa, Eddine	Nasser, Gamal	<i>North Africa:</i>	Demirel, Süleyman
Ahmed	Abdel	Abbas, Ferhat	Ecevit, Bülent
Éboué, Félix	Sādāt, Anwar el-	Abd el-Krim	İnönü, İsmet
Kasavubu, Joseph	Zaghlūl, Sa'd	Ben Bella, Ahmed	Menderes, Adnan
Lumumba, Patrice	<i>Middle East—Israel</i>	Boumedienne,	Özal, Turgut
M'ba, Léon	<i>and Zionism:</i>	Houari	<i>western Africa:</i>
Mobutu Sese Seko	Aḥad Ha'am	Bourguiba, Habib	Awolowo, Obafemi
Mutesa II	Begin, Menachem	Idris I	Azikiwe, Nnamdi
Nyerere, Julius	Ben-Gurion, David	Muhammad V	Balewa, Sir
Obote, Milton	Ben-Zvi, Itzhak	Qaddafi,	Abubaker Tafawa
Tshombe, Moise	Dayan, Moshe	Muammar al-	Daddah, Moktar
<i>eastern Africa:</i>	Herzl, Theodor	<i>southern Africa:</i>	Ould
Amin, Idi	Jabotinsky,	Banda, Hastings	Danquah, J.B.
Haile Selassie	Vladimir	Kamuzu	Doe, Samuel K.
Kenyatta, Jomo	Meir, Golda	Biko, Stephen	Gowon, Yakubu
Mboya, Tom	Peres, Shimon	Buthelezi,	Guèye, Lamine
Mengistu	Rabin, Yitzhak	Mangosuthu G.	Houphouët-Boigny,
Haile Mariam	Shamir, Yitzhak	de Klerk, F.W.	Félix
Odinga, Oginga	Sharon, Ariel	Hertzog, J.B.M.	Jawara, Sir Dawda
<i>Iran:</i>	Weizmann, Chaim	Kaunda, Kenneth	Kairaba
Khomeini,	<i>Middle East—other</i>	Lutuli, Albert	Keita, Modibo
Ruhollah	<i>Arab:</i>	Malan, Daniel F.	Margai, Sir Milton
Mohammad Reza	'Aflaq, Michel	Mandela, Nelson	Nkrumah, Kwame
Shah Pahlavi	'Arafāt, Yāsir	Mugabe, Robert	Ojukwu,
Mosaddeq,	Assad, Ḥafiz al-	Neto, Agostinho	Odumegwu
Mohammad	Chamoun, Camille	Nkomo, Joshua	Olympio, Sylvanus
Rafsanjani,	Chehab, Fuad	Nujoma, Sam	Rawlings, Jerry J.
Hashemi	Fahd	Smith, Ian	Senghor, Léopold
Reza Shah Pahlavi	Fayṣal I	Smuts, Jan	Touré, Sékou
<i>Middle East—Egypt:</i>	Gemayel family	Sobhuza II	Tubman, William
Farouk I	Hawrani,	Strijdom, Johannes	V.S.
Fu'ād I	Akram al-	Gerhardus	Zinsou, Émile
Luṭfi as-Sayyid,	Ḥusaynī, Amīn al-	Tutu, Desmond	Derlin
Aḥmad	Hussein	Verwoerd, Hendrik	<i>other:</i>
Māhir Pasha, 'Alī	Hussein, Saddam	Frensch	Amānollāh Khān
Mubārak, Hosnī	Ibn Sa'ūd	Vorster, John	Makarios III
Naguib,	Khālīd	Welensky, Sir Roy	Zahir Shah,
Muḥammad	Nuri as-Said	<i>Turkey:</i>	Mohammad
		Atatürk, Kemal	

INDEX: See entries under all of the terms above

Introduction to Part Ten:

Knowledge Become Self-conscious

by Mortimer J. Adler

The words *universe* and *encyclopaedia* have an obvious similarity of meaning. Both come from words—in the one case, Latin, in the other, Greek—that mean a totality or all-inclusive whole. Whether the universe is finite or infinite, and however it is constituted or organized, it embraces everything that is. Nothing lies outside it; everything that happens occurs within it. Can one say, with equal assurance, that the encyclopaedia is a similar totality or whole? Perhaps we cannot say that of any actual, historic encyclopaedia. But that is the ideal which all encyclopaedias attempt to embody.

It is not just the similarity of the universe and the encyclopaedia as totalities or wholes that interests us, but also how these two wholes are related to each other. One of them, the universe, embraces not only everything that is, but also everything that is knowable. The other, the encyclopaedia, sets for itself the goal of reporting everything that is and can be known about the universe. The one is mirrored or reflected in the other—the macrocosm in the microcosm.

The universe includes man—man a moving body, man a living organism, man a social animal, and man not only as a doer and seeker but also as a maker and knower of things. Among the things that man seeks to know and understand is his own knowledge—his abilities, efforts, and achievements in the sphere of knowing itself. Whether or not Aristotle was correct in saying that the highest form of intellectual activity is thinking about thinking itself, it is certainly true that “knowledge become self-conscious” is a distinctive characteristic of the human enterprise of knowing. We not only seek to know whatever can be known, but we also, reflexively, turn our knowing back upon itself when we pay attention to how we know what we know, the various ways in which we know, and the divisions or branches of our knowledge.

The organization of the encyclopaedia—the way in which the branches of knowledge have been distinguished from one another and related to one another—has changed remarkably from age to age. In antiquity, before there were any real encyclopaedias, learned men envisaged the whole of human knowledge as having a certain structure of related parts or subdivisions. The organization of knowledge in medieval encyclopaedias exhibited quite a different pattern. Later encyclopaedias introduced still other changes in the picture; and that picture has changed in important respects during the last century and is undergoing further changes today.

The new *Britannica* presents us with an outline of knowledge that is radically different in its fundamental framework and its organizational scheme from the outlines that might have been constructed for an ancient encyclopaedia—if there had been any such thing—or a medieval one. The Outline of Knowledge set forth in this

Propædia volume is divided into ten parts, each of which is broken down into divisions and sections. Division by division, from Part One through Part Nine, the outline covers what we know about the universe with the help of such sciences as physics, chemistry, astronomy, geology, meteorology, biology, medicine, psychology, anthropology, sociology, political science, economics, and technology. It also covers what we know as a result of systematic study and scholarship in such fields as education, law, the arts, religion, and history.

The knowledge of the universe that we possess by means of the disciplines mentioned above is outlined in Parts One through Nine and expounded in the articles to which the outline refers. What about Part Ten—the part to which this essay is an introduction? Where and how does that fit into the picture?

To some extent the answer has already been given. Here in Part Ten we are concerned with “knowledge become self-conscious”—with knowledge about knowledge—with our knowing turned, reflexively, back upon itself. Here it is not the knowable universe we are considering. It is, instead, the world of knowledge itself: its diverse disciplines, modes of inquiry, fields of scholarship or systematic study—in short, as the title of Part Ten indicates, the branches of knowledge. Whereas the other nine parts of the Outline of Knowledge cover *what we know* about the knowable universe, the outline of Part Ten covers what we know about the sciences or other disciplines *whereby we know* that which we know.

The answer just given is not the whole answer to the question provoked by the special character of Part Ten. What we know about the various sciences and the diverse disciplines that comprise the world of knowledge almost always includes an account of the methods of inquiry, verification or demonstration, and argument employed by scientists or scholars in a particular field of knowledge. While interest in such matters does not exhaustively represent the concerns of logic, the science of logic does provide the underpinnings for our study of the methodology of the other learned disciplines, including history and philosophy as well as the various sciences. What we know about logic itself as a science—its history and, as it were, the philosophy of it—therefore properly belongs in the outline of Part Ten, together with an indication of the scope and content of the science itself.

For a somewhat different reason mathematics is also treated here in the same way as logic. The knowledge attained by the mathematician has extraordinarily wide and diverse applicability in other spheres of inquiry and branches of knowledge—in most, if not all, of the natural sciences and in many of the social sciences. Like logic, mathematics belongs here not only for its usefulness in other sciences, but also for its own sake as a science. We

are concerned with its content as well as with its method, history, and philosophy.

In addition to logic and mathematics, two other disciplines occupy a special place in any consideration of the branches of knowledge. One is history; the other, philosophy.

History as a field of study includes more than the history of peoples, of nations, of cultures, and of social institutions. It includes the history of human learning itself, of all the branches of knowledge. It includes not only the history of the natural and social sciences, but also the history of logic, of mathematics, of philosophy, and of history itself as one of the learned disciplines. And, in addition to there being a history of the study of history (*i.e.*, historiography), there is also a logic of history (its methodology) and a philosophy of history.

Like history, philosophy is operative in the study of all the other disciplines as well as of itself. Philosophy become self-conscious is concerned with questions about the nature and scope of philosophy, about whether it has a method or methods and a subject matter or subject matters peculiarly its own. Philosophy is also concerned about its own historical development and, in that history, about its changing relationship to other disciplines, especially to religion and to the sciences. As there is a history and a philosophy of history, so there is a philosophy of philosophy and a history of philosophy—a statement which probably cannot be made about any other two disciplines in the entire range of the branches of knowledge.

In addition, as each of the other disciplines has a history, so there is a philosophy of each of the other disciplines. We have already noted that there is a philosophy of logic and of mathematics. So, too, there is a philosophy of science in general and of the different sciences in particular; and also a philosophy of education, of law, of art, and of religion.

All of this, however, does not exhaust the content of philosophy, any more than the history of all the branches of knowledge exhausts the content of history, or any more than the application of logic and mathematics to other disciplines exhausts their content as disciplines with knowledge to offer. But in the case of philosophy, as not in the case of logic and mathematics, it is sometimes questioned whether it can rightly claim to offer us knowledge of the universe as well as knowledge about knowledge itself and an understanding of the various branches of knowledge. That question, together with the question of how the knowledge that philosophers claim to have stands in relation to other forms of knowledge, constitutes what is, perhaps, the most fundamental problem dealt with by philosophers when they philosophize about philosophy itself. Whether or not the knowledge they claim to have is comparable in its validity to the knowledge achieved in other spheres of inquiry, philosophy, like science, covers a wide range of subject matters and involves a large number of distinct subdivisions, each with its own problems and controversies (*e.g.*, metaphysics, philosophy of nature, epistemology, philosophy of mind, philosophy of man, ethics, political philosophy, and aesthetics).

Concerning the whole range of disciplines that are represented in an exhaustive inventory of the branches of knowledge, three questions stand out as the most challenging. Of these, the first two have been debated over and over

again—in earlier epochs as well as in our own century, and in the context of organizations of knowledge quite different from that which prevails or is acceptable today.

One is the question about whether the various branches of knowledge can or should be arranged in a hierarchical order, in an ascending scale from lower to higher, or from less to more fundamental. In antiquity they were so arranged; as, for example, in Aristotle's ordering of the speculative sciences, beginning with physics and rising through mathematics to metaphysics as the science of first principles and ultimate causes; and in his characterization of politics as the architectonic or controlling discipline in the sphere of practical knowledge, directive of human action. So, too, in the Middle Ages, a hierarchical organization prevailed, in which theology was regarded as queen of the sciences, philosophy as its handmaiden, with all the other disciplines contributing their portions of knowledge for the greater glory of God and for the better understanding of man's destiny under Divine Providence. If, in accordance with the prevailing view today, a hierarchical order is rejected, is there any other order to replace it, and in terms of what criteria or principles can such an alternative be constructed? Is there, as the introductory essay in this volume suggests, a circle of learning instead of a hierarchy of the branches of knowledge—a circle in which no point is either a beginning or an end, and lines can be drawn from any point to any other?

The second question, to which different answers have been given at different times and to which conflicting answers are still being given today, asks about the coherence of the world of knowledge as a whole. Do all its constituent parts—its various component disciplines or branches of knowledge—adhere together harmoniously, each somehow complementing the other? Or, on the contrary, is the world of knowledge torn asunder by irremediable conflicts—by territorial disputes, by conflicting claims to sovereignty, by assertions and denials of legitimacy? Underlying whatever answers may be given to these questions, a deeper difference of opinion may exist concerning the unity of truth itself. If, for example, there is some truth in science and some truth in philosophy or in religion, must these diverse approximations of whatever truth man can possess be consistent with one another? Or, on the contrary, can there be some truth in science and some in philosophy or in religion, even though the truth of the one stands in sharp conflict to the truth of the other? Can there be, in short, a multiplicity of truths, each of which deserves that name, but each of which must be kept out of contact with the others, by being isolated in logic-tight compartments?

Unlike the two preceding questions, the third is one that has come to the forefront only recently. It concerns what many contemporary commentators regard as an unfortunate rift in the realm of knowledge—the chasm between the sciences, on the one hand, and the humanities, on the other. In the long history of the latter term, different disciplines have been grouped together on the side of the humanities and in contradistinction to the sciences. Today, the humanities group is generally thought to include language and literature, the fine arts, history, philosophy, and religion.

It is assumed that there are fundamental differences, in method or approach and in criteria of validity, between the

humanistic disciplines, on the one hand, and the sciences, both natural and social, on the other. Of course there are, but they are not entirely clear. By reference to methodology or to criteria of validity, certain of the disciplines called humanistic closely resemble those called scientific. For example, mathematicians and logicians do their work by sitting still and thinking, not by undertaking experiments or by going out into the field to collect data or do research. Philosophy is like them in this respect; but mathematics and logic are usually regarded as sciences, whereas philosophy is grouped with the humanities. Furthermore, the criteria of validity thought to be applicable to philosophy do not operate as criteria for judging the excellence of literature or of other fine arts, yet all three are classified as humanities.

Supposing that some line can be clearly drawn to divide the humanities from the sciences, the problem that agitates those who contemplate the world of learning is whether it is one world or two—whether the rift or chasm that separates the sciences from the humanities involves an iron curtain that prevents communication between them. It is not within the purpose or the province of this essay to provide an answer to that question. Nevertheless, an answer would appear to be suggested by the conception of the encyclopaedia as a totality, as an organized whole. That conception would seem to favour the view that, in the circle of learning, there are no impenetrable barriers to communication or unbridgeable breaks in continuity. Underlying it is the faith that the whole world of knowledge is a single universe of discourse.

Part Ten. The Branches of Knowledge

Several points should be noted about the relations of this part to the preceding parts. The results of investigations in the natural and social sciences, and in medicine and technology—their content or knowledge—are set forth in Parts One through Five, and in Part Seven. Accordingly, the outlines in the seven sections of Division III in this part are confined to questions about the history of these disciplines, and about their nature, scope, structure, methods, and principal problems or tasks. Direct historical accounts of the peoples and civilizations of the world are set forth in Part Nine, whereas Section 10/41 in Division IV of this part is confined to historical and analytical studies of the discipline of history itself, treating the history of historical writing, the methods of modern historical investigation and research, speculative philosophies of history, and philosophical analyses of the specific character of historical knowledge.

The case is different with Divisions I, II, and V—on logic, mathematics, and philosophy. The results of these disciplines have not been dealt with in previous parts. In the history of each of these disciplines, substantive developments have persistently involved, and issued from, positions taken not only *within them*, but also from positions taken *about them*. Accordingly, the outlines in the sections of Divisions I, II, and V treat the substantive results of logical, mathematical, and philosophical inquiry, on the one hand, and the historical and analytical studies of the nature, scope, branches, methods, and principal problems of logic, mathematics, and philosophy, on the other.

In Part Six on the arts and Part Eight on religion, the outlines include historical and analytic studies of knowledge and inquiry concerning the arts and religion. Such studies, then, are not included separately in Part Ten. They are, however, treated in Section 10/42 of this part, insofar as the study of the arts and of religion are, together with the study of language, history, and philosophy, component disciplines of the humanities—a group of disciplines traditionally distinguished from the natural and social sciences, and traditionally considered to have, taken together, a special educational and cultural role. Section 10/42 sets forth a historical review of the changing conceptions of the humanities and of humanistic scholarship, and treats issues about the definition and scope of the humanities, about their distinction from the sciences, and about their role in education and culture.

Division VI, which contains only one section, differs from other divisions in that it is not discipline-specific; to the contrary, it deals with the institutions and techniques used to preserve knowledge, and certain objects of knowledge, in all fields.

- Division I. Logic 479
 - II. Mathematics 483
 - III. Science 492
 - IV. History and the Humanities 509
 - V. Philosophy 513
 - VI. Preservation of Knowledge 522

Division I. Logic

The outlines in the two sections of Division I deal with the history and philosophy of logic and with the content of the disciplines of formal logic, metalogic, and applied logic.

The outline in Section 10/11 first treats the history of logic in the West and the history of Indian and Chinese logic; and then treats differing conceptions of the field and scope of logic, problems in the philosophy of logic concerning meaning, truth, and ontology, and the place of logic among the sciences and disciplines.

Section 10/12 deals first with formal logic, treating the propositional calculus, the predicate calculus, the theory of the syllogism, modal logic, and set theory and natural-number arithmetic. It goes on to the nature and elements of metalogic, which studies the syntax and semantics of formal languages, formal systems, and logical calculi. Finally, it deals with the applications of logic in different domains of inquiry and discourse.

- Section 10/11. History and Philosophy of Logic 480
- 10/12. Formal Logic, Metalogic, and Applied Logic 481

Section 10/11. History and Philosophy of Logic

A. History of logic

1. Ancient logic

- a. Precursors of ancient logic: contributions of the Sophists, Socrates, and Plato to theories of language and the axiomatic method
- b. Aristotle and the logic of predicates: theories of the structure of language, theories of opposition and conversion, development of syllogistic and modal logic
- c. Later developments in the logic of predicates: contributions of Theophrastus and Galen
- d. Founding of the logic of propositions: contributions of Theophrastus and the Megarians, Stoic logic

2. Medieval logic

- a. Development of medieval logic: Arabic contributions, disputes between the “old logic” and the “new logic” after the translation of Aristotle’s *Organon*, summations by William of Sherwood and Peter of Spain
- b. Medieval theories of language and their relation to the development of logic: the theory of categorematic and syncategorematic terms, the theory of supposition
- c. Medieval developments in formal logic: the logic of predicates, of propositions, and of modal expressions; logical fallacies and paradoxes

3. Modern logic from the Renaissance to the 20th century

- a. Logic in the Renaissance: the influence of Neoplatonism and of the rise of the natural sciences, the logics of Petrus Ramus and of Port-Royal
- b. The rise of mathematical logic during the Enlightenment: contributions of Leibniz (e.g., his general calculus of reasoning and general methodology), the search for clarity and the use of diagrams
- c. Development of mathematical logic in the 19th century: expansions of syllogistic, Boole’s algebra of logic, refinements of the calculus, the study by Frege and Cantor of the relation between logic and the foundations of mathematics

4. Logic in the 20th century

- a. The conflict of Logicism, the view that mathematics is a continuation of logic, with Intuitionism and Formalism: Russell’s Logicism and the theory of types, Brouwer’s Intuitionism, Hilbert’s Formalism
- b. Developments in the logic of propositions and in the logic of predicates
- c. Metalogical studies: the study of the properties of axiomatized systems; syntax and semantics as metalogical disciplines

5. Logic in the East

- a. Indian logic: its origins in the commentaries on the scriptural texts called *sūtras*, special problems in grammar and special types of inference, interest in the logical implications of the notion of negation
- b. Chinese logic: its origins in reflections on the characteristics of controversies between the major philosophies of Confucianism, Taoism, and Moism; its neglect after the establishment of Neo-Confucianism in the 11th century AD

B. Philosophy of logic

1. The organization of logic as a discipline

- a. The nature and varieties of logic: differing conceptions of its field and scope, varieties of logical symbolism
- b. Features and problems of logic: concerns with logical semantics or model theory, questions of the limitations of logic, Gödel’s incompleteness theorems, the question of logic and computability

2. Issues and developments in the philosophy of logic

- a. Problems in meaning and truth: logical semantics of modal concepts, logic and informativeness

- b. Problems of ontology: problems concerning individuation and existence
 - c. Alternative logics: modal logics, intuitionistic logic
3. The place of logic among the sciences and disciplines

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the history and philosophy of logic

Logic, The History and Kinds of
Philosophies of the Branches of Knowledge

MICROPAEDIA: Selected entries of reference information

General subjects

analogy	axiom	ekthesis	thought, laws of
analytic	De Morgan laws	fallacy	types, theory of
proposition	dialectic	induction	universal

Biographies

Boole, George	Leibniz, Gottfried	Peirce, Charles	Socrates
Carnap, Rudolf	Wilhelm	Sanders	Whitehead, Alfred
Frege, Gottlob	Leśniewski,	Ramus, Petrus	North
Gödel, Kurt	Stanislaw	Russell, Bertrand	

See also Sections 10/51, 10/52, and 10/53

INDEX: See entries under all of the terms above

Section 10/12. Formal Logic, Metalogic, and Applied Logic

A. Formal logic

1. The propositional calculus: the logic of unanalyzed sentences in combination
 - a. General features of the propositional calculus: symbols employed for propositional connectives or operators (*i.e.*, “not,” “and,” “or,” “if . . . then,” “is equivalent to”), propositional variables
 - b. Special systems of the propositional calculus
2. The predicate calculus: the logic of quantified functions of terms
 - a. General features of the predicate calculus: individual variables and predicate variables, universal and existential quantifiers (*i.e.*, “any” or “all,” “some” or “one”)
 - b. The lower predicate calculus: the logic of individual variables
 - c. Higher order predicate calculi: the logics of classes of variables
3. Syllogistic: the theory of the syllogism
4. Modal logic: the logic of necessity, possibility, and contingency; systems of and validity in modal logic
5. Set theory and natural-number arithmetic

B. Metalogic: the study of the syntax and the semantics of formal languages, formal systems, and logical calculi

1. The nature and elements of metalogic
2. The nature of a formal system and of a formal language
3. Discoveries about formal mathematical systems: completeness and consistency, decidability and undecidability
4. Discoveries about logical calculi
5. Model theory: the study of the interpretations, or models, that satisfy the axioms of a given formal system

C. Applied logic

1. The critique of forms of reasoning
 - a. Theory of argumentation: the new rhetoric
 - b. Analysis of logical fallacies: material, verbal, and formal fallacies
2. Epistemic logic: logic dealing with the concepts of belief, knowledge, assertion, doubt, and question
3. Practical logic: logic dealing with the concepts of choosing, planning, commanding, and permitting
4. Logics of physical application
5. Hypothetical reasoning and counterfactual conditionals: logic involving consequents whose antecedents are known to be false

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with formal logic, metalogic, and applied logic

Logic, The History and Kinds of
Rhetoric

MICROPAEDIA: Selected entries of reference information

General subjects

analytic proposition	deduction	modus ponens and modus tollens	rhetoric
axiom	dichotomy	mood	set theory
axiomatic method	dilemma	predicate calculus	sylogistic
categorical proposition	enthymeme	predication	
condition	formal system	propositional calculus	
connective	logic	recursive function	
conversion	metalogic	reduction	
	modal logic		
	modality		

Biographies

Antiphon	Lewis, C.I.	Quintilian
Isocrates	Peano, Giuseppe	Zeno of Elea

See also Sections 10/51, 10/52, and 10/53

INDEX: See entries under all of the terms above

Division II. Mathematics

[For Part Ten headnote see page 479.]

The outlines in the three sections of Division II treat the history and foundations of mathematics, the branches of mathematics, and the applications of mathematics.

Section 10/21 deals first with the general history of mathematics, with the development of representative non-probabilistic areas of mathematics, and with the historical development of probabilistic areas. The treatment of the foundations of mathematics covers the axiomatic method, the genetic method, 20th-century rival formulations of the foundations of mathematics, and current investigations of the foundations of mathematics.

Section 10/22, the branches of mathematics, first treats set theory, arithmetic, elementary multivariate algebra, linear and multilinear algebra, and algebraic structures, including the subjects of homological algebra and universal algebra. It goes on to deal with Euclidean and non-Euclidean geometry, projective geometry, analytic and trigonometric geometry, differential geometry, and algebraic geometry. It then deals with the subdivisions of mathematical analysis: real analysis, complex analysis, differential equations, functional analysis, Fourier analysis, the theory of probability, and vector and tensor analysis. The outline next deals with combinatorics and combinatorial geometry, and with number theory. Finally, it treats topology: general topology, topological groups and differential topology, and algebraic topology.

Section 10/23, applications of mathematics, first treats mathematics as a calculatory science and then goes on to deal with statistics, numerical analysis, definitions and examples of automata and the development of automata theory, the mathematical theory of optimization, information theory, and the mathematical aspects of physical theories.

Section 10/21. History and Foundations of Mathematics 483

10/22. Branches of Mathematics 485

10/23. Applications of Mathematics 490

Section 10/21. History and Foundations of Mathematics**A. History of mathematics**

1. The development of mathematics in general, through ancient, medieval, and modern times
 - a. Ancient and medieval periods
 - i. Ideas and methods originating or developing in Mesopotamia and Egypt
 - ii. Greek and Hellenistic mathematics
 - iii. The Middle Ages: Islāmic mathematics and its transmission to the West
 - b. The modern period
 - i. The 17th century: discovery of logarithms and analytic geometry, development of calculus by Newton and Leibniz
 - ii. The 18th century: advances in geometry, algebra, and analysis; contributions of the Bernoulli family, Euler, Lagrange, Laplace, and others
 - iii. The 19th and 20th centuries: development of non-Euclidean geometry by Bolyai, Lobachevsky, and others; contributions to the theories of groups, functions, and complex variables; development of algebraic geometry; influence of physical science on analysis; study of the foundations of mathematics
2. Historical development of representative nonprobabilistic areas of mathematics
 - a. Numerals and numeral systems
[see also 10/23.A.1.]
 - i. Simple grouping systems: ancient Egyptian, Babylonian, Greek, and Roman numerals
 - ii. Development of multiplicative, ciphered, and positional numeral systems
 - b. Introduction of symbolic notations to represent mathematical quantities, operations, and relationships
 - c. Calculatory science
[see also 10/23.A.]
 - i. The history of mathematical tables, including tables of logarithms
 - ii. The evolution of analogue devices: origins of harmonic analyzers, differential analyzers, and the slide rule

- iii. The evolution of digital devices: development of computational aids from the abacus to the modern electronic digital computer
[see 10/23.A.7.]
 - d. Geometry
[see also 10/22.C.]
 - i. Egyptian, Babylonian, and Greek geometry
 - ii. The algebraic approach: development of analytic geometry
 - iii. Development of projective geometry
 - iv. Development of non-Euclidean geometry
 - v. Philosophical aspects of geometry
 - vi. Modern ideas and topics in geometry: the axiomatic method; geometrical transformations; the concept of space, differential geometry, and topology
 - e. Algebra
[see also 10/22.B.]
 - i. Babylonian, Egyptian, and Greek contributions
 - ii. Contributions from the Orient, India, and the Islāmic world
 - iii. Medieval and modern European developments
 - iv. Evolution of the theory of algebraic equations of one variable: solutions prior to and after Galois
 - 3. Historical development of probabilistic areas of mathematics
[see also 10/22.D.6.]
 - a. Development of the mathematical theory of probability
 - i. The abstract calculus of probability: the common structure of theories of probability
 - ii. Alternative views of probability: the frequency theory of probability, the range theory of probability and the principle of indifference, the belief theory of probability, subjective and objective notions of probability
 - iii. Bernoulli's theorem, inverse probability, and asymptotic probabilities
 - b. Development of mathematical statistics: the history of the theory of stochastic processes, origins of control theory
- B. Foundations of mathematics**
- 1. The axiomatic method: mathematical analysis based upon a set of axioms, or unproved statements
 - a. Euclidean geometry
[see also 10/22.C.1.]
 - b. Non-Euclidean geometry
[see also 10/22.C.2.]
 - c. The formal axiomatic method
 - 2. The genetic method: mathematical analysis based upon the orderly construction or generation of objects with unknown properties from objects with known properties
 - a. Arithmetic and analysis
[see also 10/22.B.1.]
 - b. The concept of cardinal number and the theory of sets
[see also 10/22.A.2.]
 - 3. The crisis in the foundations of mathematics after 1900: reformulations in terms of the three alternative philosophical positions of Intuitionism, Logicism, and Formalism
 - a. The paradoxes
 - b. Intuitionism
 - c. Logicism, Formalism, and the metamathematical method
 - 4. Current directions in investigations of the foundations of mathematics
 - a. Intuitionistic studies of the foundations of mathematics: application of formalistic procedures to Intuitionism
 - b. Non-Intuitionistic studies of the foundations of mathematics: trends in recursion theory, proof theory, model theory, and set theory

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and biographies dealing with the history and foundations of mathematics

Archimedes
 Gauss
 Mathematics, The Foundations of
 Mathematics, The History of
 Pascal
 Philosophies of the Branches of Knowledge

MICROPAEDIA: Selected entries of reference information

General subjects

analysis	exhaustion,	logicism	Sturm–Liouville
Bessel function	method of	metatheory	problem
Boolean algebra	fluxion	Riemannian	transitive law
derivative	hyperbolic	geometry	
Dirichlet's theorem	geometry		

Biographies

Abel, Niels Henrik	Cayley, Arthur	Kolmogorov, A.N.	Oresme, Nicholas
Abū al-Wafā'	Clifford, William	Lagrange,	Painlevé, Paul
Apollonius of	Kingdon	Joseph-Louis	Picard, Émile
Perga	Dedekind, Richard	Lebesgue,	Plücker, Julius
Bell, Eric Temple	Diophantus of	Henri-Léon	Poincaré, Henri
Bernoulli, Daniel	Alexandria	Legendre,	Poisson,
Bernoulli, Johann	Euclid	Adrien-Marie	Siméon-Denis
Birkhoff, George	Eudoxos of Cnidus	Leibniz, Gottfried	Ramanujan,
David	Euler, Leonhard	Wilhelm	Srinivasa
Bolyai, János	Fermat, Pierre de	Leonardo Pisano	Regiomontanus
Boole, George	Fourier, Joseph,	Liouville, Joseph	Riemann,
Brouwer, L.E.J.	Baron	Lobachevsky,	Bernhard
Cantor, Georg	Frege, Gottlob	Nikolay	Steiner, Jakob
Carathéodory,	Galois, Évariste	Ivanovich	Sylvester, James
Constantin	Hamilton, Sir	Maclaurin, Colin	Joseph
Cauchy,	William Rowan	Moivre,	Thales of Miletus
Augustin-Louis,	Hero of Alexandria	Abraham de	Wallis, John
Baron	Hilbert, David	Noether, Emmy	Weierstrass, Karl

INDEX: See entries under all of the terms above

Section 10/22. Branches of Mathematics**A. Set theory**

1. Origins of set theory and the definitions of a set and a set element, or member
2. Introduction to set theory
 - a. Fundamental set concepts
 - b. Essential features of Cantorian set theory
3. Axiomatic set theory: formal analyses of set theory based upon certain fundamental assumptions or undefined notions called axioms
 [see also 10/21.B.3.a.]
 - a. Postulates of axiomatic set theory: the Zermelo–Fraenkel axioms, the von Neumann–Bernays–Gödel axioms
 - b. Limitations of axiomatic set theory: failure of attempts to prove the consistency of axiomatic set theory, Gödel's theorem
 - c. The present status of axiomatic set theory: profound changes in axiomatic set theory as a result of recent discoveries

B. Algebra

1. Arithmetic

- a. Fundamental definitions and laws: the concepts of natural number and integer; the binary operations of addition and multiplication; the commutative and associative laws of addition; the commutative, associative, and distributive laws of multiplication
- b. Theory of divisors: extension of natural number concepts to non-integers, fractions resulting from the binary operation of division
- c. Number systems and notation: use of the positional principle and the symbol zero to specify magnitude in sequences of digits; number systems having different bases—*e.g.*, binary, decimal, and sexagesimal systems
[see also 10/23.A.1.]
- d. Arithmetic calculation with decimals: binary operations with decimals; divisibility rules; calculation of square, cube, and higher roots
- e. Logarithms: formal definition of logarithms, use of logarithms to reduce the operations of multiplication and division to the simpler operations of addition and subtraction
[see also 10/23.A.4.b.]

2. Elementary and multivariate algebra

- a. Algebra as an extension and generalization of arithmetic
- b. Basic algebraic properties of numbers
- c. Polynomials and rational functions
- d. Solution of equations: the principal problem of elementary algebra

3. Linear and multilinear algebra

- a. Linear algebra
 - i. Vector spaces
 - ii. Matrices
 - iii. Linear transformations and linear operators
 - iv. Linear functionals and their relation to linear transformations
 - v. Inner products and inner product spaces: self-conjugate, or Hermitian, matrices; unitary and orthogonal matrices
 - vi. Linear operators in an inner product space: self-adjoint, or Hermitian, operators; unitary and orthogonal operators; the spectral theorem for normal operators

b. Multilinear algebra

4. Algebraic structures

- a. Lattices
- b. Groups
- c. Fields
- d. Rings
- e. Categories
- f. Homological algebra
- g. Universal algebra

C. Geometry

1. Euclidean geometry

- a. Geometry as an abstract doctrine: the axiomatization of the foundations of geometry; axioms of order, incidence, congruence, parallels, and continuity and results derived from them
- b. The measure of polygons and polyhedra: the theories of equivalence and measure and their relation, Euclid's contribution and its modern extension and generalization
- c. Transformation geometry: reflection, rotation, and translation of geometric figures; homotheties and similitudes
- d. Geometric constructions: the equivalence between Euclidean constructions and existence theorems, gauge constructions, ruler and compass constructions, construction with compass only

- e. Geometry of more than three dimensions: the generalization of Euclidean geometry
 - f. The concept of convexity and convex sets
2. Non-Euclidean geometry
[see also 10/21.B.1.b.]
 - a. Distinction between Euclidean and non-Euclidean geometry: hyperbolic geometry and elliptic geometry
 - b. Geometric representations of the hyperbolic plane and hyperbolic space
 - c. Coordinates in spherical and elliptical space: interpretations of four-dimensional Euclidean space
 - d. Coordinates in the hyperbolic plane and hyperbolic trigonometry
 - e. Transformations: hyperbolic geometry as characterized by its group of reflections
 3. Projective geometry
 - a. The procedure of projection as the foundation of projective geometry
 - b. Homogeneous coordinates: location of points in space
 - c. Complex geometry: introduction of complex numbers as homogeneous coordinates
 - d. Abstract geometries: extension and generalization of projective geometry to space of any number of dimensions
 4. Analytic and trigonometric geometry
 - a. Plane analytic geometry: fundamental procedures and concepts
 - b. Trigonometry
 - c. Coordinates and transformation of coordinates
 - d. Projective and solid analytic geometry: extensions of analytic geometry to the projective plane and to three or more dimensions
 - e. Special curves: named curves that have been studied with regard to problems in mathematics or the physical sciences; *e.g.*, the folium of Descartes, the lemniscate of Bernoulli, the cardioid, the cycloid, the catenary, the brachistochrone
 5. Combinatorial geometry
[see E.1.c., below]
 6. Differential geometry
[see also F.2.e., below]
 7. Algebraic geometry
[see also F.3., below]
- D. Analysis
1. Real analysis
 - a. Origins and concepts of real analysis
 - b. Number systems and their properties
 - c. Functions and differential calculus
 - d. Measure and integral calculus
 2. Complex analysis
 - a. Theory of analytic functions of one complex variable
 - b. Theory of analytic functions of several complex variables
 - c. Potential theory
 3. Differential equations
 - a. Ordinary differential equations
 - b. Partial differential equations
 - c. Special functions that arise as solutions to differential equations; *e.g.*, the hypergeometric function, Legendre polynomials, spherical harmonics, Bessel functions
 - d. Dynamical systems on manifolds
 4. Functional analysis

- a. General features of functional analysis
- b. Calculus of variations
- c. Generalized functions: the theory of distributions
- 5. Fourier analysis
 - a. The theory of series
 - b. Fourier series
 - c. Harmonic analysis and integral transforms
 - d. Representations of groups and algebras: Fourier analysis on non-Abelian groups
- 6. Theory of probability
 - a. Heuristic introduction to probability: the need for a mathematically precise definition of probability
 - b. Probability on finite dimensional spaces
 - c. Probability on infinite dimensional spaces
- 7. Vector and tensor analysis
 - a. Scalars, vectors, tensors, and the physical quantities that give rise to them
 - b. Vector algebra and analysis
 - c. Tensor algebra and analysis
- E. Combinatorics and number theory
 - 1. Combinatorics and combinatorial geometry
 - a. The nature and scope of combinatorics: the definition of combinatorics as the branch of mathematics concerned with arrangements, operations, and selections within a finite or a discrete system
 - b. Methods, results, and unsolved problems of combinatorial theory, exclusive of geometric considerations
 - c. Combinatorial geometry
 - 2. Number theory
 - a. Elementary number theory: properties of the whole numbers, or integers
[see B.1.a., above]
 - b. Algebraic number theory: properties of algebraic numbers
 - c. Analytic number theory
 - d. Geometric number theory
 - e. Probabilistic number theory
- F. Topology
 - 1. General topology
 - a. Definition and basic concepts of topology; the subject matter and applications of topology as exemplified by certain simple topological problems and their solutions
 - b. Topological spaces: methods for constructing topological spaces; Euclidean n -dimensional space, Hilbert space, Cartesian-product space, and other examples of topological spaces
 - c. Topological properties
 - d. Topological problems of current interest; *e.g.*, the planar fixed-point problem, the polyhedral Schoenflies problem
 - 2. Topological groups and differential topology
 - a. Interaction between analysis and topology
 - b. The theorems of Tikhonov and Ascoli: embedding of a topological space as a subspace of a compact space
 - c. Continuous groups
 - d. Analysis on manifolds: topological implications of problems in global analysis
 - e. Differential topology
[see also C.6., above]

3. Algebraic topology

[see also C.7., above]

- a. The nature and scope of algebraic topology and its context within general topology, the basic concepts of topological spaces and maps
- b. Invariants: unchanging quantities that play a central role in the classification of spaces and maps
- c. Homotopy theory: homotopy classes and the concept of homotopy-equivalent spaces
- d. Homology and cohomology theory: definition of a simplex, axiomatic homology theory
- e. Homotopy groups: stability and suspension
- f. Definition and properties of fibres, fibre bundles, and fibrings
- g. Sheaf cohomology
- h. Spectral sequences: Serre, Rothenberg–Steenrod, and Eilenberg–Moore spectral sequences
- i. Further developments in homotopy theory: Eilenberg–MacLane spaces, the methods of killing homotopy groups, Serre’s C-theory
- j. Generalized homology and cohomology theory: K-theory, the spectral sequence of G.W. Whitehead–Atiyah–Hirzebruch
- k. Recent advances in algebraic topology

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the branches of mathematics

Algebra	Geometry
Analysis (in Mathematics)	Number Theory
Arithmetic	Probability Theory
Combinatorics and Combinatorial	Set Theory
Geometry	Trigonometry

MICROPAEDIA: Selected entries of reference information

General subjects

<i>algebra</i> :	infinite series	<i>geometry</i> :	Zermelo-Fraenkel
algebra	integration	algebraic geometry	axiom
binomial theorem	Laplace’s equation	analytical geometry	<i>topology</i> :
discriminant	Markov process	catastrophe theory	compactness
eigenvalue	mean-value	Desargues’s	connectedness
exponential	theorem	theorem	Euler characteristic
function	parabolic equation	differential	four-colour map
Gauss elimination	perturbation	geometry	problem
harmonic function	probability theory	duality	homology
homotopy	real number	fractal	metric space
linear equation	singular solution	geometry	topological space
logarithm	stochastic process	hyperbolic	<i>other</i> :
matrix	<i>combinatorics and</i>	geometry	arithmetic function
quarter squares	<i>number theory</i> :	projection	graph
root	combinatorics	projective	graph theory
<i>analysis</i> :	Fermat prime	geometry	mathematics
analysis	NP-complete	Riemannian	normal
calculus	problem	geometry	distribution
differential	number theory	<i>set theory</i> :	number system
equation	permutations and	Boolean algebra	numeral system
differentiation	combinations	measure	pi
Dirichlet problem	Riemann zeta	set theory	trigonometry
elliptic equation	function	transfinite number	
exact equation			

Biographies

See Section 10/21

INDEX: See entries under all of the terms above

Section 10/23. Applications of Mathematics

- A. Mathematics as a calculatory science
 - 1. Numerical notations
 - a. Aggregations, or units used to assist counting or grouping of objects
 - b. Ancient numerical notations
 - c. Decimal notation and modern notational developments
 - 2. Geometrical aids
 - a. Early applications of geometry
 - b. Instruments for observation and navigation
 - c. Mapping
 - d. Applications of geometry to celestial measurement
 - e. Optical instruments
 - f. Drawing instruments
 - 3. Mathematical models: physical constructions used to aid the visualization of mathematical ideas or relationships
 - 4. Calculatory aspects of algebra
 - a. Algebraic notation
 - b. Logarithms
 - c. Slide rules
 - 5. Calculation using tables and graphs
 - a. Mathematical tables
 - b. Graphs and graphical procedures
 - 6. Analogue computation
[see also 735.D.]
 - a. Types of problems solvable by analogue computation
 - b. Analogue computers
 - 7. Digital computation
[see also 735.D.]
 - a. Digital calculators
 - b. Punched cards
 - c. Programmed machines (digital computers)
- B. Statistics
 - 1. The basic principles of statistical inference: application of the concepts and techniques of probability theory to the analysis of data
 - a. The concept of a statistical experiment: mathematical description of experiments in terms of random variables
 - b. Distribution functions and their properties: the median, mean, variance, and standard deviation of a distribution; the Gaussian or normal distribution
 - 2. Estimation: techniques for approximating the parameters of families of distributions of random variables
 - 3. Hypothesis testing: techniques for determining the correctness of alternative hypotheses concerning given data and an assumed probability model
 - 4. Structure in data: use of regression analysis to discover systematic patterns
- C. Numerical analysis
 - 1. Introduction: definition, origins, and basic concepts of numerical analysis
 - 2. Errors: round-off and truncation
 - 3. Approximation of functions: linear and polynomial interpolation, least squares approximation

4. Solution of equations: linear, nonlinear, and differential equations
5. Applications and implementation of numerical analysis: optimization, large-scale scientific computation, mathematical software

D. Automata theory

[see also 712.A.6.]

1. Introduction: definition and examples of automata, development of the basic concepts of automata theory, the analogy between automata and the nervous systems of living organisms
2. Neural nets and automata
3. Probabilistic questions: random effects in the operation of automata
4. Classification of automata

E. Mathematical theory of optimization

1. The theory of games: analysis of the strategic features of conflict situations
2. Linear and nonlinear programming (mathematical programming)
3. Cybernetics
4. Control theory

F. Information theory

[see also 735.A.]

1. Origins and definitions of information theory
2. Central problems of information theory
3. Principles of information theory
4. Applications of information theory to cryptography, linguistics, and other fields

G. Computer science

1. Synthesis and analysis of algorithms
2. Theory of computation
3. Computer architecture
4. Programming languages and methodology
5. Numeric computation
6. Artificial intelligence

H. Mathematical aspects of physical theories

1. Mechanics of particles and systems
[see also 126.A.]
2. Fluid mechanics
[see also 126.F.]
3. Mechanics of solids
[see also 126.D.]
4. Statistical mechanics
[see also 124.A.9.]
5. Electromagnetic theory
[see also 127.E.]
6. Relativity theory: space and time as a four-dimensional continuum
[see also 131.D.]
7. Riemannian geometry
8. Quantum mechanics
[see also 111.A.4.c.]
9. Dimensional analysis

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with applications of mathematics

Automata Theory	Numerical Analysis
Computer Science	Optimization, The
Computers	Mathematical Theory of
Game Theory	Statistics
Information Processing and Information Systems	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>computers and other mathematical devices:</i>	input/output device	mathematical programming	<i>other:</i> algorithm
abacus	integrator	optimization	artificial intelligence
analog computer	microprocessor	queuing theory	automata theory
calculator	planimeter	<i>statistics:</i> decision theory	dimensional analysis
central processing unit	quipu	distribution function	distortion
computer	slide rule	freedom, degree of	eigenvalue
programming	supercomputer	inference	fractal
language	time-sharing	mean	gamma function
computer	<i>numerical analysis:</i> difference equation	normal distribution	graph graph theory
programs	interpolation	sampling	information theory
differential analyzer	numerical analysis	standard deviation	mathematical model
differentiator	<i>optimization:</i> control theory	statistics	
digital computer	cybernetics	Student's t-test	
harmonic analyzer	game theory	variance	
	linear programming		

Biographies

Babbage, Charles	Pascal, Blaise	von Neumann, John	Wiener, Norbert
Boole, George	Turing, Alan M.	Weyl, Herman	
Napier, John			

INDEX: See entries under all of the terms above

Division III. Science

[For Part Ten headnote see page 479.]

The results of investigations in the natural, social, and medical sciences and the achievements of technology are dealt with in Parts One through Five and in Part Seven. The outlines in the seven sections of Division III are concerned with inquiries that have viewed those sciences and technology as the objects of historical and analytical studies.

Section 10/31 deals with science taken generally. It first presents a synoptic history of Western and Eastern science. It then deals with the nature and scope of the philosophy of science, and with analyses of the empirical procedures and formal structures of science, of science's modes of discovery, and of validating concepts and theories.

Section 10/32 is on the physical sciences. The outline first deals with the historical evolution of astronomy and astrophysics, of physics, and of chemistry. Then, for each of them, it treats issues about the nature, scope, component disciplines, methods, and principal problems of the discipline.

Similarly, Section 10/33 first deals with the history of the several complementary Earth sciences, and then with studies of the nature, scope, methods, and principal problems of the geologic, hydrologic, and atmospheric sciences.

Section 10/34 is first concerned with the historical development of the biological sciences and with issues about the methodology, scope, and conceptual structure of biology as a whole. It then sets forth the work done at four levels of biological research: the molecular, cellular, organismic, and population levels. Finally, it treats issues in the philosophy of biology: issues about the nature of biological systems, issues concerning evolution and evolutionary theory, and biological issues with ethical implications.

Section 10/35 treats the history of medicine; the many specialized fields of medical practice and research; and such affiliated disciplines as dentistry, osteopathy, nursing, and pharmacy.

Section 10/36 is on the social sciences and psychology. It first deals with the general historical development of the social sciences. It then separately treats the development, nature, scope, and methods of the particular social sciences: anthropology, sociology, economics, and political science. Finally, it deals with the history, scope, and methods of psychology.

Section 10/37 treats the history of the technological sciences; the academic and professional aspects of engineering; the nature and scope of agricultural sciences; and the nature and scope of such recently developed interdisciplinary fields as bionics, systems engineering, and cybernetics.

Section 10/31. History and Philosophy of Science 493

10/32. The Physical Sciences 495

10/33. The Earth Sciences 499

10/34. The Biological Sciences 501

10/35. Medicine and Affiliated Disciplines 503

10/36. The Social Sciences and Psychology and Linguistics 506

10/37. The Technological Sciences 508

Section 10/31. History and Philosophy of Science

A. History of science

1. Introduction: problems and difficulties of tracing the development of science
2. Science in ancient and medieval Western civilization
 - a. Science in Greek civilization
 - i. Protoscience in Greece before the age of Pericles: empirical versus religious or mythological explanations of natural phenomena
 - ii. Development of scientific attitudes: the beginning of disciplined observation, inference, definition, and classification; the Platonic versus the Aristotelian view of nature
 - iii. Science during the Hellenistic Age: the emergence of Alexandria as the foremost centre of scientific research
 - b. Science in Rome: the contrast between Roman success in law and technology and Roman failure in science
 - c. Medieval science
3. Science in other civilizations: Islāmic science; science in India, China, and Japan
4. European science in the early modern period
 - a. The rebirth of science in the Renaissance
 - i. The state of science in Europe in the early 15th century
 - ii. The influence of advances in printing, mining, metallurgy, and other areas of technology: the demands placed upon science by increases in trade and exploration
 - iii. The coexistence of new scientific discoveries and old philosophical views
 - b. The revolution in natural philosophy
 - i. The radical reformulation of the objects, methods, and functions of natural knowledge: the work of Bacon, Descartes, and Galileo
[see also 10/42.A.3.]
 - ii. Results of the new philosophy: establishment of scientific societies, progress in particular fields of science
 - c. Characteristics of European science
5. Science in the age of modern revolutions
 - a. Science during the Industrial Revolution
 - b. Intellectual origins of revolution: the spirit of the Enlightenment
 - c. The institutional organization of science under the French Revolution
 - d. Romantic reaction and science: the proponents of *Naturphilosophie*
6. Science in the 19th century: difference in styles of research; progress in physics, chemistry, and biology

7. Science in the early 20th century: the social organization and style of science, the common pattern of advance in scientific research
8. Contemporary problems and prospects: the moral, political, and environmental difficulties facing science

B. Philosophy of science

[see also 10/52.B.2.]

1. The nature and scope of the philosophy of science and its relation to other disciplines: the diverse concerns of and methods of approach to the philosophy of science
2. Historical development of the philosophy of science
 - a. Classical and medieval periods: the alternative viewpoints of the Stoics and Epicureans and of the Platonists and Aristotelians
 - b. The 17th century: the debate about scientific methodology, Bacon's inductive approach and Descartes's deductive approach
 - c. The 18th century: Empiricist, Rationalist, and Kantian interpretations of Newtonian physics
 - d. From the beginning of the 19th century through World War I: the influence of Kant's belief in the unique rationality of the classical synthesis of Euclid and Newton
 - e. The 20th-century debate: responses to relativity, quantum mechanics, and other profound changes in the natural sciences; Logical Positivism versus Neo-Kantianism
3. Elements of the scientific enterprise
 - a. Empirical, conceptual, and formal elements and their theoretical interpretation: diverse views of the relative importance of observation, theory, and mathematical formulation
 - b. Empirical procedures of science: measurement, design of experiments, classification
 - c. The formal structures of science: the problem of constructing a purely formal analysis of scientific inference, the distinction between scientific laws and empirical generalizations
 - d. Conceptual change and the development of science: historical problems concerning the changing theoretical organization of science
4. Movements of scientific thought: the basic procedures of intellectual development in science
 - a. Scientific discovery: the extreme positions of formalism, which emphasizes the rational elements of scientific discovery, and of irrationalism, which emphasizes the role of intuition, guesswork, and chance
 - b. Validation and justification of new concepts and theories: the view that prediction is the crucial test of scientific validity; the view that coherence, consistency, and comprehensiveness are the essential requirements of a scientific theory
 - c. Unification of the theories and concepts of separate sciences: attempts to construct an axiomatic system for all of natural science, the reductionist problem of achieving a consistent conceptual basis for two or more sciences
5. The philosophical status of scientific theory
 - a. The status of scientific propositions and concepts of entities: diverse views of the epistemological status of scientific propositions and of the ontological status of scientific concepts
 - b. The relationship between philosophical analysis and scientific practice: the application of different philosophical doctrines and approaches to different sciences
6. The relevance of scientific knowledge to other spheres of human experience and concern: the social significance of science and of scientific attitudes, limitations on the scientific endeavour
7. The relation between science and the humanities: questions of differences between scientific and humanistic methodologies
[see 10/42.B.3.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and biographies dealing with the history and philosophy of science

Franklin	Locke	Philosophies of	Science, The
Galileo	Newton	the Branches of	History of
Kelvin		Knowledge	

MICROPAEDIA: Selected entries of reference information

General subjects

Baconian method	scientific theory
hypothetico-deductive method	typology
nature, law of	

Biographies

Albertus Magnus,	Bacon, Roger	Empedocles
Saint	Bruno, Giordano	Oresme, Nicholas
Anaxagoras	Buffon,	Poincaré, Henri
Anaximenes of	Georges-Louis	
Miletus	Leclerc, comte de	

INDEX: See entries under all of the terms above

Section 10/32. The Physical Sciences

A. History of the physical sciences: the evolution of astronomy, physics, and chemistry

1. History of astronomy

a. Ancient astronomy

- i. Time reckoning and astronomical prediction: development of lunar and solar calendars, prediction of eclipses and of first appearances of the New Moon
- ii. Early cosmologies
- iii. Ancient astronomical records, treatises, and star catalogs

b. Medieval astronomy: European and Islāmic contributions

c. Astronomy in the 16th and 17th centuries

- i. The geocentric and heliocentric world systems
- ii. The discovery of the laws of planetary motion
- iii. The invention and use of the telescope
- iv. The theory of universal gravitation
[see 2.c., below]

d. Astronomy in the 18th century

- i. Development of celestial mechanics: the calculation of orbits, the three-body problem, the dynamical stability of gravitational systems
- ii. Improvements in telescope design and increased accuracy of measurements: the discovery of the aberration of light
- iii. Speculations concerning the origin of the solar system, the nature of nebulae, and the structure of the universe

e. Astronomy in the 19th century

- i. The discovery of Neptune and the asteroids, the search for a planet within the orbit of Mercury
- ii. Improved determinations of stellar positions and magnitudes; the first measurements of stellar parallax; the compilation of catalogs of nebulae, stars, and star clusters
- iii. Development of astronomical spectroscopy and the use of photography in observational work

f. Astronomy in the 20th century

- i. Statistical studies of stars, nebulae, and galaxies
- ii. Theories of stellar structure and of stellar formation and evolution
- iii. Astronomical tests of general relativity: the gravitational red shift, the deflection of light, the precession of the perihelion of Mercury, the cosmological red shift
- iv. Relativistic cosmologies: the big bang model; open and closed models of the universe
- v. Major advances in solar-system astronomy: manned lunar missions; exploration of the planets and their satellites with unmanned space probes; analysis of micrometeoroids and meteorites

- vi. Development of radio, X-ray, infrared, ultraviolet, and gamma-ray astronomy
 - vii. Identification of pulsars, quasars, cosmic background radiation, and possible black holes
 - viii. Advances in instrumentation and methodology: *e.g.*, use of Earth-orbiting observatories; development of electronic radiation detectors; refinement of very long baseline interferometry
2. History of physics
- a. Greek physics: speculations concerning the nature of space, matter, and motion
 - b. Medieval physics: the influence of Aristotle
 - c. Physics in the 16th and 17th centuries: discoveries and theories in mechanics and optics
 - d. Physics in the 18th and 19th centuries
 - i. Development of theories of light: the wave theory versus the corpuscular theory, the search for the ether
 - ii. Development of the theories of electricity, magnetism, and electromagnetic waves
 - iii. Developments in thermodynamics: theories of heat, the laws of thermodynamics, the impossibility of perpetual motion, the kinetic theory of gases
 - iv. Development of the atomic theory of matter: the discovery of the electron, the discovery of radioactivity and X-rays, the discovery of spectral regularities
 - e. Physics in the 20th century
 - i. Development of the theory of relativity
 - ii. Development of the quantum theory, wave mechanics, statistical mechanics, and related theories
 - iii. Development of theories and laws concerning atomic structure, nuclear interactions, and elementary particles, including efforts to produce a unified field theory
 - iv. Development of condensed-matter physics and its contributions to electronics
 - v. Modern developments in physics: atomic beams, nuclear magnetic resonance, and electron spin resonance methods; development of nonlinear optics; the development of masers and lasers
3. History of chemistry
- a. Chemistry before 1700
 - i. The rise of alchemy: the goal of the alchemists—to prolong life and to transmute base metals to gold
 - ii. The influence of the new mechanical philosophy on chemistry: the work of Boyle
 - b. Chemistry in the 18th century
 - i. Studies of combustion and respiration: the phlogiston theory, the work of Lavoisier and Cavendish
 - ii. Laboratory discoveries: isolation and identification of gases; discoveries of new elements, compounds, and chemical reactions
 - c. Chemistry in the 19th century
 - i. Development of the periodic table of the elements: the work of Mendeleev and Meyer
 - ii. Discoveries of new elements, isotopes, and radioactive elements
 - iii. Development of more accurate methods of analysis
 - iv. Development of theories of molecular structure and chemical reaction
 - v. Development of organic chemistry: introduction of the concept of valence, the study of aromatic compounds, development of the structural theory
 - vi. Development of electrochemistry: the theory of chemical affinity in electrical terms
 - vii. Development of industrial chemistry: the application of chemical principles and reactions to industrial processes

- d. Chemistry in the 20th century
- i. Development of instrumental methods of chemical analysis
 - ii. Explanation of chemical phenomena by principles of atomic and molecular structures
 - iii. Application of quantum mechanics to chemical bonding
- B. The nature and scope of astronomy and astrophysics: the major subject matters and principal problems
[see also Part One, Division III]
1. The nature of astronomy and methods of study
 2. Component disciplines of astronomy and their relationship to other sciences: planetary and lunar sciences; meteoritics; the study of comets, minor planets, and the origin of the solar system
 3. Investigation of the scale of the universe and of the distribution of objects within it: the determination of positions, the measurement of distances
 4. Orbit theory: its role in astronomy
 5. Astrophysics: the study of stars, galaxies, and the universe; cosmology and cosmogony
- C. The nature and scope of physics: its major subject matters, methods, and problems
[see also Part One, Divisions I and II]
1. The nature of physics: its concern with matter and energy and their interactions
 2. Component disciplines of physics: mechanics, thermodynamics, heat, electricity, magnetism, sound, optics, quantum mechanics, states of matter, nuclear and atomic physics
 3. The experimental and theoretical methods of physics
 4. The relationship of physics to other disciplines
 5. Interdisciplinary fields of physics: astrophysics, biophysics, geophysics
 6. Philosophical problems in physics: at the formal level, quantum level, macrophysical level, and cosmological level
- D. The nature and scope of chemistry: its major subject matters and problems
[see also 121, 122, and 123]
1. The nature of chemistry: its concern with the composition, properties, and changes of matter
 2. The subdivisions of chemistry: analytical, inorganic, organic, physical, polymer, and industrial chemistry and biochemistry
 3. The methods of chemistry
 4. The study of chemical transformations
 5. Interdisciplinary fields of chemistry: geochemistry, chemical engineering, medicinal chemistry

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and biographies dealing with the physical sciences

Bohr	Helmholtz	Philosophies of	Physical
Copernicus	Kepler	the Branches of	Sciences, The
Einstein	Lavoisier	Knowledge	Planck
Faraday	Maxwell	Physical Science,	Rutherford
Galileo	Newton	Principles of	
Heisenberg	Pascal		

MICROPAEDIA: Selected entries of reference information

General subjects

<i>major fields and component disciplines:</i>	cosmology	radio and radar	<i>methodology and instrumentation:</i>
aerodynamics	fluid mechanics	astronomy	astronomical
astronomy	infrared astronomy	statistical	observatory
biochemistry	mechanics	mechanics	bubble chamber
celestial mechanics	optics	thermodynamics	centrifuge
chemistry	physics	ultraviolet	chromatography
	quantum	astronomy	cloud chamber
	mechanics		

digital computer
laser
mass spectrometry
microscope
molecular beam

nuclear magnetic
resonance
particle
accelerator
photometry

radio
interferometer
radio telescope
satellite
observatory
sounding rocket

spacecraft
spectrochemical
analysis
star catalog
supercomputer
telescope

Biographies

astronomers:

Ambartsumian,
Viktor
Banneker,
Benjamin
Bessel, Friedrich
Wilhelm
Bradley, James
Brahe, Tycho
Cannon, Annie
Jump
Cassini, Gian
Domenico
Eddington, Sir
Arthur Stanley
Eudoxus of Cnidus
Gamow, George
Halley, Edmund
Herschel, Sir John
Herschel, Sir
William
Hipparchus
Hubble, Edwin
Powell
Kuiper, Gerard
Peter
Laplace,
Pierre-Simon,
marquis de
Le Verrier,
Urbain-Jean-Joseph
Lovell, Sir Bernard
Messier, Charles
Newcomb, Simon
Ptolemy
Russell, Henry
Norris
Schwarzschild, Karl
Struve, Otto

chemists:

Arrhenius, Svante
Berthelot,
Marcellin

Berthollet,
Claude-Louis,
Comte
Berzelius, Jöns
Jacob
Boyle, Robert
Bunsen, Robert
Wilhelm
Cannizzaro,
Stanislao
Cori, Carl; and
Cori, Gerty
Crookes, Sir
William
Curie, Marie
Curie, Pierre
Dalton, John
Davy, Sir
Humphry
Debye, Peter
Gay-Lussac,
Joseph-Louis
Haber, Fritz
Hahn, Otto
Hodgkin, Dorothy
Mary
Joliot-Curie,
Frédéric and
Irène
Kendrew, Sir John
Cowdery
Langmuir, Irving
Lavoisier,
Antoine-Laurent
Libby, Willard F.
Liebig, Justus,
Freiherr von
Mendeleyev,
Dmitry Ivanovich
Mulliken, Robert
Sanderson
Pasteur, Louis

Pauling, Linus
Priestley, Joseph
Ramsay, Sir
William
Sanger, Frederick
Scheele, Carl
Wilhelm
Seaborg, Glenn T.
Soddy, Frederick
Stahl, Georg Ernst
Woodward, R.B.
Wöhler, Friedrich

physicists:

Alvarez, Luis
Walter
Arago, François
Bardeen, John
Becquerel, Henri
Bethe, Hans
Albrecht
Bragg,
Sir Lawrence
Bragg, Sir William
Bridgman, P.W.
Broglie,
Louis-Victor, 7e
duc de
Cavendish, Henry
Dirac, P.A.M.
Fermi, Enrico
Feynman, Richard
P(hillips)
Gell-Mann,
Murray
Gibbs, J. Willard
Henry, Joseph
Hertz, Heinrich
Hooke, Robert
Huygens,
Christiaan
Kapitsa, Pyotr
Leonidovich

Kirchhoff, Gustav
Robert
Landau, Lev
Davidovich
Lee, Tsung-Dao
Lorentz, Hendrik
Antoon
Mach, Ernst
Mayer, Maria
Goepfert
Meitner, Lise
Michelson, A.A.
Mössbauer, Rudolf
Ludwig
Oppenheimer, J.
Robert
Pauli, Wolfgang
Plücker, Julius
Purcell, E.M.
Raman, Sir
Chandrasekhara
Venkata
Rayleigh, John
William Strutt,
3rd Baron
Rutherford, Ernest
Schrödinger, Erwin
Stokes, Sir George
Gabriel
Thompson, Sir
Benjamin
Thomson, Sir
Joseph John
Tomonaga
Shin'ichirō
Yang, Chen
Ning
Young, Thomas
Yukawa Hideki

Section 10/33. The Earth Sciences

- A. The history of the Earth sciences
 1. The origins of the Earth sciences in prehistoric times
 2. The Earth sciences from antiquity to the 16th century
 - a. Geologic sciences
 - i. Speculations about earthquakes and volcanic eruptions
 - ii. Speculations about fossils
 - iii. Study of landforms and land–sea relations
 - b. Hydrologic and atmospheric sciences
 - i. Theories of groundwater circulation and precipitation
 - ii. The origin of the Nile and the cause of its floods
 - iii. Study of the tides
 3. The Earth sciences in the 16th, 17th, and 18th centuries
 - a. Geologic sciences
 - i. The beginnings of mineralogy: the study of ore deposits
 - ii. The development of paleontology and stratigraphy
 - iii. The controversy between the Neptunists and Plutonists: Earth history according to Werner and Hutton
 - b. Hydrologic sciences
 - i. Theories of spring discharge
 - ii. The earliest quantitative investigations of the global water balances
 - c. Atmospheric sciences
 - i. The study of water vapour in the atmosphere
 - ii. The study of atmospheric pressure, temperature, and circulation
 4. The Earth sciences in the 19th century
 - a. Geologic sciences
 - i. The development of crystallography and the classification of minerals and rocks
 - ii. The concept of faunal succession and organic evolution: the contributions of William Smith, Charles Darwin, and others
 - iii. The concept of uniformitarianism: contributions of Charles Lyell and others
 - iv. Evidence for an Ice Age: the work of Louis Agassiz
 - v. The concept of geologic time and estimates of the age of the Earth
 - vi. Concepts of landform evolution
 - vii. The study of gravity, isostasy, and the Earth's figure
 - b. Hydrologic sciences
 - i. The study of groundwater flow and surface water discharge: Darcy's law
 - ii. The beginnings of oceanography as a discipline
 - c. Atmospheric sciences
 - i. The study of the composition of the atmosphere
 - ii. The study of clouds, fog, dew, and storms
 - iii. The study of weather and climate: the origin of synoptic meteorology
 5. The Earth sciences in the 20th century
 - a. Geologic sciences
 - i. Development of radiometric dating
 - ii. The experimental study of rocks: experimental petrology

- iii. Advances in geophysics: the development of seismology and the study of the internal structure of the Earth
 - iv. Astrogeologic research: the application of the Earth sciences to the investigation of the planets and their satellites
 - v. Advances in paleontology: the development of paleoecology and micropaleontology; the study of Precambrian life
 - vi. The theory of plate tectonics: a unification of the ideas of continental drift and seafloor spreading
- b. Hydrologic sciences
- i. The study of water resources and seawater chemistry
 - ii. The exploitation of oceanic resources: desalinization, tidal power, and minerals from the sea
 - iii. The charting of the ocean floors: progress in bathymetry
 - iv. The study of ocean circulation, currents, and waves
 - v. The study of glacier motion and high-latitude ice sheets
- c. Atmospheric sciences
- i. The application of modern technology to meteorology: ground-based remote-sensing instruments, orbiting satellites, computer models simulating atmospheric features
 - ii. Advances in weather forecasting and cloud physics
 - iii. The study of the properties and structure of the atmosphere
 - iv. The development of weather modification methods
 - v. The classification of climate

B. The nature, scope, and methods of the individual Earth sciences
 [see also Part Two]

- 1. Physical geography: the study of the distribution and spatial patterns of soils, water, climate, landforms, and other Earth features
 [see also 10/36.F.]
- 2. The geologic sciences: mineralogy, petrology, economic geology, and geochemistry; geodesy, geophysics, structural geology, and volcanology; geomorphology; glacial geology; engineering, environmental, and urban geology; geochronology, historical geology, paleontology, stratigraphy, and astrogeology
 [see also Part Two, Divisions I, III, and IV]
- 3. The hydrologic sciences: hydrology, limnology, glaciology, oceanography
 [see also 222]
- 4. The atmospheric sciences: meteorology, climatology, aeronomy; the study of the atmospheres of other planets
 [see also 221 and 223]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the Earth sciences

Earth Sciences, The
 Geography

MICROPAEDIA: Selected entries of reference information

General subjects

<i>component disciplines:</i>	environmental geology	marine geophysics	sedimentology
astrogeology	geochemistry	meteorology	seismology
bioclimatology	geochronology	mineralogy	structural geology
chemical	geology	oceanography	tectonics
hydrology	geomorphology	paleoclimatology	volcanology
climatology	geophysics	paleogeography	<i>methodology and instrumentation:</i>
dendrochronology	hydrology	paleogeology	aerial photography
economic geology	hydrometeorology	palynology	barometer
	marine geology	pedology	bathymetry
		petrology	

bathyscaphe	gravimeter	Richter scale	<i>other:</i>
bathythermograph	magnetometer	seismograph	International
dating	radiosonde	weather map	Geophysical Year
geologic time			

Biographies

Agassiz, Louis	Goldschmidt,	Powell, John	Van Hise, Charles
Agricola, Georgius	Victor Moritz	Wesley	Richard
Bjerknes, Vilhelm	Humboldt,	Press, Frank	Vernadsky,
F.K.	Alexander von	Romer, Alfred	Vladimir
Buch, Leopold,	Hutton, James	Sherwood	Ivanovich
Freiherr von	Köppen, Wladimir	Runcorn, Stanley	Wegener, Alfred
Cuvier, Georges,	Leonardi, Piero	Keith	Lothar
Baron	Lyell, Sir Charles	Simpson, George	Werner, Abraham
Dana, James D.	Maury, Matthew	Gaylord	Gottlob
Ekman, V. Walfrid	Fontaine	Smith, William	
Gilbert,	Mohorovičić,	Suess, Eduard	
Grove Karl	Andrija		

INDEX: See entries under all of the terms above

Section 10/34. The Biological Sciences

A. History of the biological sciences

1. Origin and early development of biological ideas

- a. Views of life and living things in ancient Eastern and Middle Eastern civilizations
- b. Biology in the Greco-Roman world: theories about mankind and the origin of life; Aristotelian concepts of classification, reproduction, heredity, and descent; botanical investigations; initial anatomical discoveries
- c. Biology in the Middle Ages: the influence of Arabian biologists, the development of botany and zoology as separate disciplines, further discoveries in anatomy
- d. Biology in the Renaissance: the influence of the craft of printing and artists' illustrations on the dissemination of botanical knowledge, the beginning of the scientific study of anatomy through the use of dissection

2. Developments in the biological sciences in the 17th, 18th, and 19th centuries

a. Biology in the 17th and 18th centuries

- i. The discovery of the circulation of blood
- ii. The establishment of scientific societies
- iii. The development of the microscope: the classical microscopists
- iv. The rise of modern taxonomy: the systematic classification of plants and animals
- v. The emergence of comparative biological studies
- vi. Experimental approaches to the origin of life: the theory of spontaneous generation

b. Biology in the 19th century

- i. The effect of geographical explorations on the development of the biological sciences
- ii. The development of cell theory: the establishment of cellular biology
- iii. The theory of evolution: the impact of the concept of natural selection
- iv. The rise of embryology: discoveries concerning reproduction and development of organisms
- v. The emergence of genetics: the study of heredity and its mechanisms

3. Biology in the 20th century

a. The establishment of molecular biology

- i. The one-gene, one-enzyme theory and its effects
- ii. The discovery of the genetic significance of DNA and RNA: deciphering the genetic code

- b. The emergence of intradisciplinary specialties; *e.g.*, cell physiology, cytochemistry, ecology, population biology
 - c. The application to biology of the concepts and techniques of other sciences: the development of biochemistry and biophysics, the importance of biological discoveries to medicine and agriculture
- B. The nature, scope, and methodology of the biological sciences**
[see also Part Three]
1. Molecular biology: biochemistry, biophysics, genetics
 2. Cell biology: cancer research, microbiology, radiation biology, tissue culture, transplantation biology
 3. Organismic biology: botany, ecology, embryology, ethology, eugenics, genetics, gnotobiology, morphology, paleontology, physiology, zoology
 4. Population biology: biogeography, comparative psychology, ecology, population genetics
 5. Taxonomy and methods of classification
- C. Philosophy of biology**
1. The range of topics in biophilosophy; *e.g.*, old questions investigated anew in the light of biological advances and new standards of philosophical rigour
 2. Issues concerning the nature of biological systems
 3. Issues concerning evolution
 4. Issues with ethical implications

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and biographies dealing with the biological sciences

Biological Sciences, The	Harvey
Darwin	Pasteur
Genetics and Heredity, The Principles of	Philosophies of the Branches of Knowledge

MICROPAEDIA: Selected entries of reference information

General subjects

<i>component disciplines:</i>	cytology	microbiology	zoology
agrostology	ecology	molecular biology	<i>methodology and instrumentation:</i>
anatomy	embryology	morphology	centrifuge
bioethics	entomology	ornithology	chromatography
biogeography	ethology	paleontology	electrophoresis
biology	eugenics	palynology	fluoroscope
biophysics	exobiology	parasitology	microscope
biotechnology	genetic engineering	physiology	nuclear magnetic resonance
botany	genetics	protozoology	testcross
comparative anatomy	herpetology	synecology	
	ichthyology	taxonomy	
	mammalogy	teratology	

Biographies

<i>anatomists:</i>	Huxley, Sir Julian	Watson, James	Hoagland, Dennis
Müller, Johannes	Huxley, T.H.	Dewey	Robert
Peter	Lamarck,	<i>botanists:</i>	Hooker, Sir Joseph
Sabin, Florence	Jean-Bapiste	Bentham, George	Dalton
Rena	de Monet,	Brown, Robert	Hooker, Sir
Vesalius, Andreas	Chevalier de	Candolle,	William Jackson
<i>biologists:</i>	Loeb, Jacques	Augustin	Linnaeus, Carolus
Bateson, William	Lysenko, Trofim	Pyrame de	Nägeli, Karl
Carson, Rachel	Denisovich	Cohn, Ferdinand	Wilhelm von
Ehrenberg,	Malpighi, Marcello	Dodge, Bernard	Ray, John
Christian	<i>biophysicists:</i>	Ogilvie	Sprengel, Christian
Gottfried	Crick, Francis	Engler, Adolf	Konrad
Elton, Charles	Harry Compton	Gray, Asa	

Stakman, Elvin	Hérelle, Félix d'	Sherrington, Sir	Geoffroy,
Charles	Merchnikoff, Élie	Charles Scott	Saint-Hilaire,
<i>embryologists:</i>	Waksman, Selman	Spallanzani,	Étienne
Baer, Karl Ernst,	Abraham	Lazzaro	Gesner, Conrad
Ritter von	<i>physiologists:</i>	Starling, Ernest	Leeuwenhoek,
Spemann, Hans	Bayliss, Sir	Henry	Antoine van
<i>geneticists:</i>	William Maddock	<i>zoologists:</i>	Owen, Sir Richard
Beadle, George	Bernard, Claude	Cuvier, Georges,	Swammerdam, Jan
Wells	Einthoven, Willem	Baron	Wallace, Alfred
Dobzhansky,	Galen of	de Beer, Sir Gavin	Russel
Theodosius	Pergamum	Haeckel, Ernst	
Mendel, Gregor	Haller,	Lorenz, Konrad	
Morgan, Thomas	Albrecht von	Rafinesque,	
Hunt	Macleod, J.J.R.	Constantine	
Weismann, August	Müller, Johannes	Samuel	
Wright, Sewall	Peter	<i>other:</i>	
<i>microbiologists:</i>	Pavlov, Ivan	Galton, Sir Francis	
Dubos, René	Petrovich	Galvani, Luigi	

INDEX: See entries under all of the terms above

Section 10/35. Medicine and Affiliated Disciplines

A. History of medicine and surgery

1. Early medicine: Western medicine before 1800, Oriental medicine before c. 1900
 - a. The medicine of prehistoric peoples
 - b. The practice of medicine among the Babylonians, the ancient Egyptians, and the Hebrews
 - c. Medicine and surgery in the Orient: the beginning of systematized medicine
 - i. Medicine in India: the Vedic and Brahmanistic heritage, the influence of religious and magical beliefs, surgical practices
 - ii. Medicine in China: the influence of the cosmic theory of Yin and Yang; the use of herbals, drugs, and acupuncture
 - iii. Medicine in Japan: assimilation of Chinese and European practices
 - d. The beginning of systematic medicine in the Greco-Roman world
 - i. Early influences: mythological beliefs, the investigations and theories of early philosophers
 - ii. The work of Hippocrates: theories on the nature and treatment of disease, the charter of medical conduct
 - iii. The spread of Greek teachings to Rome: the acceptance of Galen as a medical authority
 - e. Medicine from the fall of Rome through the Middle Ages
 - i. Reservoirs of medical learning: the role of medieval monasteries in preserving the medical heritage of Greece and Rome, contributions of Arabian medicine
 - ii. Establishment of the first organized medical school at Salerno
 - f. Medicine in the Renaissance
 - i. Improvements in anatomical theory and surgery
 - ii. The control of medical practice in Britain
 - iii. The work of Paracelsus and Fracastoro
 - g. Medicine in the 17th century
 - i. Discoveries concerning the circulation of the blood: use of the experimental method, importance of the microscope to medical studies
 - ii. The iatrochemical and iatrophysical theories: the view of life as a series of chemical processes versus the view of life as a mechanism governed by physical laws
 - h. Medicine in the 18th century

- i. Genesis of the medical school and the hospital
 - ii. The beginning of medical specialties: emergence of surgery, obstetrics, and pathology as separate disciplines
 - iii. Improvement in techniques of vaccination and in the treatment of disease: the rise and decline of systems of animism and mesmerism
2. The rise of scientific medicine in the 19th century
 - a. New doctrines, laws, and concepts; *e.g.*, the cell and cellular pathology, natural selection, homeostasis, pathogenesis, the Mendelian laws
 - b. Further advances in physiology
 - c. Establishment of bacteriology: verification of the germ theory, the identification of disease-producing organisms, the introduction of antiseptics
 - d. The discovery and use of anesthesia
 - e. Other advances: the discovery of the transmission of disease by insects, initial measures to control typhoid, the discovery of X-rays, the development of the ophthalmoscope and the stethoscope
3. Medicine in the 20th century
 - a. Advances in chemotherapy: the discovery, development, and use of antibiotics and synthetic drugs in the treatment of bacterial diseases
 - b. Advances in immunology
 - i. Improvements in vaccines that control bacterial diseases; *e.g.*, typhoid, diphtheria, tetanus, tuberculosis
 - ii. The introduction and use of vaccines to control viral diseases; *e.g.*, yellow fever, influenza, poliomyelitis, measles
 - c. Developments in endocrinology: the discovery of insulin and the control of diabetes, the use of cortisone as an anti-inflammatory agent, the study and use of sex hormones
 - d. Advances in other fields
 - i. Nutrition: the treatment of deficiency diseases through the discovery and identification of vitamins
 - ii. Cancer research: the treatment of abnormal cell growths through the application of various therapies
 - iii. Tropical medicine: the treatment of yellow fever, malaria, and leprosy through the discovery and application of synthetic organic compounds derived from quinine and other sources; the application of insecticides to control malaria and yellow fever
 - iv. Medical technology and biomedical instrumentation: the use of electronic devices to monitor physiological processes, to conduct automatic laboratory analyses, and to perform other diagnostic and therapeutic procedures
4. Surgery in the 20th century
 - a. The state of surgery prior to 1900: the importance of antiseptics, asepsis, and anesthesia to the development of modern surgery
 - b. The emergence of surgical specialties: the development of new surgical and diagnostic techniques
 - c. Improvements in the treatment of wounds; *e.g.*, the development of plastic surgery, postsurgical rehabilitation
 - d. The use of blood transfusions and other intravenous techniques to reduce shock, treat fluid loss, and restore electrolyte balance
 - e. The introduction of inhalation anesthetic procedures; *e.g.*, improvements in thoracic surgery
- B. Fields of specialized medical practice or research
 1. Hospital residency specialties
 - a. Radiology
 - b. Surgery
[see also 423.C.2.a.]
 - c. Obstetrics and gynecology
[see also 423.F.6.]

- d. Urology
[see also 423.F.7.]
- e. Ophthalmology and otolaryngology
[see also 423.F.9.f. and g.]
- f. Neurology
[see also 423.F.9.]
- g. Psychiatry
- h. Other hospital specialties; *e.g.*, anesthesiology, pathology
- 2. Other clinical specialties
 - a. Aerospace medicine
 - b. Medical jurisprudence
 - c. Occupational medicine
 - d. Public health
 - e. Endocrinology
 - f. Immunology
 - g. Toxicology
 - h. Tropical medicine
- 3. Nonclinical specialties and the basic medical sciences: medical physiology and pathological physiology, nutrition, pharmacology and experimental therapeutics, gerontology
- 4. Ancillary medical disciplines: cytotechnology, medical records, medical technology, X-ray technology
- C. Disciplines affiliated with medicine
 - 1. History and practice of dentistry
 - 2. History and practice of osteopathy
 - 3. History and practice of nursing
 - 4. History and practice of pharmacy

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major article dealing with medicine and affiliated disciplines

Medicine

MICROPAEDIA: Selected entries of reference information

General subjects

aerospace medicine	gerontology and	ophthalmology	plastic surgery
anesthesiology	geriatrics	oral surgery	podiatry
cardiology	hematology	orthodontics	prosthodontics
dentistry	holistic medicine	orthopedics	psychiatry
dermatology	homeopathy	osteopathy	public health
emergency medicine	immunology	otolaryngology	radiology
endocrinology	internal medicine	pathology	sports medicine
endodontics	nephrology	pediatrics	surgery
epidemiology	neurology	pedodontics	toxicology
family practice	nursing	peridontics	tropical medicine
forensic medicine	obstetrics and	pharmacology	urology
gastroenterology	gynecology	pharmacy	

Biographies

Alexander, Franz	Blackwell,	Ehrlich, Paul	Gesell, Arnold
Avicenna	Elizabeth	Fleming, Sir	Harvey, William
Barnard,	Blalock, Alfred	Alexander	Hippocrates
Christiaan	Carrel, Alexis	Fracastoro,	Jenner, Edward
Barnard, Claude	Cohn, Ferdinand	Girolamo	Jung, Carl
Bekhterev,	De Bakey, Michael	Freud, Sigmund	Koch, Robert
Vladimir	Ellis	Galvani, Luigi	

Lister, Joseph	Nightingale, Florence	Rush, Benjamin	Semmelweis, Ignaz
Malpighi, Marcello	Osler, Sir William	Salk, Jonas	Philipp
Mayo family	Paracelsus	Edward	Vesalius, Andreas
Menninger family	Reed, Walter	Séguin, Edouard	Virchow, Rudolf
Meyer, Adolf			

INDEX: See entries under all of the terms above

Section 10/36. The Social Sciences and Psychology and Linguistics

A. History of the social sciences

1. Origins of the social sciences
 - a. Precursors of the social sciences in the Middle Ages and the Renaissance
 - b. Heritage of the Enlightenment: social reforms and revolution
2. 19th-century developments in the social sciences
 - a. The influence of new concepts in social, political, economic, and scientific theories
 - b. Development of the separate disciplines; *e.g.*, economics, political science, anthropology, sociology, social statistics, human geography
3. 20th-century developments in the social sciences
 - a. The influence of social upheaval in the non-Western world: the revolution of rising expectations
 - b. The influence of Marxism
 - c. The influence of Freudian ideas
 - d. The changing character of the disciplines
 - i. Specialization and cross-disciplinary approaches
 - ii. The increasing professionalism of social scientists as consultants and decision makers in government and business
 - iii. The introduction of mathematical and other quantitative methods: the use of computers
 - iv. The influence of empiricism: the collection of data, the use of surveys and polls, the testing of theories
 - e. Major theoretical influences: developmentalism, the social-systems approach, structuralism and functionalism

B. The nature of anthropology

[see also Part Five, Division I]

1. The background of anthropology
2. The scope and methods of anthropology: the division between cultural and physical anthropology

C. The nature of sociology

[see also Part Five, Division II]

1. The background of contemporary sociology
2. The methodology of contemporary sociology
3. The status of contemporary sociology
4. Emergent trends in sociology
5. Cognate disciplines: criminology, penology, social psychology, demography

D. The nature of economics

[see also Part Five, Division III]

1. Development of theories of economics
2. The scope and methods of the study of economics: microeconomics, macroeconomics
3. Cognate disciplines: mathematical economics, econometrics, accounting

E. The nature of political science

[see also Part Five, Division IV]

1. The history of political science
2. The scope and methods of contemporary political science
3. Cognate disciplines: the study of public opinion, public law, public administration, political systems, and international relations

F. The nature of geography

[see also 10/33]

1. The history of geography
2. The scope and methods of geography: the division between physical, human, and regional geography

G. History and methods of psychology

[see also Part Four, Division III]

1. The history of psychology
2. The nature and scope of psychology
3. Special branches and cognate disciplines of psychology: physiological psychology, social psychology

H. The nature of linguistics

[see also 514]

1. The history of linguistics
2. The nature and scope of linguistics
3. Linguistics and other disciplines: psycholinguistics, sociolinguistics, linguistic anthropology, linguistic geography, computational linguistics, mathematical and statistical linguistics, stylistics, and semantics

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and biographies dealing with the social sciences and psychology and linguistics

Freud	Marxism, Marx and
Geography	Smith, Adam
Linguistics	Social Sciences, The

MICROPAEDIA: Selected entries of reference information

General subjects

<i>anthropology and allied disciplines:</i>	institutional	semiotics	experimental
anthropological	economics	sociolinguistics	psychology
linguistics	Keynesian	structural	functionalism
cultural	economics	linguistics	Gestalt psychology
anthropology	macroeconomics	synchronic	humanistic
ethnography	managerial	linguistics	psychology
neoevolutionism	economics	<i>political science:</i>	individual
particularism	welfare economics	geopolitics	psychology
physical	<i>linguistics:</i>	political science	industrial
anthropology	anthropological	<i>psychology:</i>	psychology
structuralism	linguistics	analytic	physiological
<i>economics:</i>	comparative	psychology	psychology
Austrian school of	linguistics	applied psychology	psychology
economics	computational	behaviourism	social psychology
classical economics	linguistics	clinical psychology	<i>other:</i>
econometrics	dialectology	comparative	criminology
economics	ethnolinguistics	psychology	demography
historical school of	historical	developmental	geography
economics	linguistics	psychology	penology
	linguistics	educational	sociology
	neurolinguistics	psychology	

Biographies

anthropologists:

Benedict, Ruth
 Boas, Franz
 Dart, Raymond A.
 Frazer, Sir James
 George
 Hale, Horatio
 Kroeber, A.L.
 Leakey, L.S.B.
 Leakey, Richard
 Lévi-Strauss,
 Claude
 Malinowski,
 Bronisław
 Mead, Margaret
 Morgan, Lewis
 Henry
 Radin, Paul
 Redfield, Robert
 Sapir, Edward
 Seligman, C.G.
 Thurnwald,
 Richard
 Tozzer, Alfred M.
 Tylor, Sir Edward
 Burnett
economists:
 Bagehot, Walter
 Bentham, Jeremy
 Infantin,
 Barthélemy-Prosper
 Keynes, John
 Maynard
 Lauderdale, James
 Maitland, 8th
 earl of

Malthus, Thomas
 Robert
 Marshall, Alfred
 Marx, Karl
 Myrdal,
 Gunnar
 Oresme, Nicholas
 Pareto, Vilfredo
 Ricardo, David
 Samuelson, Paul
 Simonde de
 Sismondi, J.C.L.
 Tawney, Richard
 Henry
 Veblen, Thorstein

geographers:

Davis, William
 Morris
 Hettner, Alfred
 Humboldt,
 Alexander von
 Idrisi, ash-Sharif al-
 Mackinder, Sir
 Halford John
 Marsh, George
 Perkins
 Mercator, Gerardus
 Ptolemy
 Ratzel, Friedrich
 Richthofen,
 Ferdinand
 Paul Wilhelm,
 Freiherr von
 Ritter, Carl
 Strabo

Varenius,
 Bernhardus
 Vidal de La
 Blache, Paul

linguists:

Chomsky, Noam
 Jakobson, Roman
 Jespersen, Otto
 Kimhi, David
 Lomonosov,
 Mikhail
 Vasilyevich
 Rask, Rasmus
 Saussure,
 Ferdinand de
 Schleicher, August

psychologists:

Bleuler, Eugen
 Bruner, Jerome S.
 Cattell, James
 McKeen
 Fechner, Gustav
 Theodor
 Fromm, Erich
 Hall, G. Stanley
 Hull, Clark L.
 James, William
 Köhler, Wolfgang
 Kraepelin, Emil
 Kretschmer, Ernst
 McDougall,
 William
 Menninger family
 Meyer, Adolf
 Piaget, Jean
 Rank, Otto

Skinner, B.F.
 Thorndike,
 Edward L.
 Thurstone, L.L.
 Watson, John B.
 Wertheimer, Max

sociologists:

Beccaria, Cesare
 Comte, Auguste
 Cooley, Charles
 Horton
 Durkheim, Émile
 Frazier,
 E. Franklin
 Geiger, Theodor
 Julius
 Lazarsfeld, Paul
 Felix
 MacIver, Robert
 Morrison
 Mauss, Marcel
 Merton, Robert K.
 Mumford, Lewis
 Parsons, Talcott
 Ratzenhofer,
 Gustav
 Riesman, David
 Spencer, Herbert
 Tönnies,
 Ferdinand
 Weber, Max

INDEX: See entries under all of the terms above

Section 10/37. The Technological Sciences
A. History of the technological sciences

[see also Part Seven]

B. Nature and scope of engineering

1. Engineering as a profession: education and training; functions of the engineer; professional associations
2. Branches of engineering: civil engineering, aeronautical engineering, chemical engineering, electrical and electronics engineering, mechanical engineering, optical engineering, nuclear engineering

C. The nature and scope of agricultural sciences
1. History of the agricultural sciences

[see also 731.A.]

2. Subdivisions of the agricultural sciences: soil science, plant production, animal production, agricultural economics and management, agricultural engineering

[see also 731.B., C., and D.]

D. The nature and scope of recently developed interscience disciplines
1. Bionics

- a. Mimicry of nature as the basis for bionics; *e.g.*, the human brain as the paradigm for computer memory devices, construction of vehicles with articulated legs
 - b. The use of natural models to understand and solve engineering problems; *e.g.*, natural neural networks as models for electronic circuits, the human brain as a model for computers and information-processing devices
2. Systems engineering and operations research
[see 712.B.]
 3. Cybernetics, control theory, and information science
[see 10/23.E. and F.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the technological sciences

Engineering	Optics, Principles of
Materials Science	

MICROPAEDIA: Selected entries of reference information

General subjects

aerospace	civil engineering	industrial	nuclear
engineering	electrical and	engineering	engineering
bioengineering	electronics	materials science	petroleum
bionics	engineering	mechanical	engineering
chemical engineering		engineering	

Biographies

Beach, Alfred Ely	Deming, W. Edwards	Pierce, George	Steinmetz, Charles
Brunel, Isambard	Eads, James B.	Washington	Proteus
Kingdom	Eckert, J. Presper, Jr.	Roebing, John	Taylor,
Brunel, Sir Marc	Edison, Thomas Alva	Augustus	Frederick W.
Isambard	Hollerith, Herman	Sikorsky, Igor	Tsiolkovsky,
Burbank, Luther	McCormick,	Stakman, Elvin	Konstantin
Carver, George	Cyrus Hall	Charles	Eduardovich
Washington	Mauchly, John W.		Whitney, Eli

INDEX: See entries under all of the terms above

Division IV. History and the Humanities

[For Part Ten headnote see page 479.]

The outlines in the two sections of Division IV deal with historiography and the study of history, and with the humanities and humanistic scholarship.

Section 10/41 first treats the history of historical writing in the major cultures of both East and West, and the disciplines and methods involved in modern historical investigation and research. It then treats the speculative philosophies of history that have appeared in the West and the East, and philosophical analyses of the specific character of historical knowledge.

Section 10/42 first sets forth a historical review of changing conceptions of the humanities and of humanistic scholarship, covering all the major periods and mutations, from the Greek ideal of *paideia* to contemporary developments. It then treats issues about the nature and scope of the humanities; about the relation of the component disciplines to one another; and about their distinction from the sciences, their validity as ways of knowing, and their role in education.

Section 10/41. Historiography and the Study of History 509

10/42. The Humanities and Humanistic Scholarship 511

Section 10/41. Historiography and the Study of History

A. Historiography: the types of historical writing

1. Development of historiography: the history of historical writing

a. In the ancient world

i. Near Eastern historiography

- ii. Classical historiography: Greek and Roman
 - iii. Early Christian historiography
 - b. In the Middle Ages
 - i. Western Christian historiography
 - ii. Byzantine historiography
 - c. From the Renaissance to the present
 - i. Renaissance historiography
 - ii. Early modern historiography
 - iii. Enlightenment historiography: the 18th century
 - iv. 19th- and 20th-century historiography
 - d. Non-Western historiographical traditions
 - i. Islāmic historiography
 - ii. East Asian historiography
 - 2. Types of historical writing: diverse ways of distinguishing or classifying kinds of historical writing by method or function
 - 3. Factors involved in the writing of history: the background of the author and his vantage point, method of work, and purpose
- B. Modern historical investigation and research: sources and methods**
- 1. Sources for historical writing: material remains, written materials, folklore, place-names
 - 2. Auxiliary disciplines for ascertaining and interpreting the sources
 - a. Anthropology
 - b. Archaeology
 - c. Bibliography
 - d. Chronology
 - e. Dendrochronology
 - f. Diplomatics
 - g. Epigraphy
 - h. Genealogy
 - i. Geography
 - j. Heraldry
 - k. Iconography and iconology
 - l. Linguistics
 - m. Paleography
 - n. Psychoanalysis
 - o. Radiometric dating
 - p. Sigillography
 - q. Textual criticism
- C. Philosophy of history: speculations about the historical process, philosophical analysis of the writing of histories**
- 1. Conceptions of the philosophy of history
 - 2. Speculative philosophy of history: diverse explanations of the pattern of historical events
 - 3. Critical or analytical philosophy of history: the analysis of history as a discipline

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with historiography and the study of history

History, The Study of
Philosophies of the Branches of Knowledge

MICROPAEDIA: Selected entries of reference information

General subjects

archaeology	genealogy	history	papyrology
bibliography	historical	iconography	sigillography
diplomats	geography	linguistics	textual criticism
epigraphy	historiography	paleography	

Biographies*archaeologists:*

Bingham, Hiram
 Blegen, Carl
 Botta, Paul-Émile
 Boucher de
 Perthes, Jacques
 Carter, Howard
 Evans, Sir Arthur
 Garstang, John
 Layard, Sir Austen
 Henry
 Mariette, Auguste
 Petrie, Sir Flinders
 Pitt-Rivers,
 Augustus Henry
 Lane-Fox
 Rassam, Hormuzd
 Schliemann,
 Heinrich
 Squier, E.G.
 Stein, Sir Aurel
 Stephens, John
 Lloyd
 Thompson,
 Edward Herbert
 Thomsen,
 Christian
 Jürgensen
 Wheeler, Sir
 Mortimer
 Winckler, Hugo
 Woolley, Sir
 Leonard
 Worsaae, Jens
 Jacob Asmussen

historians:

Acton, John
 Emerich Edward
 Dalberg Acton,
 1st Baron

Arai Hakuseki
 Aulard,
 François-Alphonse
 Bancroft, George
 Barros Arana,
 Diego
 Beard, Charles A.
 Becker, Carl
 Bede the
 Venerable, Saint
 Biondo, Flavio
 Bloch, Marc
 Léopold
 Benjamin
 Braudel, Fernand
 Burckhardt, Jacob
 Bury, J.B.
 Clarendon, Edward
 Hyde, 1st earl of
 Droysen, Johann
 Gustav
 Froude, James
 Anthony
 Fustel de
 Coulanges, Numa
 Denis
 Geoffrey of
 Monmouth
 Geyl, Pieter
 Gibbon, Edward
 Giovanni da Pian
 del Carpi
 Guicciardini,
 Francesco
 Halévy, Élie
 Haskins, Charles
 Homer
 Herodotus
 Huizinga, Johan
 Ibn Khaldūn
 Jien

Klyuchevsky,
 Vasily Osipovich
 Lamprecht, Karl
 Gottfried
 Liutprand of
 Cremona
 Livy
 Ma Tuan-lin
 Macaulay, Thomas
 Babington
 Macaulay, Baron
 McMaster, John
 Bach
 Mas'ūdī, al-
 Meinecke,
 Friedrich
 Michelet, Jules
 Mommsen,
 Theodor
 Namier, Sir Lewis
 Bernstein
 Niebuhr, Barthold
 Georg
 Pan Ku
 Parkman, Francis
 Pasquier, Étienne
 Pirenne, Henri
 Polybius
 Prescott,
 William H.
 Procopius
 Ranke,
 Leopold von
 Robinson, James
 Harvey
 Rostovtzeff,
 Michael
 Ivanovich

Sallust
 Sarkar, Sir
 Jadunath
 Schlesinger,
 Arthur M.
 Solovyov, Sergey
 Mikhaylovich
 Ssu-ma Ch'ien
 Ssu-ma Kuang
 Tabari, at-
 Tacitus
 Tawney, Richard
 Henry
 Thierry, Augustin
 Thou,
 Jacques-Auguste de
 Thucydides
 Tocqueville,
 Alexis de
 Toynbee, Arnold
 Trevelyan, G.M.
 Turner, Frederick
 Jackson
 Tyler, Moses Coit
 Woodson,
 Carter G.
other:
 Champollion,
 Jean-François
 Rawlinson, Sir
 Henry Creswicke
 Sayce, Archibald
 Ventris, Michael

INDEX: See entries under all of the terms above

Section 10/42. The Humanities and Humanistic Scholarship

A. History of humanistic scholarship

1. The beginnings of learning: the ideal of *paideia*

a. Homeric education: the ideal of the hero

b. The Sophists and Socrates: the turn to *logos*, the beginnings of rhetoric

c. Plato and the Academy: the relation of theology to mythology, mathematics in the service of philosophy

- d. Aristotle and the Lyceum: the invention of logic, the division and organization of the sciences
 - e. Hellenistic scholarship: the development of literary and textual criticism, Alexandria and Pergamum as cultural centres
 - f. The Roman ideal of *humanitas*: the training of the orator
 - g. The conflict of cultural ideals: the battle among rhetoric, philosophy, and science
2. Christian learning in antiquity and the Middle Ages
 - a. The Christianization of pagan culture: the reconciliation of classical humanism with Christian revelation
 - b. The codification of the liberal arts: the trivium and the quadrivium
 - c. The founding of the universities
 - d. The Scholastic method: logic and the genres of theological exposition
 - e. Faith and reason: the distinction of philosophy from sacred theology
 3. The development of humane letters from the Renaissance to the present
 - a. The idea of Renaissance: the ideal of the classical, the rise of the vernacular, the concept of the dignity of the free individual
 - b. Humanism and the new learning
 - c. The search for a universal method
 - d. The separation of science from philosophy: the rise and development of empirical science
 - e. The quarrel between ancients and moderns: the problem of progress in learning
 - f. The growth of modern humanistic scholarship: the transition from the ideal of *belles lettres* to the scientific investigation of antiquity through archaeology and philology
 - g. The rise and development of the liberal arts college and the graduate school
[see 562.B.]
 - h. The growth and proliferation of special disciplines: the knowledge explosion
 - i. The organization of the contemporary university: questions of its social responsibility, the profession of learning
[see 561.C.1.c.]
 4. The Jewish tradition of humanistic scholarship: its nature, methods, and development: its relation to classical and Christian learning
 5. The Islāmic tradition of humanistic scholarship: its nature, methods, and development: its relation to classical and Christian learning
 6. The humanities and humanistic scholarship in the East: in India, in China, in Japan
- B. The humanities
1. Diverse views of the definition and scope of the humanities
 2. The humanities as an educational program: the question of the humanities as a unified field of study
 3. Theories of the humanities as a fundamental division of knowledge: the question of the distinction of the humanities from the sciences
 4. Problems about the humanities

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and biographies dealing with the humanities and humanistic scholarship

Bacon, Francis
Erasmus

Humanism
Scholarship, Classical

MICROPAEDIA: Selected entries of reference information

General subjects

humanism
humanities

paideia
reason

Renaissance
Renaissance man

scholasticism

Biographies

Adams, Henry	Casaubon, Isaac	Lefèvre d'Étaples,	Scaliger, Julius
Alberti, Leon	Estienne, Henri II	Jacques	Caesar
Battista	George of	Melanchthon,	Taine, Hippolyte
Alcuin	Trebizond	Philipp	Valla, Lorenzo
Bentley, Richard			Wang Wei

INDEX: See entries under all of the terms above

Division V.**Philosophy**

[For Part Ten headnote see page 479.]

The outlines in the three sections of Division V treat the history of philosophy; the nature and the divisions of philosophy; and philosophical schools and doctrines.

The outline in Section 10/51 presents a synoptic history of philosophy. After treating the history of Western philosophy and of non-Western philosophies, the outline indicates other sections that treat philosophies associated with religions.

Section 10/52 first deals with theories about philosophy as a whole: theories about its nature, scope, methods, forms of exposition, and about the criteria of meaning and truth in philosophical thought. It then treats the traditional component disciplines of philosophy: metaphysics, the philosophy of nature, epistemology, the philosophy of mind, the philosophy of mankind, ethics, political philosophy, and aesthetics. In the case of each of these eight disciplines, the outline treats its historical development; its nature and scope; its relations to other branches of philosophy and other intellectual disciplines; and its principal problems. At the end, the outline of this section indicates other sections that treat disciplines involving philosophical studies of other subjects: language, logic, mathematics, art, science, religion, law, education, and history.

Section 10/53 begins by listing 25 major philosophical schools in the West. The section then deals with doctrinal differences between these schools on major philosophical issues, treating differences in theories about Being and existence; about thought, knowledge, and the faculties of the mind; and about human conduct.

Section 10/51. History of Philosophy 513

10/52. The Nature and the Divisions of Philosophy 517

10/53. Philosophical Schools and Doctrines 520

Section 10/51. History of Philosophy**A. History of Western philosophy****1. Ancient Greek and Roman philosophy****a. The beginnings of philosophy in Greece: the Pre-Socratic philosophers**

- i. Cosmology and the metaphysics of matter: theories of the origin and nature of the physical world, monistic and pluralistic cosmologies
- ii. The rise of problems in the theory of knowledge: problems about the real and phenomenal worlds
- iii. The metaphysics of number: Pythagorean speculations about number and the nature of reality, advances toward the foundation of quantitative science
- iv. Anthropology and relativism: the Sophists' criticism of cosmological and metaphysical speculations, man as the measure of all things, the positions of the Sophists about the conventionality of law and justice

b. The maturity of Greek philosophy

- i. The ethical concerns and positions of Socrates: the Socratic method of teaching, the influence of Socrates
- ii. The philosophy of Plato: his dialogues on issues in politics, ethics, metaphysics, epistemology, and cosmology; his emphasis on the relations of mathematics to philosophy
- iii. The philosophy of Aristotle: his criticisms of Platonic metaphysics and theory of knowledge; the corpus of his works on logic; his teleological positions in biology, ethics, and politics; his empirical researches in the natural sciences and on laws and political institutions

- c. Hellenistic and Roman philosophy: developments from the time of Alexander III the Great to the closing of the philosophical schools in Athens
 - i. The philosophy of the Stoics: the teaching of Zeno of Citium concerning the basis of human happiness, the further elaboration of Stoic thought by Cleanthes and Chrysippus, the role of Stoicism during the late Roman Republic and the empire
 - ii. The philosophy of the Epicureans: the teaching of Epicurus concerning the universe, the role of pleasure, and man's relationship to the gods
 - iii. The philosophy of the Skeptics: the teaching of Pyrrhon of Elis concerning man's lack of certainty in knowing, the role of the Skeptics in preserving the doctrines of ancient philosophers
 - iv. The philosophy of the Neo-Pythagoreans and of the Neoplatonists: the teaching of Plotinus concerning the various levels of being, Neo-Pythagorean schools in Asia Minor
 - v. Jewish and Christian philosophy during the Hellenistic Age: diverse attempts to relate the teachings of the Hellenistic and Roman schools to Jewish and Christian theology
- 2. Philosophy in the Middle Ages
 - a. Early medieval philosophy
 - i. The patristic period: Augustine's use of Neoplatonist thought in his theology and his doctrine of man, the role of Boethius' translations and commentaries, Anselm's proofs of the existence of God, the methodology of Abelard
 - ii. Philosophy and the liberal arts in the schools of the Christian West from the 9th to the 11th century
 - b. The contribution of Arabic and Jewish philosophy: the role of the Islāmic philosophers in increasing the influence of Aristotle in the West, the teaching of Solomon ibn Gabirol and Maimonides
 - c. The age of the Schoolmen: the attempt to reconcile philosophy and theology, the teaching of Bonaventure and Albertus Magnus, Thomas Aquinas' synthesis of Aristotelianism and Christian theology
 - d. Philosophy in the late Middle Ages: new styles of philosophy and theology that vied with Thomism, the criticism of Aristotelian thought by Duns Scotus and Ockham, the speculative mysticism of Eckehart, Nicholas of Cusa's doctrine of the "coincidence of opposites"
- 3. Modern philosophy
 - a. Philosophy in the Renaissance
 - i. Political theory: the views of Machiavelli, Bodin, Hobbes, Grotius, and others on the nature and moral status of political power
 - ii. Humanism: the influence of the writings of Plato on moral theory and literary endeavour; renewed interest in Atomistic Materialism, ancient Skepticism, and Stoicism
[for humanistic scholarship in the Renaissance, see also 10/42.A.3.]
 - iii. Philosophy of nature: the pluralistic, machinelike, and mathematically ordered character ascribed to the natural world; the influence of discoveries in anatomy, physics, and astronomy on philosophy
 - b. The early modern period: the rise of Empiricism and Rationalism
 - i. Developments in the Empiricist tradition: Bacon's attempt to formulate a new scientific method, Hobbes's theory of knowledge
 - ii. Developments in the Rationalist tradition: the antiempirical character of Descartes's metaphysics and the dualism of his doctrine of man and the world, the speculative systems of philosophy provided by the writings of Spinoza and Leibniz
 - c. Philosophy in the period of the Enlightenment, or the Age of Reason
 - i. Epistemological issues: the attempt of Locke and Berkeley to inquire into the origin and nature of reason, Hume's science of man, Kant's critical examination of reason
 - ii. Developments in the philosophy of science: Materialist views, the effect of scientific discoveries on philosophical thought
 - iii. Social and political philosophy: the concern of Locke and Rousseau with the freedom and equality of citizens, developments in religious philosophy
 - d. Philosophy in the 19th century

- i. The resurgence of the metaphysical spirit: the Idealism of Fichte, Schelling, and Hegel
 - ii. Developments in the empirical and scientific tradition: Comte's Positivism and its subsequent influence on the philosophy of science, J.S. Mill's theory of knowledge and ethics, the dialectical Materialism of Marx and Engels
 - iii. The reaction against Rationalism: Kierkegaard's preoccupation with the states of consciousness, Schopenhauer's doctrine of cosmic will, the writings of Nietzsche
- e. Philosophy in the 20th century
- i. Independent speculative and social philosophies: Bergson's intuitionism, Whitehead's speculative philosophy, William James's and Dewey's Pragmatism
 - ii. Developments in Marxist thought: Lenin's metaphysical Materialism and his theory of knowledge, the continuing attempt to make theory serve practice

B. Non-Western philosophy

1. Indian philosophy

- a. Early Indian philosophical thought: the role of Hindu and Buddhist sacred literature in presystematic philosophy, the concepts of Brahman and *ātman* in Hindu thought and of selflessness and Nirvāṇa in early Buddhist writings
- b. The beginning of system building in Indian philosophy: the role of the *sūtra*, metaphysical and epistemological concerns, ethical and political thought, the teaching of the Ājīvikas and Cārvākas
- c. The further developments of systematic thought in India: Realism and Idealism in metaphysical and epistemological thought, the relation of pluralistic and monistic views to various linguistic philosophies
- d. The schools of Vedānta: the contribution of Śaṅkara and Rāmānuja and their followers; the schools of Nimbārka, Vallabha, and Caitanya
- e. The Vaiṣṇava and Śaiva schools: philosophical systems based on the literature of Vaiṣṇavism and Śaivism
- f. Later Indian philosophical thought: the influence of Islāmic thought and European philosophy, recent trends

2. Chinese philosophy

- a. The classical Chinese philosophical schools: *e.g.*, Confucianism, Taoism, Yin-Yang, Mohism, Dialecticians, the Legalist school
- b. Neo-Taoist and Buddhist thought
- c. Neo-Confucianism: the development of the concept of principle
- d. 20th-century Chinese philosophy: the effects of Western thought and of Maoism

3. Japanese philosophy

- a. Early Japanese philosophical thought: the introduction of Buddhism and Confucianism, the Six Schools of Nara, Tendai and Shingon philosophy
- b. Developments during the Kamakura and Muromachi periods: the origins and concerns of the Zen, Jōdo (Pure Land), and Nichiren sects; tendencies in Shintō and Confucian thought

C. Philosophies associated with religion

1. Hindu philosophy

[see 823.B.3.]

2. Buddhist philosophy

[see 824.B.3.]

3. Confucian philosophy

[see 825.B.3.]

4. Taoist philosophy

[see 825.C.3.]

5. Jewish philosophy

[see 826.B.6.]

6. Islāmic philosophy

[see 828.B.4.]

7. Christian philosophy

[see 827.E.7.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and biographies dealing with the history of philosophy

Aristotelianism,	Hegelianism,	Mill, John Stuart	Smith, Adam
Aristotle and	Hegel and	Nietzsche	Socrates
Augustine	Hume	Philosophy,	Taoism
Cartesianism,	Indian Philosophy	The History of	Thomism,
Descartes and	Kantianism,	Western	Thomas
Christianity	Kant and	Platonism,	Aquinas and
Confucianism,	Locke	Plato and	
Confucius and	Marxism,	Rousseau,	
	Marx and	Jean-Jacques	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>Arabic philosophy:</i>	entelechy	kuṇḍālinī	Zen
Ahl al-Kitāb	epochē	Mādhyaṃika	<i>medieval Western</i>
Bāṭinīyah	first cause	māyā	<i>philosophy:</i>
Dahriyah	form	Mīmamsa	fideism
fayḍ	hylomorphism	nirguṇa	intention
ghaybah	logos	Nyāya	Ockham's razor
ikhtilāf	microcosm	pāramitā	Scholasticism
kalām	Not-Being,	prajñapti	tabula rasa
kasb	denial of	prakṛiti	<i>modern Western</i>
Māturīdīyah	opposites, table of	pramāṇa	<i>philosophy:</i>
Murji'ah	paradoxes of Zeno	prana	a priori knowledge
Mu'tazilah	sensationalism	prāṇāyāma	antinomy
Qadariyah	virtue,	pratītya-samutpāda	as if, philosophy of
Rāfiḍah	teachability of	pratyakṣa	axiology
rahbānīyah	<i>Indian philosophy:</i>	pratyaya	categorical
rajm	Abhidharmakośa	puruṣa	imperative
Sālimiyah	abhijñā	śabda	cogito, ergo sum
shirk	Advaita	Śaiva-siddhānta	common sense,
tahajjud	ahankara	samadhi	philosophy of
talbiyah	ajiva	Sāṃkhya	concept
taqiya	Ājīvika	samsāra	constitution theory
tashbih	akriyāvāda	saṃvṛti-satya	deconstruction
tawhīd	ālaya-vijñāna	skandha	deontological
ziyārah	ānanda	smṛtyupasthāna	ethics
<i>Chinese philosophy:</i>	anumāna	syādvāda	deus otiosus
ch'i	Artha-śāstra	tat tvam asi	dialectical
Chinese	asana	trivabhāva	materialism
philosophy	asrāva	upādhi	eudaemonism
hsien	āstika	Vaisheshika	good-reason theory
hsu	ātman	Vedānta	humanism
jen	bhedābheda	Viśiṣṭādvaita	ideal language
Legalism	brahma	yama	identity theory
Mohism	brahmavihāra	Yoga	innate idea
p'u	cakra	Yogācāra	interactionism
T'ai Chi	Cārvāka	<i>Japanese philosophy:</i>	irrationalism
tao	dravya	Japanese	I-Thou
te	Dvaita	philosophy	leap of faith
T'ien Ming	Haṭha Yoga	Jōjitsu	mathematicism
tzu-jan	Indian philosophy	Kegon	metaethics
wu-wei	indriya	Nichiren	metalanguage
yin-yang	jiva	Buddhism	methodic doubt
<i>Greek philosophy:</i>	jñana	Pure Land	mind-body dualism
apathy	kammaṭṭhāna	Buddhism	monad
cosmopolitanism	karma	Ritsu	natural law
emanationism	Kashmir Śaivism	Shingon	normative ethics

noumenon	protocol sentence	social contract	theodicy
occasionalism	radical empiricism	solipsism	transcendental
panpsychism	reductionism	superman	idealism
phenomenalism	revisionism	synthesis	unified science
phenomenon	secularism	teleological ethics	

Biographies

Anaximenes of Miletus	Inoue Tetsujirō Israeli, Isaac ben Solomon	Maimonides, Moses	Spinoza, Benedict de
Averroës	Justin Martyr, Saint	Nārājunga	
Avicenna	Lao-tzu	Nishida Kitarō	
Buber, Martin		Schopenhauer, Arthur	
Chuang-tzu			

See also Sections 10/52 and 10/53

INDEX: See entries under all of the terms above

Section 10/52. The Nature and the Divisions of Philosophy

A. The nature, scope, and methods of philosophy

[for the major philosophical schools in the West, see 10/53; for the development of non-Western philosophy, see 10/51.B.]

1. Diverse conceptions of philosophy
2. Diverse views of the methods of philosophy
3. The forms of philosophical exposition: *e.g.*, dialogues, commentaries, histories, systematically ordered treatises
4. Criteria of meaning and truth in philosophical thought

B. The divisions of philosophy

1. Metaphysics, or speculative philosophy in general
 - a. The history, nature, and scope of metaphysics
[for schools of thought in metaphysics, see 10/53.B.1.]
 - b. The relation of metaphysics to other parts of philosophy: *e.g.*, ethics, logic, natural theology
 - c. Problems in metaphysics
2. The philosophy of nature: the philosophical problems concerning the phenomena, laws, and theories of the natural sciences
[see also 10/31.B.]
 - a. The history, status, and scope of the philosophy of nature
 - b. The relation of the philosophy of nature to science, the philosophy of science, and metaphysics
 - c. The basic aspects of the natural order
 - d. The philosophy of physics
 - e. The philosophy of biology
3. Epistemology, or theory of knowledge
 - a. The history, nature, and scope of epistemology
[for schools of thought in epistemology, see 10/53.C.]
 - b. The relation of epistemology to metaphysics, philosophy of mind, logic, and other disciplines
 - c. Problems in epistemology
4. The philosophy of mind, or philosophical psychology
 - a. The history, nature, and scope of the philosophy of mind
 - b. The relation of the philosophy of mind to the empirical and mathematical sciences and to other philosophical disciplines

- c. Problems in the philosophy of mind
- 5. The philosophy of man, or philosophical anthropology
 - a. The history, nature, and scope of philosophical anthropology
[for schools of thought in philosophical anthropology, see 10/53.B.3.]
 - b. The relation of philosophical anthropology to physical and cultural anthropology and to other disciplines in philosophy and the social sciences
 - c. Problems in philosophical anthropology
- 6. Ethics, or moral philosophy
 - a. The history, nature, and types of ethics: the distinction between metaethics and normative ethics
 - b. The relation of ethics to other philosophical disciplines or to other branches of knowledge or experience
 - c. Problems in ethics
- 7. Political philosophy
 - a. The nature and scope of political philosophy: its relation to political science
 - b. The form of political statements and arguments
 - c. The history of political philosophy
- 8. Aesthetics
 - a. The nature and scope of aesthetics as a discipline
 - b. The development of aesthetics: approaches to the study of the aesthetic experience
 - c. Problems in aesthetics
 - d. The relation of aesthetics to other disciplines
- 9. The philosophy of language
- 10. The philosophy of logic
[see 10/11.B.]
- 11. The philosophy of mathematics
[see 10/21.B.]
- 12. The philosophy of art
[see 611.A.]
- 13. The philosophy of science
[see 10/31.B.]
- 14. The philosophy of religion
[see 811.A.]
- 15. The philosophy of law
[see 551.A.]
- 16. The philosophy of education
[see 561.A.]
- 17. The philosophy of history
[see 10/41.C.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and biographies dealing with the nature and the divisions of philosophy

Aesthetics	Philosophical	Political	Rousseau,
Epistemology	Anthropology	Philosophy,	Jean-Jacques
Ethics	Philosophies of	The History of	Smith, Adam
Metaphysics	the Branches of	Western	Time
Mind, The	Knowledge		
Philosophy of			

MICROPAEDIA: Selected entries of reference information

General subjects

<i>aesthetics:</i>	eudaemonism	phenomenon	nomos
aesthetics	free will	pluralism and	political
<i>epistemology:</i>	good-reasons	monism	philosophy
a priori knowledge	theory	spiritualism	powers,
belief	metaethics	voluntarism	separation of
dualism	moral theology	<i>philosophy of mind:</i>	social contract
epistemology	normative ethics	belief	<i>other:</i>
Idéalogie	probabilism	identity theory	emergence
intuition	teleological ethics	immortality	philosophical
psychologism	virtue	intentionality	anthropology
reason	<i>metaphysics:</i>	interactionism	philosophy
<i>ethics:</i>	creative evolution	mind	teleology
altruism	dualism	mind-body	time
axiology	form	dualism	
categorical	Great Chain of	other minds	
imperative	Being	psychophysical	
choice	hylozoism	parallelism	
comparative ethics	irrationalism	<i>political philosophy:</i>	
conscience	metaphysics	divine right of	
egoism	microcosm	kings	
ethical relativism	naturalism	general will	
ethics	ontology	human rights	

Biographies

<i>aesthetics:</i>	Campanella,	Nietzsche,	<i>other:</i>
Baumgarten,	Tommaso	Friedrich	Adler, Mortimer J.
Alexander	Clauberg, Johann	Norris, John	Alembert, Jean Le
Gottlieb	Descartes, René	Schelling, Friedrich	Rond d'
Bosanquet,	Feuerbach,	Wilhelm	Aron, Raymond
Bernard	Ludwig	Joseph von	Bayle, Pierre
Croce, Benedetto	Fichte, Johann	Schopenhauer,	Collingwood, R.G.
Santayana, George	Gottlieb	Arthur	Condillac, Étienne
<i>epistemology:</i>	Geulinx, Arnold	Spinoza,	Bonnot de
Cassirer, Ernst	Green, T.H.	Benedict de	Cousin, Victor
Dühring, Eugen	Hegel, Georg	Whitehead, Alfred	Dilthey, Wilhelm
Locke, John	Wilhelm	North	Gilson, Étienne
Mill, John Stuart	Friedrich	<i>political philosophy:</i>	Gioberti, Vincenzo
<i>ethics:</i>	Heidegger, Martin	Bentham, Jeremy	Helvétius,
Abelard, Peter	Husserl, Edmund	Berlin, Sir Isaiah	Claude-Adrien
Cudworth, Ralph	Jacobi, Friedrich	Burke, Edmund	Hoffer, Eric
Cumberland,	Heinrich	Engels, Friedrich	Rodó, José
Richard	Jaspers, Karl	Han-fei-tzu	Enrique
Hutcheson, Francis	Kant, Immanuel	Herzen, Aleksandr	Spencer, Herbert
Moore, G.E.	Kierkegaard, Søren	Hobbes, Thomas	Strauss, David
Scheler, Max	Leibniz, Gottfried	Machiavelli,	Friedrich
Whewell, William	Wilhelm	Niccolò	Swedenborg,
<i>metaphysics:</i>	Lewes, George	Mill, James	Emanuel
Aurobindo, Śrī	Henry	Montesquieu,	Teilhard de
Berdyaev,	Malebranche,	Charles-Louis de	Chardin, Pierre
Nikolay	Nicolas	Secondat, baron	Vico, Giambattista
Aleksandrovich	Marcel, Gabriel	de La Brède et de	Weil, Simone
Berkeley, George	Meinong, Alexius	Paine, Thomas	Wittgenstein,
Bradley, F.H.			Ludwig

See also Sections 10/51 and 10/53

INDEX: See entries under all of the terms above

Section 10/53. Philosophical Schools and Doctrines
A. Major philosophical schools in the West
1. Philosophical schools in antiquity and in the Middle Ages

- a. Pythagoreanism
- b. The Sophists
- c. Eleaticism
- d. Atomism
- e. Platonism
- f. Aristotelianism
- g. Stoicism
- h. Epicureanism
- i. Skepticism
- j. Scholasticism

2. Philosophical schools in the modern period

- a. Cartesianism
- b. Empiricism
[for Empiricist tendencies in earlier philosophy, see A.1.b. and i., above; for contemporary Logical Empiricism, see A.2.i., below]
- c. Rationalism
[for Rationalist tendencies in ancient and medieval philosophy, see A.1.a., c., e., and j., above]
- d. Materialism
[for dialectical Materialism, see A.2.j., below]
- e. Kantianism
- f. Idealism
- g. Hegelianism
- h. Utilitarianism
- i. Positivism and Logical Empiricism
[for metalogical studies, see 10/12.B.; for studies in the foundations of mathematics, see 10/21.B.]
- j. Marxism
- k. Realism
- l. Pragmatism
- m. Phenomenology
- n. Existentialism
- o. Analytic and Linguistic philosophy

B. Theories of Being and existence

1. Different types of metaphysical theory: Platonism; Aristotelianism; Thomism; Cartesianism; Idealism; Materialism—dialectical Materialism, Atomism, and Naturalism; Pythagoreanism; Organismic dynamism
2. Different views concerning the existence, attributes, and knowledge of God: agnosticism, atheism, Deism, fideism, humanism, pantheism, theism
3. Different conceptions of man as knower, doer, and maker: Existentialism, humanism, Phenomenology, Pragmatism, rationalism, irrationalism
4. Different views concerning the existence of the mind and its relation to the body: Materialism, dualism, immaterialism

C. Theories of thought, knowledge, and faculties of mind

1. Different conceptions of the object of knowledge: sense-datum theory, Phenomenalism, Idealism, Realism

2. Different conceptions of the validity of knowledge: Kantianism, positivism, pragmatism, Skepticism
3. Different views of the sources or foundations of knowledge: rationalism, Empiricism
4. Different views of the status of the universal: realism, conceptualism, nominalism
5. Different views of the epistemic status of scientific theories; *e.g.*, realism, conventionalism, and operationalism; the Unity of Science movement; reductionism

D. Theories of conduct

1. Metaethical theories: intuitionism, naturalism, noncognitivism, good reasons theories
2. Deontological theories: rationalism, intuitionism, Existentialism
3. Teleological theories: eudaemonism, Utilitarianism

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with Western philosophical schools and doctrines

Aristotelianism, Aristotle and	Marxism, Marx and	Religious and Spiritual Belief,
Cartesianism, Descartes and	Philosophical Schools and	Systems of Thomism, Thomas
Hegelianism, Hegel and	Doctrines, Western	Aquinas and
Kantianism, Kant and	Platonism, Plato and	

MICROPAEDIA: Selected entries of reference information

General subjects

Absolute Idealism	eclecticism	Neo-Hegelianism	Skepticism
Academy	Eleaticism	nominalism	solipsism
Alexandrist	Empiricism	personalism	Sophist
Analytic philosophy	Epicureanism	phenomenology	Stoicism
atomism	Ethical Culture	positivism	theism
Cambridge Platonists	Existentialism	pragmatism	transcendental idealism
Cynic	idealism	process philosophy	Utilitarianism
Cyrenaic	Latin Averroism	Pythagoreanism	Vienna Circle
Deism	Logical Positivism	rationalism	
determinism	materialism	realism	
	Megarian school	scholasticism	
	naturalism	sensationalism	

Biographies

Albertus Magnus, Saint	Carnap, Rudolf	Hume, David	Pico della Mirandola,
Apuleius, Lucius	Cohen, Hermann	Husserl, Edmund	Giovanni, Count di Concordia
Athenagoras	Comte, Auguste	James, William	
Berdyyayev, Nikolay Aleksandrovich	Cousin, Victor	Jaspers, Karl	Plotinus
Bernard de Chartres	Dewey, John	Kierkegaard, Søren	Royce, Josiah
Boethius, Anicias Manlius Severinus	Dühring, Eugen	Lewes, George Henry	Sartre, Jean-Paul
Bosanquet, Bernard	Duns Scotus, John	Maine de Biran, Marie-François-Pierre	Scheler, Max
Bradley, F.H.	Fichte, Johann Gottlieb	Malebranche, Nicolas	Schlick, Moritz
Buridan, Jean	Francis of Meyronnes	Marcel, Gabriel	Unamuno, Miguel de William de la Mare
	Gentile, Giovanni	Maritain, Jacques	
	Godfrey of Fontaines	More, Henry	
	Green, T.H.	Ockham, William of	
	Heidegger, Martin		

See also Sections 10/51 and 10/52

INDEX: See entries under all of the terms above

Division VI. Preservation of Knowledge

[For Part Ten headnote see page 479.]

Division VI, which contains only one section, deals with the various means, techniques, and institutions used to preserve knowledge and, by extension, the objects of knowledge. Because the preservation of knowledge is so closely bound up with technology, which has provided ever more efficient methods, there is much overlap between this section and various sections in Part Seven, and accordingly there are in the outline presented here many cross-references to that part.

Section 10/61. Institutions and Techniques for the Collection, Storage, Dissemination, and Preservation of Knowledge**A. Protection and storage of objects and artifacts****1. Museums and galleries****a. The management and maintenance of institutional collections****b. Types of museum categorized by subject area****i. General museums****ii. Museums of natural history and natural science**

[see also 355.C.6.a.]

iii. Museums of science and technology**iv. Museums of history****v. Museums of art and art galleries**

[see also 612.G.1.]

vi. Museums concerned with particular vocations: e.g., farming, forestry, wine making**vii. Other museums****c. Other systems of museum classification****i. By geographical coverage****ii. By character of collection****iii. By character of provider****iv. By particular clientele****2. Libraries**

[see B.4., below]

3. Historic places and landmarks**4. Public and private collections of animals and plants**

[see also 355.C.6.]

a. Zoological gardens and aviaries**b. Aquariums****c. Botanical gardens and arboretums****5. Parks and nature preserves**

[see also 355.D.]

B. Storage and retrieval of information**1. Dictionaries and lexicons**

[see also 735.H.2.c.i.]

2. Encyclopaedias

[see also 735.H.2.c.ii.]

3. Atlases and map collections

[see also 735.H.2.c.iii.]

4. Libraries**a. Types of libraries****b. The science of library systems**

5. Archives
 6. Bibliographic and numeric databases
[see 735.H.1.b.]
 7. Magnetic and optical recordings
[see 735.F. and H.1.a.]
- C. Institutions for the advancement and dissemination of knowledge
1. Educational institutions
[see Part Five, Division VI]
 2. Academies of learning, or societies established for the advancement of knowledge
 3. Publishing: selection, preparation, and marketing of printed material
 - a. Print publishing
[see also 735.I.1.]
 - i. Books
 - ii. Newspapers
 - iii. Periodicals
 - b. Electronic publishing
 4. Broadcasting
 - a. Radio
[see also 735.I.5]
 - b. Television
[see also 735.I.6]
 5. Observatories and planetariums

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with institutions and techniques for the collection, storage, dissemination, and preservation of knowledge

Broadcasting
Encyclopaedias and Dictionaries
Libraries
Museums
Publishing

MICROPAEDIA: Selected entries of reference information

General subjects

academy	broadcasting	national forest	newspaper
aquarium	dictionary	national	syndicate
archives	encyclopaedia	monument	oceanarium
astronomical	gazette	national park	pamphlet
observatory	library	national seashore	pinacotheca
atlas	little magazine	nature preserve	planetarium
aviary	magazine	news agency	publishing
aviculture	museum	newscast	wall newspaper
book	musical societies	newsletter	zoo
botanical garden	and institutions	newspaper	

INDEX: See entries under all of the terms above

Board of Editors (1974–98)

MORTIMER J. ADLER. Chairman (ret. 1995), Board of Editors. *Philosopher, author, editor, and lecturer. Director, Institute for Philosophical Research, Chicago, 1952–95.*

PHILIP W. GOETZ. Executive Vice-Chairman, Board of Editors. *Editor in Chief, Encyclopædia Britannica, 1979–91.*

FRANK B. GIBNEY. Vice-Chairman, Board of Editors. *Vice-Chairman, TBS-Britannica Company Ltd., Tokyo.*

JACQUES BARZUN. *University Professor Emeritus, Columbia University; Dean of Faculties and Provost, 1958–67.*

WENDY DONIGER. *Mircea Eliade Professor of the History of Religions, University of Chicago.*

CLIFTON FADIMAN. *Writer and editor. Chief Editorial Adviser, Book-of-the-Month Club.*

WILLIAM H. MCNEILL. *Robert A. Millikan Distinguished Service Professor Emeritus of History, University of Chicago.*

MARTIN MEYERSON. *President Emeritus and University Professor of Public Policy Analysis and City and Regional Planning, University of Pennsylvania, Philadelphia.*

CHRISTOPHER D. NEEDHAM. *Principal Lecturer in Library and Information Studies, Polytechnic of North London, 1973–85.*

WALTER PERRY, BARON PERRY OF WALTON. *Vice-Chancellor, Open University, Milton Keynes, England, 1969–80.*

WARREN E. PREECE. *The Editor, Encyclopædia Britannica, 1964–75.*

ANTHONY QUINTON, BARON QUINTON. *Chairman of the British Library Board, 1985–90. President, Trinity College, University of Oxford, 1978–87.*

ROGER C. SCHANK. *Director, Institute for the Learning Sciences; John Evans Professor of Electrical Engineering and Computer Science and Professor of Psychology and of Education and Social Policy, Northwestern University, Evanston, Illinois.*

Advisers

Members of University Advisory Committees

BRIAN D.O. ANDERSON. Chairman of the Australian Universities Advisory Committee. *Professor of Systems Engineering and Director, Research School of Information Sciences and Engineering, Australian National University, Canberra.*

MARC AUGÉ. *Professor of Social Anthropology, School of Higher Studies in Social Sciences, Paris.*

WARREN A. BEBBINGTON. *Ormond Professor and Dean, Faculty of Music, University of Melbourne.*

JOHN L. BERGGREN. *Professor of Mathematics, Simon Fraser University, Burnaby, British Columbia.*

JACQUES BERSANI. Secretary of the European Universities Advisory Committee. *Managing Editor, Encyclopaedia Universalis, Paris.*

GEOFFREY BLAINEY. *Chancellor, University of Ballarat, Australia. Emeritus Professor of History, University of Melbourne.*

ROBERT EUGENE BOGNER. *Professor of Electrical Engineering, University of Adelaide, Australia.*

MAURO CAPPELLETTI. *Shelton Professor of International Legal Studies, Stanford University, California. Professor of Law, University of Florence.*

HANS DAALDER. Chairman of the European Universities Advisory Committee. *Emeritus Professor of Political Science, University of Leiden, The Netherlands.*

FRANÇOIS DUCHESNEAU. *Professor of Philosophy, University of Montreal.*

MANFRED EIGEN. *Director, Max Planck Institute for Biophysical Chemistry, Göttingen, Germany. Cowinner, Nobel Prize for Chemistry, 1967.*

DAVID R. FRASER. *Professor of Animal Science and Dean, Faculty of Veterinary Science, University of Sydney.*

WILLIAM E. FREDEMAN. Cochairman of the Canadian Universities Advisory Committee. *Emeritus Professor of English, University of British Columbia, Vancouver.*

FERNANDO GIL. *Professor of Philosophy of Knowledge, New University of Lisbon. Professor of Epistemology, School of Higher Studies in Social Sciences, Paris.*

CALVIN C. GOTLIEB. *Emeritus Professor of Computer Science, University of Toronto.*

ERIC L. JONES. *Emeritus Professor of Economics, La Trobe University, Bundoora, Victoria, Australia. Professorial Associate, Melbourne Business School, University of Melbourne. Professor of Economics, University of Reading, England.*

PETER KENNEDY. *Professor of Economics, Simon Fraser University, Burnaby, British Columbia.*

UWE KITZINGER. *Visiting Scholar, Harvard University, 1993–96. President, Templeton College, 1984–91; Emeritus Fellow of Nuffield College, University of Oxford.*

DAME LEONIE JUDITH KRAMER. *Chancellor and Emeritus Professor of Australian Literature, University of Sydney.*

KURT LIPSTEIN. *Emeritus Professor of Law, University of Cambridge; Fellow of Clare College, Cambridge.*

F. GRAHAM LITTLE. *Reader in Political Science, University of Melbourne.*

H. CHRISTOPHER LONGUET-HIGGINS. *Emeritus Professor, University of Sussex, Brighton, England; Royal Society Research Professor, 1968–88.*

SIR JOHN LYONS. *Master of Trinity Hall, University of Cambridge.*

FREDERICK R.W. McCOURT. *Professor and Chairman, Department of Chemistry, University of Waterloo, Ontario.*

DONALD GUNN MACRAE. *Martin White Professor Emeritus of Sociology, London School of Economics and Political Science, University of London.*

EDWARD MCWHINNEY. *Queen's Counsel. Member of Parliament, House of Commons, Ottawa. Emeritus Professor of Constitutional and International Law, Simon Fraser University, Burnaby, British Columbia.*

OTFRIED MADELUNG. *Emeritus Professor of Theoretical Physics, University of Marburg, Germany.*

DAVID A. MARTIN. *Emeritus Professor of Sociology, London School of Economics and Political Science, University of London. Honorary Professor, Department of Religious Studies, University of Lancaster, England.*

DONALD M. NICOL. *Koraës Professor Emeritus of Byzantine and Modern Greek History, Language, and Literature, King's College, University of London. Director, Gennadius Library, American School of Classical Studies at Athens, 1989–92.*

CHARLES E. OXNARD. *Professor and Head, Department of Anatomy and Human Biology; Director, Centre for Human Biology, University of Western Australia, Nedlands.*

SIR BRIAN PIPPARD. *Chairman of the British Universities Advisory Committee. Emeritus Professor of Physics, University of Cambridge; Cavendish Professor, 1971–82.*

JOHN DOUGLAS RITCHIE. *General Editor, Australian Dictionary of Biography; Professor, Research School of Social Sciences, Australian National University, Canberra.*

A. EDWARD SAFARIAN. *Cochairman of the Canadian Universities Advisory Committee. Emeritus Professor of Economics; Professor of International Business, University of Toronto.*

JOHN T. SAYWELL. *University Professor and Director, Graduate Program in History, York University, North York, Ontario.*

PEDRO SCHWARTZ. *Professor of the History of Economic Doctrines, Autonomous University of Madrid.*

IAN G. STEWART. *Emeritus Professor of Economics, University of Edinburgh.*

C. ANTHONY STORR. *Emeritus Fellow, Green College, Oxford; Clinical Lecturer in Psychiatry, University of Oxford, 1974–84. Consultant Psychotherapist, Oxford Health Authority, 1974–84.*

GRANT STRATE. *Emeritus Professor of Dance, Simon Fraser University, Burnaby, British Columbia.*

SIR KEITH THOMAS. *President, Corpus Christi College, University of Oxford.*

A. DOUGLAS TUSHINGHAM. *Emeritus Professor of Near Eastern Studies, University of Toronto. Head, Division of Art and Archaeology, Royal Ontario Museum, Toronto, 1955–64; Chief Archaeologist, 1964–79; Member, Board of Trustees, 1984–90.*

DONOVAN W.M. WATERS. *Queen's Counsel. Scholars Professor of Law, University of Victoria, British Columbia. Associate Counsel, Douglas, Symes & Brissenden, Vancouver.*

GÜNTHER WILKE. *Emeritus Professor of Chemistry, University of the Ruhr, Bochum. Emeritus Director, Max Planck Institute for Coal Research, Mülheim an der Ruhr, Germany.*

•Indicates persons who served as contributors to or consultants on the Outline of Knowledge.

Part One. Matter and Energy

EDWARD ANDERS. *Horace B. Horton Professor Emeritus of Chemistry, Enrico Fermi Institute and Department of Chemistry, University of Chicago.*

•A.G.W. CAMERON. *Professor of Astronomy, Harvard University.*

EDWARD U. CONDON (d. 1974). *Professor of Physics, University of Colorado, Boulder, 1963–70.*

•FARRINGTON DANIELS (d. 1972). *Professor of Chemistry, University of Wisconsin, Madison, 1928–59.*

RAYNOR L. DUNCOMBE. *Professor of Aerospace Sciences, University of Texas at Austin.*

•MORTON HAMERMESH. *Professor of Physics, University of Minnesota, Minneapolis, 1975–86.*

JOSEPH J. KATZ. *Emeritus Distinguished Senior Scientist, Argonne National Laboratory, Argonne, Illinois; Senior Chemist, 1946–82.*

MALCOLM H. MACFARLANE. *Professor of Physics, Indiana University, Bloomington.*

•VINCENT E. PARKER. *Emeritus Professor of Physics, California State Polytechnic University, Pomona; Dean, School of Science, 1967–77.*

SIR BRIAN PIPPARD. *Emeritus Professor of Physics, University of Cambridge; Cavendish Professor, 1971–82.*

LOCKHART B. ROGERS (d. 1992). *Graham Perdue Professor of Chemistry, University of Georgia, Athens, 1974–86.*

RUPERT WILDT (d. 1976). *Professor of Astrophysics, Yale University, 1957–73.*

•MARK W. ZEMANSKY (d. 1981). *Professor of Physics, City College, City University of New York.*

Part Two. The Earth

•R.J. CHORLEY. *Professor of Geography, University of Cambridge; Fellow of Sidney Sussex College, Cambridge.*

BERNHARD KUMMEL (d. 1980). *Professor of Geology, Harvard University, 1962–80.*

PAUL EDWIN POTTER. *Professor of Geology, University of Cincinnati, Ohio.*

•WILLIAM STELLING VON ARX. *Senior Scientist, Woods Hole Oceanographic Institution, Massachusetts, 1968–78.*

BRIAN F. WINDLEY. *Professor of Geology, University of Leicester, England.*

•PETER J. WYLLIE. *Professor of Geology and Chairman, Division of Geological and Planetary Sciences, California Institute of Technology, Pasadena.*

Part Three. Life on Earth

•N.J. BERRILL. *Strathcona Professor of Zoology, McGill University, Montreal, 1946–65.*

JOHN TYLER BONNER. *George M. Moffett Professor Emeritus of Biology, Princeton University.*

•V.G. DETHIER (d. 1993). *Gilbert L. Woodside Professor of Zoology, University of Massachusetts at Amherst, 1975–93.*

PETER W. FRANK. *Emeritus Professor of Biology, University of Oregon, Eugene.*

CARL GANS. *Professor of Biology, University of Michigan, Ann Arbor.*

ERNEST M. GIFFORD. *Emeritus Professor of Botany, University of California, Davis.*

Outline of Knowledge

Staff

MORTIMER J. ADLER (d. 2001). *Editor.*

CHARLES VAN DOREN. *Associate Editor. Vice President, Editorial, Encyclopædia Britannica, Inc., 1973–82.*

WILLIAM J. GORMAN (d. 1982). *Associate Editor. Senior Fellow, Institute for Philosophical Research.*

- **LOUIS S. GOODMAN, M.D.** *Distinguished Professor of Pharmacology, University of Utah, Salt Lake City.*
- **GARRETT HARDIN.** *Emeritus Professor of Human Ecology, University of California, Santa Barbara.*
EMANUEL MARGOLIASH. *Owen L. Coon Professor Emeritus of Molecular Biology, Northwestern University, Evanston, Illinois. Professor of Biological Sciences, University of Illinois at Chicago.*
- **ERNST WALTER MAYR.** *Alexander Agassiz Professor Emeritus of Zoology, Harvard University.*
- **JOHN ALEXANDER MOORE.** *Emeritus Professor of Biology, University of California, Riverside.*
- **THEODORE T. PUCK.** *Professor of Biochemistry, Biophysics, and Genetics and Distinguished Professor of Medicine, University of Colorado Health Sciences Center, Denver; Director, Eleanor Roosevelt Institute for Cancer Research.*
G. LEDYARD STEBBINS. *Emeritus Professor of Genetics, University of California, Davis.*
JOHN W. THIERET. *Professor of Botany, Northern Kentucky University, Highland Heights; Chairman, Department of Biological Sciences, 1973–80.*
- **BIRGIT VENNESLAND.** *Head, Vennesland Research Laboratory, Max Planck Society, 1970–81; Director, Max Planck Institute for Cell Physiology, Berlin, 1968–70.*
- **PAUL B. WEISZ.** *Professor of Biology, Brown University, Providence, Rhode Island.*
- **RALPH H. WETMORE.** *Emeritus Professor of Botany, Harvard University.*
- **EMIL H. WHITE.** *D. Mead Johnson Professor of Chemistry, Johns Hopkins University, Baltimore, Maryland.*

Part Four. Human Life

- DONNA BERGEN, M.D.** *Associate Professor of Neurological Sciences, Rush University, Chicago.*
- WILLIAM CAMERON BOWMAN.** *Professor of Pharmacology, University of Strathclyde, Glasgow.*
- **SIR WILFRID EDWARD LE GROS CLARK (d. 1971).** *Professor of Anatomy, University of Oxford.*
ELIZABETH B. CONNELL, M.D. *Professor of Gynecology and Obstetrics, Emory University, Atlanta, Georgia.*
HARVEY J. DWORCKEN, M.D. *Emeritus Professor of Medicine, Case Western Reserve University, Cleveland, Ohio.*
- **RUSSELL S. FISHER, M.D. (d. 1985).** *Chief Medical Examiner, State of Maryland, Baltimore. Professor of Forensic Pathology, University of Maryland Medical School, Baltimore.*
MARK C. FISHMAN, M.D. *Former Assistant Professor of Medicine, Harvard University.*
CECIL A. GIBB. *Emeritus Professor of Psychology, Australian National University, Canberra.*
ROY R. GRINKER, SR., M.D. (d. 1993). *Professor of Psychiatry, University of Chicago, 1969–85. Director, Institute for Psychosomatic and Psychiatric Research and Training, Michael Reese Hospital and Medical Center, Chicago, 1951–76.*
NORMAN K. HOLLENBERG, M.D. *Professor of Radiology, Harvard University.*
- **F. CLARK HOWELL.** *Professor of Anthropology, University of California, Berkeley.*
JOHN H. HUMPHREY, M.D. (d. 1987). *Professor of Immunology, Royal Postgraduate Medical School, University of London, 1976–81.*
HOWARD F. HUNT. *Clinical Professor of Psychology in Psychiatry, Cornell University Medical College, New York City.*
- AINSLEY IGGO.** *Professor of Veterinary Physiology, 1962–90; Dean, Faculty of Veterinary Medicine, 1974–77 and 1985–90, University of Edinburgh.*
- JEROME P. KASSIRER, M.D.** *Sara Murray Jordan Professor of Medicine, Tufts University, Boston.*
- WILLIAM KESSEN.** *Eugene Higgins Professor of Psychology; Professor of Pediatrics, Yale University.*
- **GREGORY A. KIMBLE.** *Emeritus Professor of Psychology, Duke University, Durham, North Carolina.*
- **ERICH KLINGHAMMER.** *Associate Professor of Psychology, Purdue University, West Lafayette, Indiana.*
LOUIS LASAGNA, M.D. *Dean, Sackler School of Graduate Biomedical Sciences; Dean for Academic Affairs, School of Medicine, Tufts University, Medford, Massachusetts.*
- **WARREN STURGIS McCULLOCH, M.D. (d. 1969).** *Neurophysiologist, cyberneticist. Staff Member, Research Laboratory of Electronics, Massachusetts Institute of Technology, Cambridge, 1952–69.*
- **WILLIAM J. MCGUIRE.** *Professor of Psychology, Yale University.*
W. BRYAN MATTHEWS, M.D. *Emeritus Professor of Clinical Neurology, University of Oxford.*
- **SIR PETER MEDAWAR (d. 1987).** *Jodrell Professor of Zoology and Comparative Anatomy, University College, London, 1951–62. Director, National Institute, Mill Hill, London, 1962–71. Member, Scientific Staff, Medical Research Council, England, 1971–84. Nobel Prize for Physiology or Medicine, 1960.*
MICHAEL FRANCIS OLIVER, M.D. *Professor, National Heart and Lung Institute, London. Duke of Edinburgh Professor of Cardiology, University of Edinburgh, 1979–89.*
D. KEITH PETERS. *Regius Professor of Physic, University of Cambridge.*
KEN RAWNSLEY (d. 1992). *Professor and Head, Department of Psychological Medicine, University of Wales College of Medicine, Cardiff, 1964–85.*
DRUMMOND RENNIE, M.D. *Professor of Medicine, University of California, San Francisco. Deputy Editor (West), The Journal of the American Medical Association.*
JAMES SCOTT ROBSON, M.D. *Emeritus Professor of Medicine, University of Edinburgh.*
FRED S. ROSEN, M.D. *James L. Gamble Professor of Pediatrics, Harvard University.*
IRVING SARNOFF. *Emeritus Professor of Psychology, New York University, New York City.*
WILFRED SIRCUS, M.D. *Senior Consultant Physician, Gastrointestinal Unit; former Reader in Medicine, University of Edinburgh.*
WILLIAM H. TALIAFERRO (d. 1973). *Eliakim Hastings Moore Distinguished Service Professor of Microbiology, University of Chicago, 1954–60. Senior Immunologist, Division of Biological and Medical Research, Argonne National Laboratory, Argonne, Illinois, 1960–69.*
ILZA VEITH. *Emeritus Professor of Psychiatry and the History of Health Sciences, University of California, San Francisco.*
MAXWELL M. WINTROBE, M.D. (d. 1986). *Professor of Internal Medicine, University of Utah, Salt Lake City, 1943–70.*

Part Five. Human Society

- FRANCIS A. ALLEN.** *Huber C. Hurst Professor Emeritus of Law, University of Florida, Gainesville. Edson R. Sunderland Professor Emeritus of Law, University of Michigan, Ann Arbor.*
- CLEVELAND AMORY.** *Author and lecturer. President of The Fund for Animals.*

- **WILLIAM J. BAUMOL.** *Professor of Economics, New York University, New York City. Emeritus Professor of Economics, Princeton University.*
- **DANIEL BELL.** *Henry Ford II Professor Emeritus of Social Science, Harvard University.*
- **GIULIANO H. BONFANTE.** *Former Professor of Linguistics, University of Turin, Italy.*
- **KENNETH E. BOULDING** (d. 1993). *Distinguished Professor of Economics, University of Colorado, Boulder, 1977–80.*
- TIMOTHY J. COLTON.** *Morris and Anna Feldberg Professor of Government and Russian Studies; Director, Russian Research Center, Harvard University.*
- **LEWIS A. COSER.** *Distinguished Professor Emeritus of Sociology, State University of New York at Stony Brook.*
- MAURICE CRANSTON** (d. 1993). *Professor of Political Science, London School of Economics and Political Science, University of London, 1969–85.*
- **SIGMUND DIAMOND.** *Giddings Professor Emeritus of Sociology, Columbia University.*
- **CARL J. FRIEDRICH** (d. 1984). *Eaton Professor of the Science of Government, Harvard University, 1955–71.*
- DAVID A. GOSLIN.** *President, American Institutes for Research in Behavioral Sciences, Washington, D.C.*
- ANDREW HACKER.** *Professor of Political Science, Queens College, City University of New York, Flushing.*
- JOHN HACKETT.** *Consultant, Organization for Economic Cooperation and Development, Paris; Director for Financial, Fiscal, and Enterprise Affairs, 1979–89.*
- ERIC P. HAMP.** *Robert Maynard Hutchins Distinguished Service Professor Emeritus of Linguistics, of Psychology, and of Slavic Languages, University of Chicago.*
- JEROME HOLTZMAN.** *Author and journalist. Baseball Columnist, Chicago Tribune. Elected to the Writers' Wing, National Baseball Hall of Fame, 1990.*
- EDMUND JAMES KING.** *Emeritus Professor of Education, King's College, University of London.*
- JOHN RICHARD KRUEGER.** *Managing Editor, publications of the Mongolia Society, Indiana University, Bloomington; former Professor of Uralic and Altaic Studies.*
- SIR JOHN LYONS.** *Master of Trinity Hall, University of Cambridge.*
- DONALD GUNN MACRAE.** *Martin White Professor Emeritus of Sociology, London School of Economics and Political Science, University of London.*
- RUSSELL L. MATHEWS.** *Emeritus Professor of Economics, Australian National University, Canberra.*
- JEANNETTE R. MIRSKY** (d. 1987). *Visiting Fellow, Department of East Asian Studies, Princeton University, 1970–74.*
- HANS J. MORGENTHAU** (d. 1980). *Leonard Davis Distinguished Professor of Political Science, City College, City University of New York, 1968–74. Albert A. Michelson Distinguished Service Professor of Political Science and Modern History, University of Chicago, 1963–68.*
- **PAUL MUNDY.** *Professor of Sociology; Chairman, Department of Criminal Justice, Loyola University, Chicago.*
- ALEXANDER NOVE** (d. 1994). *Professor of Economics, University of Glasgow, 1963–82.*
- **KENYON E. POOLE** (d. 1988). *Professor of Economics, Northwestern University, Evanston, Illinois.*
- **C. HERMAN PRITCHETT.** *Emeritus Professor of Political Science, University of California, Santa Barbara, and University of Chicago.*
- ALBERT J. REISS, JR.** *William Graham Sumner Professor of Sociology; Lecturer in Law, Yale University.*
- CHARLES SZLADITS** (d. 1986). *Adjunct Professor of Comparative Law, Columbia University.*
- **SOL TAX** (d. 1995). *Professor of Anthropology, University of Chicago, 1948–76. Director, Center for the Study of Man, Smithsonian Institution, Washington, D.C., 1968–76.*
- **CHARLES RAYMOND WHITTLESEY.** *Emeritus Professor of Finance and Economics, University of Pennsylvania, Philadelphia.*
- AARON B. WILDAVSKY** (d. 1993). *Professor of Political Science, University of California, Berkeley, 1965–93.*
- TURRELL V. WYLIE** (d. 1984). *Professor of Tibetan Studies, University of Washington, Seattle, 1972–84.*

Part Six. Art

- **RUDOLF ARNHEIM.** *Emeritus Professor of Psychology of Art, Carpenter Center for the Visual Arts, Harvard University.*
- JOHN ELY BURCHARD** (d. 1975). *Professor of Humanities and Dean, School of Humanities and Social Science, Massachusetts Institute of Technology, Cambridge, 1948–64.*
- ALBERT BUSH-BROWN** (d. 1994). *Chancellor, Long Island University, Greenvale, New York, 1971–85.*
- **ROBERT JESSE CHARLESTON** (d. 1994). *Keeper, Department of Ceramics, Victoria and Albert Museum, London, 1963–76.*
- **CLIFTON FADIMAN.** *Writer and editor. Member, Board of Editors, Encyclopædia Britannica.*
- **FRANCIS FERGUSSON** (d. 1986). *Professor of Comparative Literature, Princeton University, 1973–81. Professor of Comparative Literature, Rutgers University, New Brunswick, New Jersey, 1953–69.*
- HELMUT GERNSHEIM** (d. 1995). *Photo-historian and author. Founder of the Gernsheim Collection. Regents Professor of Art, University of California, Riverside, 1984. Guest Professor, University of California, Santa Barbara, 1985 and 1989.*
- **JOHN GLOAG** (d. 1981). *Novelist and writer on architecture and industrial design.*
- OLEG GRABAR.** *Professor, School of Historical Studies, Institute for Advanced Study, Princeton, New Jersey. Aga Khan Professor of Islâmic Art, Harvard University, 1981–90.*
- **RICHARD GRIFFITH** (d. 1969). *Lecturer on Motion Pictures, Wesleyan University, Middletown, Connecticut, 1967–69. Curator, Museum of Modern Art Film Library, New York City, 1951–65.*
- **RICHARD HOGGART.** *Warden, Goldsmiths' College, University of London, 1976–84. Professor of English, University of Birmingham, England, 1962–73.*
- HANS HUTH** (d. 1977). *Curator of Painting, 1944–57, Art Institute of Chicago; Curator of Decorative Arts, 1958–63.*
- ARTHUR KNIGHT** (d. 1991). *Professor of Cinema, University of Southern California, Los Angeles, 1967–85.*
- **EDWARD LOCKSPEISER** (d. 1973). *Officier d'Académie, Paris. Writer and broadcaster on music.*
- DENNIS K. MCINTIRE.** *Music historian and lexicographer. Editor, Baker's Biographical Dictionary of Musicians. Contributor to The New Grove Dictionary of American Music and others.*
- **ROY McMULLEN** (d. 1984). *Author, critic, and art historian.*
- WILLIAM W. MELNITZ** (d. 1989). *Professor of Theater Arts, University of California, Los Angeles, 1956–67; Dean, College of Fine Arts, 1961–67.*
- **LEONARD B. MEYER.** *Benjamin Franklin Professor of Music and Humanities, University of Pennsylvania, Philadelphia.*

- MICHAEL MORROW (d. 1994). *Music Editor*, Encyclopædia Britannica. *Director, Musica Reservata*, London.
- RAY NASH (d. 1982). *Professor of Art*, Dartmouth College, Hanover, New Hampshire, 1949–70.
- BRUNO NETTL. *Professor of Music and of Anthropology*, University of Illinois at Urbana-Champaign.
- BEAUMONT NEWHALL (d. 1993). *Visiting Professor of Art*, University of New Mexico, Albuquerque, 1971–84. *Director*, George Eastman House, Rochester, New York, 1958–71.
- DOROTHY MARGARET PARTINGTON (d. 1990). *Literary critic and historian*.
- SIR HERBERT READ (d. 1968). *Poet and critic*. *Watson Gordon Professor of Fine Art*, University of Edinburgh, 1931–33. *Editor*, The Burlington Magazine, 1933–39. *Charles Eliot Norton Professor of Poetry*, Harvard University, 1953–54.
- RICHARD ROUD (d. 1989). *Film critic*, The Guardian, Manchester, 1963–69. *Program Director*, London (1959–63) and New York (1963–87) Film Festivals.
- GEORGE SAVAGE (d. 1982). *Art consultant*. *Author of* Porcelain Through the Ages; Pottery Through the Ages; and others.
- NICOLAS SLONIMSKY (d. 1995). *Conductor, composer, writer, and editor*. *Lecturer in Music*, University of California, Los Angeles, 1964–67. *Editor*, Baker's Biographical Dictionary of Musicians, 1949–93.
- WOLFGANG STECHOW (d. 1974). *Professor of Fine Arts*, Oberlin College, Oberlin, Ohio, 1940–63.
- JOSHUA C. TAYLOR (d. 1981). *Director*, National Collection of Fine Arts, Smithsonian Institution, Washington, D.C., 1970–81. *William Rainey Harper Professor of Humanities and Professor of Art*, University of Chicago, 1963–74.
- WALTER TERRY (d. 1982). *Dance critic and editor*, Saturday Review magazine; New York Herald Tribune; and others.
- EVERARD M. UPJOHN (d. 1978). *Professor of Fine Arts*, Columbia University, 1951–70.
- PIERRE VERLET. *Chief Curator of Art Objects from the Middle Ages to the Modern Period*, Louvre Museum, Paris, 1945–65. *Chief Curator*, National Museum of Sèvres Porcelain, Sèvres, France, 1945–65. *Chief Curator*, Cluny Museum, Paris, 1945–65.
- RENÉ WELLEK (d. 1995). *Sterling Professor of Comparative Literature*, Yale University, 1952–72.
- GLYNNE WILLIAM GLADSTONE WICKHAM. *Emeritus Professor of Drama*, University of Bristol, England; *Dean*, Faculty of Arts, 1970–72.
- RAYMOND (HENRY) WILLIAMS (d. 1988). *Professor of Drama*, University of Cambridge, 1974–83; *Fellow of Jesus College*, Cambridge, 1961–88.
- C. BARRIE WILSON (d. 1995). *Senior Vice-Principal*, University of Edinburgh, 1990–95; *Professor of Architectural Science*, 1968–95.
- PAUL S. WINGERT (d. 1974). *Professor of Art History and Archaeology*, Columbia University.
- BRUNO ZEVI. *Professor of Architectural History*, University of Rome, 1963–79.
- CONSTANTINE APOSTOLOS DOXIADIS (d. 1975). *Chairman*, Doxiadis Associates International, Athens; *Chairman*, Board of Directors, Doxiadis Associates, Inc., Washington, D.C. *Chairman*, Board of Directors, Athens Technological Organization. *President*, Athens Center of Ekistics.
- EUGENE S. FERGUSON. *Emeritus Professor of History*, University of Delaware, Newark. *Curator of Technology*, Hagley Museum, Greenville, Delaware, 1969–79.
- NEAL FITZSIMONS. *Principal*, Engineering Counsel, Kensington, Maryland.
- S. PAUL JOHNSTON (d. 1985). *Director*, National Air and Space Museum, Smithsonian Institution, Washington, D.C., 1964–69.
- MELVIN KRANZBERG (d. 1995). *Callaway Professor of the History of Technology*, Georgia Institute of Technology, Atlanta, 1972–88.
- WARREN PERRY MASON (deceased). *Senior Research Associate*, Henry Krumb School of Mines, Columbia University, 1969–77. *Head of Mechanics Research*, Bell Telephone Laboratories, Murray Hill, New Jersey, 1948–65.
- HARVEY G. MEHLHOUSE. *Chairman of the Board*, Western Electric Company, New York City, 1971–72; *President*, 1969–71; *Vice President*, 1965–69.
- HARRY F. OLSON (d. 1982). *Staff Vice President*, RCA Laboratories, Princeton, New Jersey, 1966–67; *Director*, Acoustical and Electromechanical Laboratory, 1942–66.
- ROBERT SMITH WOODBURY (d. 1983). *Professor of the History of Technology*, Massachusetts Institute of Technology, Cambridge.

Part Eight. Religion

- CHARLES JOSEPH ADAMS. *Emeritus Professor of Islamic Studies*, McGill University, Montreal. *Editorial Board*, Encyclopaedia of Religion.
- SALO WITTMAYER BARON (d. 1989). *Professor of Jewish History, Literature, and Institutions*, Columbia University, 1930–63; *Director*, Center of Israel and Jewish Studies, 1950–68.
- THE REV. COLMAN J. BARRY, O.S.B. (d. 1994). *Regents Professor of History*, Saint John's University, Collegeville, Minnesota, 1951–94; *Director*, Institute for Spirituality, 1977–83.
- ARTHUR LLEWELLYN BASHAM (d. 1986). *Professor of Asian Civilizations*, Australian National University, Canberra.
- THE REV. JAMES T. BURTCHAELL. *Professor of Theology*, University of Notre Dame, Indiana; *Provost*, 1970–77.
- P. JOSEPH CAHILL, S.J. (d. 1995). *Professor of Religious Studies*, University of Alberta, Edmonton.
- THE REV. J.V. LANGMEAD CASSERLEY (d. 1978). *Professor of Apologetics*, Seabury-Western Theological Seminary, Evanston, Illinois, 1959–77.
- EDWARD J.D. CONZE (d. 1979). *Visiting Professor of Religious Studies*, University of Lancaster, England, 1973–75.
- H. BYRON EARHART. *Professor of Religion*, Western Michigan University, Kalamazoo.
- GEORGE WOLFGANG FORELL. *Carver Professor Emeritus of Religion*, University of Iowa, Iowa City.
- JUDAH GOLDIN. *Emeritus Professor of Post-Biblical Hebrew Literature*, University of Pennsylvania, Philadelphia.
- HERBERT V. GUENTHER. *Emeritus Professor of Far Eastern Studies*, University of Saskatchewan, Saskatoon.

Part Seven. Technology

- BRIAN D.O. ANDERSON. *Professor of Systems Engineering and Director*, Research School of Information Sciences and Engineering, Australian National University, Canberra.
- GRACE ROGERS COOPER. *Museum consultant*. *Curator*, Division of Textiles, National Museum of History and Technology, Smithsonian Institution, Washington, D.C., 1946–76.

- ICHIRO HORI (d. 1974). *Professor of the History of Religions, Seijo University and Kokugakuin University, Tokyo.*
- THORKILD JACOBSEN (d. 1993). *Professor of Assyriology, Harvard University, 1962–74.*
- CHARLES H. LONG. *Professor of Religious Studies; Director, Center for Black Studies, University of California, Santa Barbara.*
- THE REV. GEORGE W. MACRAE, S.J. (d. 1985). *Stillman Professor of Roman Catholic Theological Studies, Divinity School, Harvard University, 1973–85.*
- MARTIN E. MARTY. *Fairfax M. Cone Distinguished Service Professor, Divinity School, University of Chicago. Senior Editor, The Christian Century.*
- THE REV. JOHN MEYENDORFF (d. 1992). *Dean, St. Vladimir's Orthodox Theological Seminary, Tuckahoe, New York, 1984–92; Professor of Church History and Patristics, 1959–92. Professor of Byzantine and East European History, Fordham University, New York City, 1967–92.*
- HAJIME NAKAMURA. *Founder-Director, Eastern Institute, Inc., Tokyo. Emeritus Professor of Indian and Buddhist Philosophy, University of Tokyo.*
- JAROSLAV JAN PELIKAN. *Sterling Professor of History, Yale University. President, American Academy of Arts and Sciences.*
- RABBI JAKOB JOSEF PETUCHOWSKI (d. 1991). *Sol and Arlene Bronstein Professor of Judeo-Christian Studies, Hebrew Union College–Jewish Institute of Religion, Cincinnati, Ohio, 1981–91.*
- J. COERT RYLAARSDAM. *Emeritus Professor of Old Testament Theology, Divinity School, University of Chicago. Emeritus Professor of Theology, Marquette University, Milwaukee, Wisconsin.*
- R.J. ZWI WERBLOWSKY. *Emeritus Professor of Comparative Religion, Hebrew University of Jerusalem.*

Part Nine. The History of Mankind

- FREDERICK B. ARTZ (d. 1983). *Professor of History, Oberlin College, Ohio, 1934–62.*
- JACQUES BARZUN. *University Professor Emeritus, Columbia University; Dean of Faculties and Provost, 1958–67.*
- DAVID BIRMINGHAM. *Professor of Modern History, University of Kent at Canterbury, England.*
- JOHN F. CADY. *Distinguished Professor Emeritus of History, Ohio University, Athens.*
- AINSLIE T. EMBREE. *Emeritus Professor of History, Columbia University.*
- JOSEPH FLETCHER (d. 1984). *Professor of Chinese and Central Asian History, Harvard University, 1972–84.*
- HERBERT S. KLEIN. *Professor of History, Columbia University.*
- PHILIP A. KUHN. *Professor of History; Director, John King Fairbank Center for East Asian Research, Harvard University.*
- DONALD P. LITTLE. *Professor, Institute of Islāmic Studies, McGill University, Montreal.*
- DONALD M. LOWE. *Emeritus Professor of History, San Francisco State University.*
- JAMES G. LYDON. *Professor of History, Duquesne University, Pittsburgh.*
- PAUL T. MASON. *Professor of History, Duquesne University, Pittsburgh.*
- HERBERT GEORGE NICHOLAS. *Rhodes Professor Emeritus of American History and Institutions, University of Oxford; Fellow of New College, Oxford, 1951–78.*

DONALD MACGILLIVRAY NICOL. *Koraës Professor Emeritus of Byzantine and Modern Greek History, Language, and Literature, King's College, University of London. Director, Gennadius Library, American School of Classical Studies at Athens, 1989–92.*

RICHARD E. PIPES. *Frank B. Baird, Jr., Professor of History, Harvard University.*

GORDON R. WILLEY. *Bowditch Professor Emeritus of Mexican and Central American Archaeology, Harvard University.*

GEORGE MACKLIN WILSON. *Professor of History and of East Asian Languages and Cultures, Indiana University, Bloomington.*

Part Ten. The Branches of Knowledge

- MONROE C. BEARDSLEY (d. 1985). *Professor of Philosophy, Temple University, Philadelphia, 1969–84.*
- OTTO ALLEN BIRD. *Emeritus Professor of Arts and Letters, University of Notre Dame, Indiana.*
- PETER G. BROWN. *Professor of Public Policy; Director, Environmental Policy Programs, University of Maryland, College Park.*
- WING-TSIT CHAN (d. 1994). *Anna R.D. Gillespie Professor of Philosophy, Chatham College, Pittsburgh, 1966–82. Professor of Chinese Philosophy and Culture, Dartmouth College, Hanover, New Hampshire, 1942–66.*
- RODERICK M. CHISHOLM. *Andrew Mellon Professor Emeritus of the Humanities and Emeritus Professor of Philosophy, Brown University, Providence, Rhode Island.*
- JAMES DANIEL COLLINS (d. 1985). *Professor of Philosophy, St. Louis University, Missouri.*
- ALAN DONAGAN (d. 1991). *Professor of Philosophy, California Institute of Technology, Pasadena, 1984–91.*
- WILLIAM H. DRAY. *Emeritus Professor of Philosophy and of History, University of Ottawa.*
- ELDON DYER (d. 1993). *Distinguished Professor of Mathematics, Graduate School, City University of New York, 1971–92.*
- NORWOOD HANSON (d. 1967). *Professor of Philosophy, Yale University, 1963–67.*
- J.H. HEXTER (d. 1996). *Distinguished Historian in Residence, Washington University, St. Louis, Missouri, 1978–86. Charles L. Stillé Professor of History, Yale University, 1967–78.*
- THE REV. ERNAN V. McMULLIN. *Professor of Philosophy, University of Notre Dame, Indiana.*
- KARL MENGER (d. 1985). *Professor of Mathematics, Illinois Institute of Technology, Chicago, 1946–71.*
- ARTHUR NORMAN PRIOR (d. 1969). *Fellow, Balliol College, University of Oxford. Professor of Philosophy, Manchester University, 1959–66.*
- NICHOLAS RESCHER. *University Professor of Philosophy, University of Pittsburgh. Editor, American Philosophical Quarterly.*
- MARK A. RONAN. *Mason Professor of Pure Mathematics, University of Birmingham, England.*
- PAUL ARTHUR SCHILPP (d. 1993). *Professor of Philosophy, Northwestern University, Evanston, Illinois, 1950–65. Distinguished Professor, Southern Illinois University, Carbondale, 1965–77.*
- SEYMOUR SCHUSTER. *Professor of Mathematics, Carleton College, Northfield, Minnesota.*
- JULIUS R. WEINBERG (d. 1971). *Vilas Professor of Philosophy, University of Wisconsin, Madison.*

Geography

NATHANIEL O. ABELSON. *Former Map Librarian, Dag Hammarskjöld Library, United Nations, New York City.*

IBRAHIM A. ABU-LUGHOD. *Vice President, Birzeit University, West Bank. Professor of Political Science, Northwestern University, Evanston, Illinois, 1967–93.*

GEORGE I. BLANKSTEN. *Emeritus Professor of Political Science, Northwestern University, Evanston, Illinois.*

NORTON S. GINSBURG. *Emeritus Professor of Geography, University of Chicago.*

CHAUNCY D. HARRIS. *Samuel N. Harper Distinguished Service Professor Emeritus of Geography, University of Chicago.*

HELVI A. KALMAN. *Writer and Editor, Department of Public Information, United Nations, New York City, 1958–79.*

C.W. MINKEL. *Associate Vice-Chancellor; Dean, Graduate School, University of Tennessee, Knoxville.*

HANS E. PANOFSKY. *Curator of Africana, Northwestern University Library, Evanston, Illinois, 1959–91.*

G. ETZEL PEARCY (d. 1980). *Professor of Geography, California State University, Los Angeles, 1969–73.*

JOSEPH E. SCHWARTZBERG. *Professor of Geography, University of Minnesota, Minneapolis.*

IVOR G. WILKS. *Melville J. Herskovits Professor of African Studies, Northwestern University, Evanston, Illinois.*

Authors of Propædia Essays

Part One

NIGEL CALDER. *Physicist and science writer. Science Correspondent, New Statesman, 1966–71. Editor, New Scientist, 1962–66. Author of Robots; Technopolis: Social Control of the Uses of Science; and others.*

Part Two

PETER J. WYLLIE. *Petrologist, educator, and author. Professor of Geology and Chairman, Division of Geological and Planetary Sciences, California Institute of Technology, Pasadena. Author of Ultramafic and Related Rocks; The Dynamic Earth; and others.*

Part Three

RENÉ DUBOS (d. 1982). *Microbiologist, pathologist, and author. Professor of Pathology, Rockefeller University, New York City, 1957–71. Author of So Human an Animal; Mirage of Health; A God Within; and others.*

Part Four

LOREN EISELEY (d. 1977). *Anthropologist, poet, and essayist. Benjamin Franklin Professor of Anthropology and the History of Science, University of Pennsylvania, 1961–77; Curator of Early Man, University of Pennsylvania Museum, 1948–77. Author of The Immense Journey; The Invisible Pyramid; and others.*

Part Five

HAROLD D. LASSWELL (d. 1978). *Political scientist and author. Professor of Law, 1946–70, and of Political Science, 1952–70, Yale University. Author of Psychopathology and Politics; Politics: Who Gets What, When, How; A Pre-View of Policy Sciences; and others.*

Part Six

MARK VAN DOREN (d. 1972). *Poet, critic, and teacher. Professor of English, Columbia University, 1920–59. Author of lyric and narrative poems, novels, stories, plays, and works of criticism and biography.*

Part Seven

PETER RITCHIE RITCHIE-CALDER, BARON RITCHIE-CALDER (d. 1982). *Author, journalist, and educator. Senior Fellow, Center for the Study of Democratic Institutions, Santa Barbara, California, 1972–75. Montague Burton Professor of International Relations, University of Edinburgh, 1961–67. Author of Birth of the Future; Medicine and Man; The Evolution of the Machine; and others.*

Part Eight

WILFRED CANTWELL SMITH. *Educator and author. Emeritus Professor of the Comparative History of Religion, Harvard University. Author of Islam in Modern History; The Meaning and End of Religion; Questions of Religious Truth; and others.*

Part Nine

JACQUES BARZUN. *Historian, educator, and author. University Professor Emeritus, Columbia University; Dean of Faculties and Provost, 1958–67. Author of Berlioz and the Romantic Century; Darwin, Marx, and Wagner; The House of Intellect; On Writing, Publishing, and Editing; and others.*

Part Ten

MORTIMER J. ADLER (d. 2001). *Philosopher and editor. Director of the Institute for Philosophical Research, 1952–95. Editor of the Syntopicon of Great Books of the Western World; Director of Planning, Encyclopædia Britannica, Fifteenth Edition; Chairman, Board of Editors, 1974–95. Author of The Idea of Freedom; The Conditions of Philosophy; The Common Sense of Politics; and others.*

Staff of the Encyclopædia Britannica

EDITORIAL

Dale H. Hoiberg, *Vice President and Editor*
Theodore Pappas, *Executive Editor*
Marsha Mackenzie, *Managing Editor and Director of Production*
Lisa Braucher, *Data Editor*
Robert Curley, *Senior Editor*
Brian Duignan, *Senior Editor*
Laura J. Kozitka, *Senior Editor*
Kathleen Kuiper, *Senior Editor*
Kenneth Pletcher, *Senior Editor*
Jeffrey Wallenfeldt, *Senior Editor*
Anita Wolff, *Senior Editor*
Charles Cegielski, *Associate Editor*
Stephen P. Davis, *Associate Editor*
Mark Domke, *Associate Editor*
Michael Frassetto, *Associate Editor*
William L. Hosch, *Associate Editor*
Michael R. Hynes, *Associate Editor*
Jo Ann Kiser, *Associate Editor*
John Larrabee, *Assistant Editor*
Michael I. Levy, *Assistant Editor*
Erin M. Loos, *Assistant Editor*
Jim McLendon, *Associate Editor*
Tom Michael, *Associate Editor*
Sarah Orwig, *Associate Editor*
Christine Sullivan, *Associate Editor*
Kathleen B. Sheetz, *Executive Assistant*

ART DEPARTMENT

Nancy J. Canfield, *Art Director*
Kathy Nakamura, *Manager*
Anna Mycek-Wodecki, *Senior Photo Editor*
Kristine A. Strom, *Photo Editor*
Jon Hensley, *Designer*
Steven N. Kapusta, *Designer*
David Alexovich, *Project Coordinator, Illustration*
Thomas J. Spanos, *Lead Electronic Illustrator*
James Alexander, *Illustrator*
Charles Goll, *Illustrator*
Christine McCabe, *Illustrator*
Patrick O'Neill Riley, *Illustrator*
Sarah St. Claire Berg, *Illustrator*

CARTOGRAPHY

John E. Nelson, *Manager*
Paul Breeding, *Cartographer*
Roberto E. Gutiérrez, *Map Editor*
Heather J. Pospiech, *Map Editor*
David J. Wiggins, *Cartographer*

COPY/COMPOSITION DEPARTMENT

Sylvia Wallace, *Manager*
Joan Lackowski, *Special Projects Supervisor*
Patricia Bauer, *Copy Editor*
Carol A. Gaines, *Coordinator*
Glenn Jenne, *Senior Copy Editor*
Marilyn Klein, *Supervisor*
Larry Kowalski, *Supervisor*
Sandra Langeneckert, *Senior Copy Editor*
Dawn McHugh, *Copy Editor*
Julian Ronning, *Supervisor*
Chrystal Schmit, *Copy Editor*
Dennis Skord, *Product Coordinator*
Judith West, *Product Coordinator*
Danette Wetterer, *Coordinator*
Barbara Whitney, *Supervisor*

EDITORIAL TECHNOLOGIES

Steven Bosco, *Director*
Joseph Dunne, *Senior Software Engineer*
Aaron Smith, *Senior Software Engineer*
Bruce Walters, *Technical Support Coordinator*
Mark Wiechec, *Senior Systems Engineer*

INFORMATION MANAGEMENT

Carmen-Maria Hetrea, *Director*
Paul Cranmer, *Retrieval Specialist*
Marco Sampaolo, *Retrieval Specialist*
Sheila Vasich, *Retrieval Specialist*
Edward Paul Moragne, *Index Supervisor*
Mansur G. Abdullah, *Classifier*
Bradley J. Arnold, *Classifier*
Thomas Bell, *Classifier*
Noelle Borge, *Content Analyst*
Kevin Crowder, *Index Editor*
Anne Davis, *Index Editor*
Keith DeWeese, *Content Analyst*
Matthew Heinze, *Content Analyst*
Catherine Keich, *Content Analyst*
Katherine M. Meyer, *Index Editor*
Patrick Russell, *Index Editor*
Stephen Seddon, *Content Analyst*
Janet L. Stein, *Content Analyst*
Lisa Strubin, *Content Analyst*
Gayl Williams, *Index Coordinator*

LIBRARY/BIBLIOGRAPHY

Shantha Uddin, *Head Librarian*
Lars Mahinske, *Curator, Geography*
Henry Bolzon, *Assistant Librarian*
Robert Lewis, *Assistant Librarian*

MEDIA ASSET MANAGEMENT

Melvin Stagner, *Director*
Jeannine Deubel, *Digital Media Manager*
Kimberly L. Cleary, *Supervisor, Illustration Control*
Quannah Humphreys, *Media Production Technician*
Carla Whittington, *Rights and Accounting Coordinator*

PRODUCTION CONTROL

Marilyn Barton, *Supervisor*

WORLD DATA

Rosaline Jackson Keys, *Manager*
W. Peter Kindel, *Research Editor*
Stephen Neher, *Associate Editor*
Marino P. PeBenito, *Associate Editor*
Joseph R. Sturgis, *Associate Editor*

MANUFACTURING

Brian Suderski, *Manager, Marketing and Production*
Dennis Flaherty, *Manufacturing Adviser*